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BURNS, James
CARRAU, Ronaldo
CASTELLANOS, Paul
CHHETRI, Dinesh
COUREY, Mark
CRUMLEY, Roger
DAILEY, Seth
DAMROSE, Edward
DONOVAN, Donald
DRAKE, Amelia
FLINT, Paul
FRIEDMAN, Ellen
GARRETT, C. Gaelyn
GARDNER, Glenson
GOURIN, Christine
HALUM, Stacey
HAR-EL, Gady
HAYDEN, Richard
HINNI, MICHAEL
HOFFMAN, Henry
HOGIKYAN, Norman
KHOSLA, Sid
KOST, Karen
KOUFMAN, Jamie
LONG, Jennifer
MAU, I-Fan Theodore
MCGILL, Trevor
MERATI, Albert
MEYER, Tanya
MIRZA, Natasha
MYER, Charles III
NOORDZIJ, J. Pieter
OSSOFF, Robert

PANIELLO, Randy
PERSKY, Mark
PILLSBURY, Harold
PITMAN, Michael
RAHBAR, Reza
RICE, Dale
RICHTSMEIER, William
RONTAL, Michael
ROSEN, Clark
SASAKI, Clarence
SATALOFF, Robert
SIMPSON, C. Blake
SMITH, Marshall
SULICA, Lucian
THOMPSON, Dana
WENIG, Barry
WOO, Peak
WOODSON, Gail
ZEITELS, Steven

Corresponding
ABITBOL, Jean
DIKKERS, Frederik
HIRANO, Shigeru
MAUNE, Steffen
REMACLE, Marc
SAITO, Kiminori
VOKES, David

Emeritus
APPLEBAUM, Edward
CUMMINGS, Charles
FORD, Charles
HOLINGER, Lauren
MARAGOS, Nicholas

Associate
BRANSKI, Ryan
CLEVELAND, Thomas
HILLSMAN, Robert
MURRY, Thomas
THIBEAULT, Susan

Post-Graduate
AKST, Lee

BENSON, Brian
BOCK, Jonathan
BEST, Simon R.A.
BRADLEY, Joseph
BRYSON, Paul
CARROLL, Thomas
CHILD, Lesley F.
CLARY, Matthew
CRAWLEY, Brianna
DANIERO, James
DE ALARCON, Alessando
DOMINGUEZ, Laura
EKBOM, Dale
FINK, Daniel
FRANCIS, David
FRIEDMAN, Aaron
GELBERD, Alexander
GUREY, Lowell
HILLEL, Alexander
HU, AMANDA
JAMAL, Nausheen
KLEIN, Adam
KRISHNA, Priya
LOTT, David
MATTRKA, Laura
MCHUGH, Richard
MCWHORTER, Andrew
MISONO, Stephanie
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MORTENSEN, Melissa
MOORE, Jaime E.
ONGKASUWAN, Julina
READER, Lindsay
RICKERT, Scott
SADOGH, Babak
SHAH, Rupali
SILVERMAN, Joshua
SMITH, Libby
SOLIMAN, Ahmed
SONG, Phillip
TALIERCO, Sal
TAN, Melin
TANG, Christopher
VERMA, Sunil
YOUNG, VyVy
YOUNG, Nwanmegha
YUNG, Katherine
ZALVAN, Craig
MINUTES OF THE EXECUTIVE SESSIONS

REPORT OF THE SECRETARY

Dr. Har-El reported the membership census prior to the April 2016 election included 145 Active members, 72 Emeriti members, 39 Corresponding members, 2 Honorary members, 10 Associate members and 72 Post-Graduate Members for a total membership of 340 Fellows and members.

Drs. Paul Castellanos, Glendon Gardner, and J. Oieter Noordzij were elected to Active Fellowship and Drs. Stailey Blaugrund, Charles Cummings, Lauren Holinger, Rodney Lusk, Gershon Spector, Marshall Strome, and Gayle Woodson were elevated to Emeritus status. Dr. Gerhard Friedrich was elevated to Corresponding Emeritus status.

Council also approved the suspension of several Fellows who were delinquent for more than three years for membership dues. After election of the nominees, the 2016 roster reflects 129 Active members, 70 Emeriti members, 35 Corresponding members, 2 Honorary members, 10 Associate and 83 Post-Graduate members, for a total membership of 329 Fellows and members.

This year, the largest group of Post-Graduate Members approved for membership was introduced. They are Drs. Anca Barbu, Simon R. A. Best, Joseph Bradley, Meredith J. Monterio-Brandt, Brianna W. Crawley, James J. Daniero, Laura M. Dominguez, Daniel S. Fink, Lyndsay L. Madden, Lindsay S. Reder, Salvatore J. Taliercio, and Christopher G. Tang.

These totals also reflect that five members of the Association had passed away prior to this report.

The By-laws Committee performed an indepth review of the By-laws to present modifications to the voting Fellowship for the purpose of updating all sections where needed. The ballot was submitted to the membership for input. During the first business meeting, a vote was tallied and all recommendations were approved.

Dr. Har-El announced that for the 2017 Annual Meeting, the COSM Secretaries Liaison Committee approved our request to extend our meeting to a third half-day session. We have invited the European Laryngological Society (ELS) to join us. During our meeting several years ago, we had increased participation from our European colleagues so we hope this invitation will lead to greater collaboration. Also, there is a discussion to have the third session in conjunction with the ABEA. Additional information will be provided in the Spring/Summer Newsletter.

He also commented that as this was his last year serving as the Secretary of this magnificent Association, he thanked each member for the support he received during his five years of service. At the conclusion of this year’s meeting, the functions of this position to a new Secretary

Respectfully submitted,
Gady Har-El, MD
Secretary

REPORT OF THE TREASURER

The Treasurer’s report and financial statements were prepared by the ACS. The Treasurer stated that the relationship with the ACS continues to be successful.

Dr. Rosen reported that the finances of the Association continues to show some improvement, especially in the area of investments that continues to grow.

The major source of continuing income is members’ dues. Action to recoup the delinquency included making personal contact with individuals. The amount of outstanding delinquent dues has been reduced due in part to the efforts of our Administrator. Each fellow is encouraged to pay any delinquent amount so his/her membership remains in “good standing.” Council also approved membership suspensions for those who have not brought membership dues current so certified letters are being sent notifying each of the three-year+ delinquency and the guidelines of the By-Laws.

The Council continues to maximize the Association’s assets by controlling expenditures while maintaining the high level of services for the fellowsh.

Revenue received from the 2015 Annual Meeting in Boston was very positive. We will continue to seek different methods to increase paid attendance to our meeting.

Although finances are stable, the greatest need still exists for additional funding resources. Dr. Rosen reminded the Association that in 2009, Dr. Crumley
created a Sustainers’ Fund for donors to make a contribution to the ALA. This year, a campaign was initiated and each member was provided a donor’s card. There were several first time donors and more than $12,000 was received. He reiterated that donations are vital to the Association’s operations and encouraged everyone to get involved with the Sustainers Fund.

Respectfully submitted,
Clark A. Rosen, MD
Treasurer

REPORT OF THE EDITOR

Transactions
Dr. Simpson reported that the 2015 Transactions were compiled and uploaded on the website and positive feedback pertaining to the accessibility of the electronic copies continues to be received from Fellows. Hard copies may be printed by members or you may contact the Administrator if you experience difficulty in printing a copy.

ALA Website
The traffic during the past year has increased dramatically. Visits to the site continue to rise and multiple search engines are being used. The majority of visits were from the United States with others from Asia, South America, and the UK.

Dr. Simpson informed everyone that the user name of each Fellow is that person’s first initial and last name. Upon request, via the website, a temporary password will be sent. Dr. Simpson requested everyone to access the site and update his/her profile with the accurate email address. This will allow the distribution of email blasts to increase.

Publication
Dr. Simpson reported there was a very high rate (41%) of manuscripts submitted from the 2015 annual meeting were published. This rate also includes some manuscripts that originally were submitted for a poster presentation. This is indicative of the excellent quality of posters that increased the value to the contributor.

Respectfully submitted,
C. Blake Simpson, MD
Editor

REPORT OF THE HISTORIAN

Dr. Benninger reported on the passing of four Emeriti fellows since the 2016 annual meeting. After presenting a brief obituary for each deceased fellow, Dr. Benninger requested the observation of a moment of silence on memory of Drs. Samuel R. Fisher, Geza Jako, Robert A. Soffer, and John A. Tucker.

Respectfully submitted,
Michael S. Benninger, MD
Historian
RECIPIENTS OF THE DE ROALDES AWARD

1828 Chevalier L. Jackson
1931 D. Bryson Delavan
1934 Harris P. Mosher
1937 Lee Wallace Dean
1943 Ralph A. Fenton
1949 George M. Coates
1951 Arthur W. Proetz
1954 Louis H. Clerf
1959 Albert C. Furstenberg
1960 Dean M. Lierle
1961 Frederick T. Hill
1966 Paul H. Holinger
1970 Francis E. LeJeune
1973 Lawrence R. Boies
1976 Anderson E. Hilding
1979 Joseph H. Ogura
1982 John J. Conley
1985 John A. Kirchner
1985 Charles M. Norris
1987 Walter P. Work

1988 DeGraaf Woodman
1989 John F. Daly
1990 Joseph L. Goldman
1991 William W. Montgomery
1992 M. Stuart Strong
1993 Douglas P. Bryce
1994 Paul H. Ward
1995 Hugh F. Biller
1996 Byron J. Bailey
1997 George A. Sisson, Sr.

1998 Stanley M. Blaugrund
1999 Jerome C. Goldstein
2000 Thomas C. Calcaterra
2001 Eugene N. Myers
2002 Robin T. Cotton
2003 Gayle E. Woodson
2004 Robert H. Ossoff
2006 Stanley M. Shapshay
2007 W. Frederick McGuirt, Sr.
2008 Robert T. Sataloff
2009 Andrew Blitzer
2010 Marshall Strome
2011 Gerald Healy
2012 Gerald S. Berke
2013 James Netterville
2014 Marvin P. Fried
2015 C. Gaelyn Garrett
2016 Steven M. Zeitels,

RECIPIENTS OF THE CASSELBERRY AWARD

1923 George Fetterolf
1923 and Herbert Fox
1928 Ralph A. Fenton
1928 and O. Larsell
1929 Richard A. Kern
1929 and Harry P. Schenck
1929 Edward H. Campbell
1931 Arthur W. Proetz
1934 Anderson C. Hilding
1936 Francis E. LeJeune
1939 H. Marshall Taylor
1939 and Brien T. King
1940 French K. Hansel
1941 Noah D. Fabricant
1946 Paul H. Holinger
1949 Henry B. Orton
1962 Hans von Leden
1966 John A. Kirchner
1968 Joseph H. Ogura
1985 H. Bryan Neel III
1987 Joseph J. Fata
1991 James L. Koufman
1993 Frank E. Lucente
1994 Ira Sanders

1998 Steven M. Zeitels
1999 Clarence T. Sasaki
2006 Kiminori Sato
2009 Randal C. Paniello
2010 Priya Krishna

RECIPIENTS OF THE NEWCOMB AWARD

1941 Burt R. Shurly
1942 Francis R. Packard
1943 George M. Coates
1944 Charles J. Imperatori
1947 Harris P. Mosher
1948 Gordon Berry
1949 Gordon B. New
1950 H. Marshall Taylor
1951 John D. Kernan
1952 William J. McNally
1953 Frederick T. Hill
1954 Henry B. Orton
1955 Thomas C. Galloway
1956 Dean M. Lierle
1957 Gordon F. Harkness
1958 Albert C. Furstenberg
1959 Harry P. Schenck
1960 Joel J. Pressman
1961 Chevalier L. Jackson
1962 Paul H. Holinger
1963 Francis E. LeJeune
1964 Fred W. Dixon
1965 Edwin N. Broyles
1966 Lyman G. Richards
1967 Joseph H. Ogura
1968 Walter P. Work
1969 John A. Kirchner
1970 Louis H. Clerf
1971 Daniel C. Baker, Jr
1972 Alden H. Miller
1973 DeGraaf Woodman
1974 John J. Conley
1975 Francis W. Davison
1976 Joseph L. Goldman
1977 F. Johnson Putney
1978 John F. Daly
1979 Charles F. Ferguson
1980 Stanton A. Friedberg
1981 Charles M. Norris
1981 Stanton A. Friedberg
1982  William M. Trible
1983  Harold G. Tabb
1984  Daniel Miller
1985  M. Stuart Strong
1986  George A. Sisson
1987  John S. Lewis
1988  Douglas P. Bryce
1989  Loring W. Pratt
1990  William W. Montgomery
1991  Seymour R. Cohen
1992  Paul H. Ward
1993  Eugene N. Myers
1994  Richard R. Gacek
1995  Mark I. Singer
1996  H. Bryan Neel III
1997  Haskins K. Kashima
1998  Andrew Blitzer
1999  Hugh F. Biller
2000  Robert W. Cantrell
2001  Byron J. Bailey
2002  Gerald B. Healy
2003  Steven D. Gray
2004  Charles W. Cummings
2005  Roger L. Crumley
2006  Charles N. Ford
2007  Robert H. Ossoff
2008  Gayle E. Woodson
2009  Marvin P. Fried
2010  Diane Bless
2011  Jamie A. Koufman
2012  Steven M. Zeitels
2013  Lauren Holinger
2014  Clarence T. Sasaki
2015  Robert T. Sataloff
2016  Nicholas Maragos

RECIPIENTS OF THE GABRIEL F. TUCKER AWARD

1987  Seymour R. Cohen
1988  Charles F. Ferguson
1989  Blair Fearon
1990  Gerald B. Healy
1991  John A. Tucker
1992  Bruce Benjamin
1993  John N. G. Evans
1994  Joyce A. Schild
1995  Robin T. Cotton
1996  Haskins K. Kashima
1997  Lauren D. Holinger
1998  Philippe Narcy
1999  Bernard R. Marsh
2000  Donald B. Hawkins
2001  James S. Reilly
2002  Ellen M. Friedman
2003  C. Martin Bailey
2004  William P. Potsic
2005  Colin Barber
2006  Amelia F. Drake
2007  Seth Pransky
2008  William Crysdale
2009  Charles M. Myer, III
2010  Mark Richardson
2011  George Zalzal
2012  Andrew Inglis
2013  Linda Brodsky
2014  Dana M. Thompson
2015  Michael Rutter

RECIPIENTS OF THE AMERICAN LARYNGOLOGICAL ASSOCIATION AWARD

1988  Frank Netter
1989  Shigeto Ikeda
1990  Hans Littmann
1991  Arnold E. Aronson
1992  Michael Ter-Pogossian
1993  C. Everett Koop
1994  John C. Polanyi
1995  John G. Batsakis
1996  Ingo Titze
1997  Matina Horner
1998  Paul A. Ebert
1999  Bruce Benjamin
2000  M. Stuart Strong
2001  Eugene N. Myers
2002  Catherine D. DeAngelis
2003  William W. Montgomery
2004  David Bradley
2005  Herbert Dedo
2006  Christy L. Ludlow
2007  John A. Kirchner
2008  Gerald B. Healy
2009  Stanley M. Shapshay
2010  Clarence T. Sasaki
2011  Lawrence DeSanto
2012  Minoru Hirano
2013  Harvey Tucker
2014  Robert T. Sataloff
2015  Robert H. Ossoff
2016  Gerald S. Berke

RECIPIENTS OF THE AMERICAN LARYNGOLOGICAL ASSOCIATION RESIDENT RESEARCH AWARD

1990  David C. Green
1991  Timothy M. McCulloch
1991  Ramon M. Esclamado
1992  David H. Henick
1993  Gregory K. Hartig
1994  Sina Nasri
1995  Saman Naficy
1996  Manish K. Wani
1997  J. Pieter Noordzij
1998  Michael E. Jones
1999  Alex J. Correa
2000  James C. L. Li
2001  Andrew Verneuil
2002  Dinesh Chhetri
2003  Andrew Karpenko
2004  Ichiro Tateya
2005  Samir Khariwala
2006  Idranil Debnath
2007  Tara Shipchander
2008  David O. Francis
2009  David O. Francis
2010  Jeffrey Houlton
2011  Lowell Gurey
2012  Yaniv Hamzany
2013  Boris Paskhover
2014  Andrea Park
2015  Andrew M. Vahabzadeh-Hagh
**RECIPIENTS OF THE AMERICAN LARYNGOLOGICAL ASSOCIATION**

**YOUNG FACULTY RESEARCH AWARD**

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<tr>
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<td>Paul W. Flint</td>
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<tr>
<td>1992</td>
<td>Yasuo Hisa</td>
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<td>1993</td>
<td>Jay F. Piccirillo</td>
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<td>1994</td>
<td>Hans J. Welkoborsky</td>
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<td>1995</td>
<td>Nancy M. Bauman</td>
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<td>1997</td>
<td>Ira Sanders</td>
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<td>1998</td>
<td>Kiminori Sato</td>
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<td>2000</td>
<td>Steven Bielamowicz</td>
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<td>2001</td>
<td>John Schweinfurth</td>
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<td>2005</td>
<td>Dinesh Chhetri</td>
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<td>2006</td>
<td>Suzy Duflo</td>
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<td>2007</td>
<td>Tack-kyun Kwon</td>
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<td>2008</td>
<td>Bernard Rousseau</td>
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<td>2009</td>
<td>Tsunehisa Ohno</td>
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<td>2010</td>
<td>I-Fan Theodore Mau</td>
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<td>2011</td>
<td>David Francis</td>
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<td>2012</td>
<td>Mika Nomoto</td>
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<td>2013</td>
<td>Seung Won Lee</td>
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<tr>
<td>2014</td>
<td>Jennifer Long</td>
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<tr>
<td>2015</td>
<td>Nao Hiwatashi</td>
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<tr>
<td>2016</td>
<td>Ryo Suzuki</td>
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</tbody>
</table>

**THE MEMORIAL AND LARYNGOLOGICAL RESEARCH FUNDS**

The Council earnestly requests that Fellows of the Association give consideration to making a special bequest to these important funds, or to becoming a Benefactor.

**MEMORIAL FUND DONORS**

<table>
<thead>
<tr>
<th>Daniel C. Baker, Jr</th>
<th>George Fetterolf</th>
<th>Lyman G. Richards</th>
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<td>John F. Barnhill</td>
<td>Joseph L. Goodale</td>
<td>Myron J. Shapiro</td>
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<td>August L. Beck</td>
<td>William E. Grove</td>
<td>Burt R. Shurly</td>
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<td>Gordon Berry</td>
<td>Gordon F. Harkness</td>
<td>Mark I. Singer</td>
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<td>Stanley M. Blaugrund</td>
<td>Frederick T. Hill</td>
<td>Lester T. Sunderland</td>
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<td>William E. Casselberry</td>
<td>George E. Hourn</td>
<td>H. Marshall Taylor</td>
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<td>Cornelius G. Coakley</td>
<td>Samuel Johnston</td>
<td>Walter H. Theobald</td>
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<td>Lee Wallace Dean</td>
<td>John S. Lewis</td>
<td>John A. Tucker</td>
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<td>Arthur W. De Roaldes</td>
<td>H. Bryan Neel III</td>
<td>Francis L. Weille</td>
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<td>Fred W. Dixon</td>
<td>James E. Newcomb</td>
<td>Eiji Yanagisawa</td>
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<td>Charles F. Ferguson</td>
<td>Henry B. Orton</td>
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**BENEFACTORS**

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<tr>
<th>Sally Sample Aall</th>
<th>Thomas C. Galloway</th>
<th>Harry P. Schenck</th>
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<td>Mrs Daniel C. Baker, Jr</td>
<td>Joseph L. Goldman</td>
<td>Oliver W. Suehs</td>
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<td>Edwin N. Broyles</td>
<td>Robert L. Goodale</td>
<td>William M. Trible</td>
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<tr>
<td>Louis H. Clerf</td>
<td>Edley H. Jones</td>
<td>Gabriel F. Tucker, Jr</td>
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<td>Seymour R. Cohen</td>
<td>A. P. Marchessini</td>
<td>DeGraaf Woodman</td>
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<tr>
<td>John J. Conley</td>
<td>Francis H. McGovern</td>
<td>Zelda Radow</td>
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<td>John F. Daly</td>
<td>Charles M. Norris</td>
<td>Weintraub Cancer Fund, Inc</td>
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<tr>
<td>Francis W. and Mrs Davison</td>
<td>Samuel Salinger</td>
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<tr>
<td>Stanton A. Friedberg</td>
<td>Sam H. Sanders</td>
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THE MARCH OF LARYNGOLOGY: A BRIEF VIEW OF 40 YEARS.

PEAK WOO, M.D., FACS
New York, New York

I stand before this group with humility. That laryngology represents my professional parents is no secret. The title as President of this association is the highlight of my career. The year has given me a wondrous view into an organization that has stood the test of time. Our 137 year of meeting year after year to discuss issues of laryngology is unique. This year, I have seen how selfless men and women have given their time, energy and their income to this society. Working with the council and members, I realize, more than other societies, how this elite society of limited members are dedicated to foster and nourish our professional calling of laryngology.

The noun “march” can be variably defined as an act to march, to advance progress as in the march of science, as a distance covered or even to gain an advantage over. I use this word in all these meanings to describe laryngology progress over my observations over the last 40 years. Forty years is not long, it is a generation, a career. To someone in practice, the changes in practice in laryngology may seem incremental with bursts of energy followed by consolidation. However, I would state that in aggregate, the landscape of laryngology that is practiced today would not be recognizable to a third year medical student (me) on Dr. Strong’s otolaryngology service in May of 1976. That was my first exposure to laryngology using a hand held strobe light bounced off a head mirror to look at the larynx of a singer with complaints of dysphonia. Since that first exposure, there has been a steady, relentless cadence to the laryngology march over the last 40 years. I should like to highlight some observations that has made this progress in laryngology a “march”.

Today, laryngology is a recognized subspecialty. In 1970, it was an interest. When I finished my residency in Boston in 1983, the choices for someone interested in further study in laryngology were limited. One could do a fellowship in pediatrics, an observership for 3 months with a doctor to the stars, or a research year a NIH. Today, there are 23 fellowship slots with a match for graduates of the 2017 class.

In the literature, we have seen a steady rises of laryngology papers submitted for review. According to NIH PubMed, in 1976 there were 15 articles on the search topic of vocal fold paralysis, in 2015, there were 115 citations with the same search word. Such is one example of the proliferation of papers related to laryngeal disorders.

In 1981, at my first Voice Foundation meeting, it was the only national meeting on voice. Today these meetings occur with regularity all over the world.

In New York, there were two laryngologists in the academic setting in NYC in 1980’s, today, I have to think hard of a medical center that does not have a laryngologist.
What happened? Diseases of the larynx as it affects voice, airway and swallow have not changed. Yet the demand for our services and the options have blossomed. In the socio-economic arena, we have seen an aging of the population demanding function throughout their lifespan. A good example is the 64-year-old Parkinson patient who is not satisfied with his voice after deep brain implantation. The hyper-connected world we live in stresses the importance of voice and communication in our professional and personal lives. Our health care dollars are being increasingly spent on improving quality of life. Responding to patient’s needs for better voice, swallow and respiration, our specialty have developed new innovations in diagnosis and treatment. In large measure, these responses have come from men and women in this room and those that preceded them. It has arisen from societies such as ours and small group of like-minded gatherings. In aggregate, the result has been by a steady cadence of innovation, technology, and skill.

Some of the changes are due to changes in technology. We have come a long way from the head mirror. Computing technology, the personal computer, and digital imaging has allowed us to record with fidelity the mysterious workings of the larynx so much better than we could have imagined in the 1970’s. We can measure! The use of video stroboscopes, chip-tip scopes, high speed imaging, narrow band imaging represents just some aspect of expanded world of diagnostic laryngoscopy. These options would be unrecognizable to the laryngologist of the 1970’s. The development of absorbable and adjustable implants, balloons, and new injectable for treatment of airway and glottis insufficiency conditions would make the laryngologist in the 1970’s, who only had Teflon, green with envy.

Our understanding of physiology of vocal and laryngeal function have advanced. We now have a better understanding of the unique layered structure of the vocal folds and how the rheological properties contribute to the aerodynamic forces that chance tissue oscillation into sound and voice. By expansion of the seminal works of electrophysiology of the human intrinsic laryngeal muscles begun in the 60’s by Faaborg-Andersen, we now can perform laryngeal EMG in the office and talk about paresis, synkinetic movements, and selected innervation. The goals to restore purposeful movement is now possible. The revolution in stem cell research and tissue engineering has made restorative and regenerative medicine in laryngology tantalizingly close to being a reality.

Translation of skills and technology has made a difference. New tools such as endoscopes, microscopes, lasers and robotic surgery have been refined for the larynx. Techniques from minimally invasive surgery and narrow margin surgery has made surgical removal of lesions with greater certainty of preservation of function. Today, we can use multiple frequencies of the laser to address laryngeal cancer with narrow margin control. All this without the need for hospitalization or tracheostomy!

Our intellectual vigor contributed to the development of new approaches. Not just why but why not? We have challenged the traditional way to treat stenosis, papilloma, and cancer. I cite the office application of lasers, Cidofovir for papilloma, and micro-flap surgery for vocal fold masses as some examples developed in the last 40 years.

It is helpful to review what a time warp of 40 years would look like in some key areas of laryngology.

In 1970’s the big new innovation was micro-laryngoscopy. Magnification and bi-manual manipulation was only being introduced. We did not recognize sulcus vocalis as an entity. Today, we take micro surgery of the larynx for granted. We now have a systematized and classification systems for surgery. Surgery principles of open and trans-oral phono surgery is now taught as part of residency training. We have new laryngoscopes. Terms such as cordectomy, cordotomy, mini- and micro-flap were unheard of in the 1970’s. Both
micro-flap and endoscopic reconstruction codes have been added to our coding vocabulary. The practical effect is that trans-oral treatment of early and selected advanced laryngeal cancer is now preferred in much of the world over that of radiation.

Spasmodic dysphonia used to be considered a functional voice disorder with psychological overlays. In 1976, nerve section was first proposed as treatment. Through dedication and contributions of members in the audience, we can now offer Botox treatment, selected denervation and rehabilitation services for this difficult problem.

We have experienced a revolution in vocal fold paralysis diagnosis and treatment. In 1970’s, the diagnosis of vocal fold paralysis was an immobile fold with variable position. Argument was made if it was a vagal paralysis or recurrent paralysis based on its position by mirror indirect laryngoscopy. The treatment for bilateral vocal fold paralysis was tracheostomy or open arytenoidectomy. Today, static and dynamic restorative procedures for vocal fold paralysis have made the rehabilitation of function after vocal fold paralysis much more nuanced. The availability of new injectable materials including, hyaluronic acid, fat, micronized dermis, hydroxyapatite, and growth factors makes Teflon from the 1960’s seem archaic. The static procedure options of phono surgery including medialization, lateralization, vocal fold shortening and lengthening coupled to arytenoid positioning procedures such as arytenoid medialization and arytenoidpexy are now accepted procedures taught during residency training. The dream of re-innervation prompted by suture of a severed recurrent laryngeal nerve and investigated by animal work in the 1970’s has evolved such that re-innervation is an acceptable and desired option in selected patients with unilateral and bilateral vocal fold paralysis. Selected denervation, re-innervation, and re-innervation with aim of restoring purposeful motion are routinely performed in academic centers.

Stenosis from trauma, cancer and congenital defects stands at the threshold of another revolution. We do not need to rely on dilators and tracheostomy as we did in the 1970’s. Tissue engineering, prefabricated stents, 3-D printing of bio-compatible implants, stem cell culture and growth factors offer our specialty the brave new world of regenerative medicine and surgery for the larynx. All this while transplantation and free tissue transfer has made great strides in restoration of form and function.

Swallow endoscopy and intervention used to mean the Jesberg rigid esophagoscope and the dilator. Mandatory triple endoscopy for surveillance of a second primary has been replaced by PET scanning, office chip trans-nasal bronchoscopy, esophagoscope and laryngoscopy using stroboscopy with narrow band imaging. Therapeutics has moved from open surgery to trans-oral Zenker’s diverticulectomy. From operative dilations on a monthly basis, we have moved to office balloons, and office steroid injections for stenosis.

Cancer management in the 1970’s was all about conservative hemilaryngectomy versus total laryngectomy. The difficulty of training head and neck surgeons to treat complex laryngeal cancer meant that the majority of population did not have access to these surgical skills. With the contributions of chemotherapy and radiation therapy, there was a move in the United States for treatment of laryngeal cancer with non-operative means. However, there is a growing realization that organ preservation is not limited to form but to form and function. As the morbidity to function and late sequel from combined treatment became obvious, the role of minimal surgical option with functional restoration has been revived. The popularization of trans-oral resection and organ preservation has revived the role of the surgical treatment of laryngeal cancer. From simple cordectomy for early cancer to endoscopic resection followed by reconstruction for advanced lesions, the role of the surgeon in the surgical management of the patient with laryngeal cancer is now
discussed at multi-disciplinary head and neck tumor boards.

Office treatment for laryngology in the 1970’s was limited to a spray of mucolytic and demulcents before a performance. Indirect procedures having been largely supplanted by operative laryngoscopy of the 1960-1970’s. With the rediscovery of office interventional laryngology, the laryngology community and patients has embraced the possibility to office lasers, office injection laryngoplasty, and office removal of lesions. That a physician can in 2016, have two to three office lasers to offer to their patients to perform minimally invasive office laser surgery would be unthinkable in the 1970’s.

Operative lasers have changes from the simple CO2 laser for thermal cutting and coagulation to multiple frequencies. The different frequencies and combination of frequencies for tissue effect has been expanded. Today, lasers used in laryngology include the CO2 laser, the KTP laser, the PDL, laser, Thulium laser, Diode laser and the Nd-YAG laser. The mode of delivery is no longer limited to the hand piece or micro-manipulator. We have fiber-optic waveguides, fibers, and scanning and pattern generating technology that allows the surgeon to deliver thermal, photo-thermal laser energy to the tissue target and to the chromophore of interest.

Our understanding of inflammation of the larynx has undergone dramatic evolution. We no longer consider chronic non-specific laryngitis to be a diagnosis. Since 1970’s, we have come to appreciate the multiple causes of laryngeal inflammation and have added to the terminology and the treatment options for inflammatory conditions of the larynx. Laryngeal pharyngeal reflux disease was not yet coined in the 70’s. The term rhinogenic laryngitis and the unified airway was foreign. Today, we perform multi-channel Ph and impedance ph-metry, monitor reflux events in the nasopharynx and study the pressure changes of swallow in our patients with throat symptoms including globus pharynges, cough, and throat clearing. A far more nuance view of laryngitis has evolved such that laryngitis sicca, bacterial biofilm, and discussion of mucology has replaced the simple term mucosal hygiene.

As our laryngology specialty is intimate with surgery in closed spaces, nowhere in medicine is the concept “less is more” more applicable than where we work in the upper aero-digestive tract. With minimal invasive surgery, we are uniquely endowed by our heritage to explore and refine minimally invasive surgery of this area. This will continue to grow as we move into the world of hard and soft robotics. Already we have seen papers on robotic laryngectomy, endoscopic laryngeal cleft repair, endoscopic cricoid graft repair and expansion, and laryngeal fracture repair.

The above are just some of the reasons why the last 40 years has been such a game changer for our subspecialty of laryngology. For those of us who participated, we can look back in wonder. For those just starting, this is the best of times.

We continue to have many challenges that continue to plague us in laryngology. A partial list includes better approaches to: trauma and its consequences on disturbances of voice, papilloma, scar and stenosis, laryngeal inflammation and reflux, and functional deficits due to use, aging and cognition.

Despite my optimism, we face challenges. With the explosion of technology and options, the challenge to provide efficient cost effective care is our burden. We must do more with more efficiency. Not only must we advocate for better outcomes for our patients but we must also advocate for cost efficient care. As health care providers, we must put in the equation the cost factor in our daily considerations so as not to overwhelm the system we have so tenderly built. We deal in a voice and swallow disturbances that are quality of life improvements. These may not be deemed critical by those who decide on how the health dollar is spent. We must continue to advocate to society that patients with functional voice and swallow needs are
just as vital to their being as their eyesight, walking or freedom from pain. We need to standardize training and outcomes such that skill transfers from what we do in this room must be able to be validated to our colleagues and to the public. Secrets that we learn in this room has to be shared with our patients, colleagues and the public. We, as a small society, must get our voices out.

I call on the group gathered here to continue its march. You all wear the mantle of our professional specialty of being a laryngologist. It assigned by society to be a keeper of knowledge and more importantly, to move the specialty forward. It is a noble, sacred and obligatory calling. Fourth years hence, if medical student in this room may recall how laryngology was practiced 40 years ago, I hope he or she will say: wow, I would not recognize the specialty from how it was practiced 40 years ago.

Bibliography

JEAN ABITBOL, MD, PhD
Paris, France

Jean Abitbol, M.D. is an Otolaryngologist, Head Neck surgeon, a Phoniatrician and a Laser specialist. He did his medical study at the “Faculté de Médecine de Paris (France)”. Despite his prolific private practice as a laryngologist to the stars, he has written more than 300 scientific communications, multiple chapters in books and authored 3 books in both lay and professional arenas. His book laser voice surgery is a 520-page book that categorizes his experience with lasers in voice surgery over his career.

To say he is energetic and tireless would be an understatement. He has extensively traveled and given selflessly of his time in international meetings, courses and scientific presentations.

He was knighted in May 2005 “Chevalier de la Legion d’Honneur”. by the Ministry of Health on the behalf of the President de la République Française.

In September 2005, he received the certificate of Honour Award at the Foundation of the American Academy of Otolaryngology-Head and Neck Surgery. He is the past president of the International Society of Laser on surgery and Medicine (ISLSM).

His passion is doing medical films on Art and Science of the Voice with Discovery Channel. The last one in June 2013: the mystery of the voice. In February 2006, for his participation on “The Inner Adventure”, a 90 minutes’ movie with Arte TV channel, he received “le Grand Prix of the 43e Festival International “Techfilm 2005” de Prague (République Tchèque)” and the “Silver World Medal at the New York USA Festivals 2006”

But it will be his collegiality in bringing together laryngologists year after year in his Paris meeting that I will remember. It was there that I discovered his charm and grace in bringing together a large group of world class laryngology faculty in live surgery, live presentations and lively discussions. His uncompromised passion for learning and debate made the meeting a platform for continued learning on my part from my friends and colleagues. In this way, I can say that my attending the meeting as faculty was to my profit as a student, year after year.

Jean for your passion for the world of voice, lasers, and laryngology. For your energy and love of your friends in laryngology, please accept the presidential citation from the American Laryngological Association.
Presidential Citations

KENNETH W. ALTMAN, MD, PhD
Houston, Texas

Dr. Kenneth Altman is a nationally and internationally renowned expert in laryngology, care of the professional voice, cough and dysphagia. After receiving his BS from the University of Illinois at Champaign, Dr. Altman went to Duke University for his MS and PhD in Biomedical Engineering prior to obtaining his MD degree. He was at the University of Pennsylvania for residency in Otorhinolaryngology – Head & Neck Surgery, and then completed a fellowship in Laryngology & Care of the Professional Voice at Vanderbilt University. Dr. Altman spent six years in Chicago directing the Center for Voice at Northwestern Memorial Hospital, and almost 10 years in New York as Director of the Eugen Grabscheid Voice Center at Mount Sinai Medical Center. He has now joined Baylor College of Medicine as Vice Chair for Clinical Affairs and directs the Institute for Voice and Swallowing where he is championing interdisciplinary approaches to voice problems, dysphagia and chronic cough.

Dr. Altman has numerous research interests, including pre-malignant vocal fold disease, and chronic cough as an interrelation of respiratory and upper gastrointestinal tract, and dysphagia in the presence of neurodegenerative disease. He’s been focusing his recent efforts on improving the evidence-based best practice of care through clinical pathways.

I have always valued Dr. Altman as a friend and confidant. Over our last 15-year association, I have come to appreciate his eye for detail, his dedication and to our Association. As the secretary to the New York Laryngological Association, he totally revamped the Association and streamlined it and energized its meetings. I am especially indebted to him for agreeing to take on the role as the Scientific Program Chair for this year’s meeting.

Dr. Altman please come forward to receive the ALA presidential Citation.
Presidenti
al Citations

MICHAEL S. BENNINGER, MD
Cleveland, Ohio

A graduate of Harvard University, Dr. Benninger received his medical degree from Case Western Reserve University in Cleveland, Ohio. He completed his residency at the Cleveland Clinic Foundation.

Dr. Michael S. Benninger is the Chairman of the Head and Neck Institute at The Cleveland Clinic and is a Professor of Surgery at the Cleveland Clinic Lerner College of Medicine of Case Western Reserve University. The Head and Neck Institute comprise the specialties of Otolaryngology, Audiology, Speech and Language Sciences, Oral Surgery and Dentistry.

In addition to his work at the hospital, Dr. Benninger has been very involved in Regional, National and International medical organizations. He is the President of the International Association of Phonosurgery, is the Treasurer of the American Broncho-Esophagological Association and Vice-President and a member of the Board of Directors of the Voice Foundation. He served on the Board of Directors of the American Academy of Otolaryngology-Head and Neck Surgery (AAO-HNS) for 12 years, having been a former Vice President and Chairman of the Board of Governors of that organization. He is also a Past-President of the American Laryngological Association, American Rhinologic Society and the Michigan Otolaryngological Society. He is the former Editor-in-Chief of the Journal, Otolaryngology-Head and Neck Surgery, which is the largest peer-reviewed the world for that specialty. He has served on the Residency Review Committee for Otolaryngology and as a member of the Medical Advisory Board for WebMD. He is the Past-Chairman of the Steering Committee for the Sinus and Allergy Health Partnership.

Dr. Benninger has authored or edited 8 books, including his most recent books, “The Performers Voice” and “Classics in Rhinology”. He has 2 additional books in press. He has also has written over 75 book chapters and over 190 scientific articles, focusing primarily on voice care and laryngology, nasal and sinus disease and health care management. He has lectured extensively across the country and throughout the world.

He has received many awards including being the Past president of our association in 2011. He is the historian of our Association, and I look to him as a sage voice in all manners on the council. Despite his multiple duties, He is serving as our Associations liaison with the AAO HNS CORE curriculum task force and Regent representative.

I have known Michael for more than 30 years. First from working at the AAO and then from the many meetings nationally and internationally where we have presented together. Besides being a scholarly clinician master at the meetings, working and playing with him is just a lot of fun.

Dr. Benninger, please come forward to receive the ALA presidential Citation.
GADY HAR-EL, MD
Hollis, NewYork

Dr. Har-El is the Chief of the Division of Head and Neck Surgery and Oncology at Lenox Hill Hospital in New York City. He is a Professor of Otolaryngology and Neurosurgery at the State University of New York – Downstate Medical Center, and an Adjunct Professor of Otolaryngology – Head and Neck Surgery at New York University.

After graduating from Ben-Gurion University School of Medicine in Israel, Dr. Har-El obtained his Otolaryngology – Head and Neck Surgery training at Beilinson Medical Center in Tel-Aviv, followed by otolaryngology residency as well as fellowship in head and neck and skull base surgery at SUNY-Downstate Medical Center in New York.

Dr. Har-El served as the President of the American Broncho-Esophagological Association, President of the New York Head and Neck Society and President of the New York Laryngological Society. He is currently the Secretary of the American Laryngological Association and the Vice-President Elect of the Triological Society. He has been on the Council/Executive Boards of national organizations such as the Triological Society and the North American Skull Base Society. Dr. Har-El chaired numerous committees including the Committee on Skull Base Surgery in the American Academy of Otolaryngology – Head and Neck Surgery, and both the Finance and the Prevention and Early Detection Committees of the American Head and Neck Society.

Dr. Har-El authored and co-authored more than 270 scientific papers and book chapters and published 8 books and monographs on otolaryngology in general and skull base surgery and sinus surgery in particular. He made more than 430 scientific presentations, invited lectures, and invited panel presentations.

Among other awards, Dr. Har-El received five teaching and education awards from the State University of New York – Downstate Medical Center 5 times, as well as the Stanley M. Blaugrund, MD Award for Excellence in Teaching from New York University 3 times. Dr. Har-El has been listed in the “Best Doctors of New York”, “America’s Top Doctors”, and “America’s Top Doctors for Cancer” for the last 20 years.

But I want to acknowledge Gady for his dedication to the community of medicine and to our specialty of laryngology and head and neck surgery. He is really unrecognized for his service to our societies. From the NY head and neck society to the New York laryngological Association to the ABEA to now the ALA, Gady has been always there, always on top of the. Here he is sitting in the audience at 6 am in the Graduate forum for our ALA graduate members.
Dr. Michael M. Johns III is a graduate of Johns Hopkins School of Medicine. He completed his residency in Otolaryngology at the University of Michigan and trained as a research fellow through their National Institute of Health T32 program. He then pursued a fellowship in laryngology and care of the professional voice at the Vanderbilt Voice Center at Vanderbilt University. Dr. Johns was awarded high honors during his academic career, including membership in Phi Beta Kappa and Alpha Omega Alpha medical honor society. He is the director of the USC Voice Center at the University of Southern California.

He is one of the leaders in the area of Geriatric Laryngology. He was on the board of directors of the American Society of Geriatric otolaryngology for many years. He has received grant funding on the topic and he has presented extensively at national meetings on the topic. He has published and has been a champion on the topic of voice and swallow dysfunction in the elderly.

Dr. Johns is actively contributing to development of the state of the art practice in clinical laryngology worldwide. By this I cite his more than 90 peer reviewed publications, his multiple mentees in both the national and international arena, and his prodigious participation in national scholarly societies such as the Triological Society, The American Laryngological Association, and the American Broncho-esophagological Association. His commitment to service and mentorship of fellow laryngologist is evident by his all in attitude. Having only been a member of the ALA since 2013, he already serves on multiple levels of responsibility as the past chair of the post Graduate members committee, the Nomination Committee and the Membership committee. He represents the ALA on Guideline task force of the AAO.

It is just such a pleasure to have Dr. Johns as a colleague, he is energetic, positive and he gets things done. It is a pleasure to have Dr. Johns as one of our bright shining stars in the constellation of laryngology.

Dr. Johns, please come forward to receive the ALA presidential Citation.
Dr. Dennis Kraus is the Director, Center for Head and Neck Oncology, New York Head and Neck Institute, North Shore-LIJ Cancer Institute. He is Professor of Otolaryngology, Hofstra North Shore-LIJ School of Medicine. He did his BA at the University of Rochester, MD. University of Rochester, his Residency in otolaryngology head and neck surgery at the Cleveland Clinic Foundation and a fellowship in head and neck surgery at the Memorial Sloan-Kettering Cancer Center. For many years I have known Dr. Kraus as Attending Surgeon, Memorial Sloan-Kettering Cancer Center, and as Professor of Otolaryngology, Cornell University Medical Center, New York, New York. We worked together of many years as colleagues as officers in organization and running of the New York Head and Neck Society.

He is a recognized leader in head and neck surgical oncology with over 223 papers in peer and non-peer reviewed journals, 48 chapters in books and hundreds of national and international presentations in the topic of head and neck oncology.

He has received numerous awards including: 2012 - the Distinguished Service Award – AAO-HNS; 2013- an Honor Award, American Head and Neck Society; 2013- recognition by the New York Magazine’s 2013 Best Doctors; 2014 - the Castle Connolly America’s Top Doctors; 2015 - a Presidential Citation at the AHNS Annual Meeting, and the Castle Connolly Medical, Ltd., America’s Top Cancer Doctor.

He has served in leadership roles in: North American Skull Base Society, American Society for Head and Neck Surgery, Society of Head and Neck Surgeons, American Academy of Otolaryngology-Head and Neck Surgery. He has received many honors including: President of New York Head and Neck Society and the president-elect of the American Head and Neck Society.

One of the reason for his presidential citation is to acknowledge his years of service on behalf of the ALA. He is an unsung hero. Having served in the following capacity: Governor, American College of Surgeons from 2010- the present and Chair of the Ad hoc Committee on the Election Process; the 2012 deRoaldes Award Committee and between the years 2010-2014 Program Committee; 2012-2013- ACS Representative on behalf of American Laryngological Association present-2018.

Dr. Kraus please come forward to receive the ALA Presidential Citation.
This year’s Guest of Honor is Dr. Robert T Sataloff. Dr. Sataloff is no stranger to this Association.

I was so happy when I reviewed the list of guests of honor of the ALA and found out that Dr. Robert T. Sataloff has not received this honor. In his illustrious career in service to our specialty, he has received so many awards that my fear was that he has received every honor there is to receive that can be bestowed.

Dr. Sataloff is from Philadelphia. Many will remember his father as an eminent otologist in the Philadelphia area. He graduated from Haverford College, did his medical school at Jefferson and went on to an otolaryngology residency and otology fellowship at Michigan.

On returning to Philadelphia he received his DMA in voice at Combs College. Since returning to the Philadelphia area, he has been a force in the Northeast Triological section and he is the department of otolaryngology chair at the Drexel College of Medicine where he serves also an associate dean of Clinical Affairs at the Drexel college of Medicine.

He has been an innovator in areas of phono surgery and has designed instruments that he shares freely.

His CV includes 754 publications, 55 books, 110 book chapters.

The multiple awards that he has received include: The Fowler Award from The Triological Society for his thesis: Embryology of the Facial Nerve and Its Clinical Application. From American Laryngological Association alone he has received the 2008 deRoalds Award, the American Laryngological Association Award, and the James E. Newcomb Award 2012. He was the president of the ALA in 2005 having served as its treasurer.

Dr. Sataloff and I have been colleagues for so long that only through the retrospective lens can we get a 20/20 vision of his impressive impact on our specialty. Although occasionally controversial in his clinical concepts, one would never deny his collegial openness to debate, discussion and diatribe. I have learned much.

His commitment to the science and art of the voice is encapsulated in the yearly Voice Foundation Meeting in Philadelphia, where for more than three decades, he has been the champion of multidisciplinary care, research and academic research. This international meeting brings forward the best and brightest basic science to clinical science as it relates to voice care. His passion for advancing the academic mission is evident through The Journal of Voice. Through his mentorship as the editor in chief, he has molded The Journal of Voice into peer reviewed journal. Many of us in this room have been the recipient of his tireless energy and his generosity of spirit in his editorship our papers and suggestions for rewrites. He has mentored many in this room forward into academic laryngology.

Today we have the laryngology as a true subspecialty within the specialty of otolaryngology. This feat is in no small measure due to one of the giants in our specialty, who has in his life time changed the landscape of laryngology as we know it. It is with delight and deference that I introduce to you our Guest of Honor, Dr. Robert T. Sataloff.
PRESENTATION OF
THE AMERICAN LARYNGOLOGICAL ASSOCIATION AWARD

GERALD S. BERKE, MD
Los Angeles, California

Peak Woo, MD
New York, New York

The ALA Award was established in 1987, as an annual award to be given as a mark of recognition and esteem for outstanding achievement, either in medicine or other disciplines, which has contributed significantly to Laryngology.

This year’s awardee is a well-known member to the ALA. Dr. Gerald Berke has been a fixture in the ALA since 1980’s. He did his undergraduate work at USC where he completed a minor in music and physics. He did his medical school at the University of California Los Angeles and completed his Otolaryngology training in 1984. He stayed on at the UCLA and became the Chief of Otolaryngology Division in 1992 and since 2012 as the chief of the department. He has mentored many of the laryngologists in this room and has mentored many chairs of departments of otolaryngology around the country.

Dr. Berke’s academic contributions are innumerable. With over 173 peer reviewed publications and over 14 chapters and books. His publications have given us new insight on the physics of vocal fold vibratory function and his department continues to be on the cutting edge of basic research in neurolaryngology and laryngeal function.

He is amazingly active in service to the academic mission of our specialty. He was the president of the Triological Society in 2011 and continues to serve on the council as the chair of the awards committee.

His acknowledgements and honors from his colleagues in laryngology is are many: He was the past recipient of the deRoald award, he was a past Baker lecturer and served as the president to this organization in 2002.

I present to you this year’s ALA award recipient, Dr. Gerald S. Berke
PRESENTATION OF THE GABRIEL F. TUCKER AWARD
To
MICHAEL J. RUTTER, BHB, MBChB, FRACS
Cincinnati, Ohio

Reza Rahbar, MD
Boston, Massachusetts

The Gabriel F. Tucker Fund & Award was established in 1987 in memory of Gabriel F. Tucker, Sr. and Gabriel F. Tucker, Jr. The Award is to be given to an ALA member, in recognition of the individual's contributions to the field of Pediatric Laryngology or for outstanding service to the Association. This year’s recipient is Dr. Michael Rutter.

Mike was born in Indonesia and moved to New Zealand at 3 months of age, where he was raised. He began medical school at the age of 19 in Auckland School of Medicine, New Zealand, followed by a brief period of work in the United Kingdom before returning to New Zealand to start his surgical training at New Zealand Otolaryngology Training Program (1992-1996).

He then moved to Cincinnati in 1997 for his pediatric fellowship. Interesting, his initial interest was pediatric sinus surgery. He then developed a deep interest in airway disorders after being exposed to the airway program in Cincinnati. He is currently professor of otolaryngology and director of clinical research at the Department of Otolaryngology, University of Cincinnati College of Medicine.

Mike has written 85 peer reviewed articles and 40 book chapters. He has been the section editor and/or editor for 3 books. He has been an invited speaker at over 250 national meetings and over 170 international conferences. He has taught over 40 AAO instruction courses, among many other national and international courses where he was an invited speaker. He has 4 patents, including a balloon dilator, having helped design or have patented both of the airway balloons currently on the market.

He has received many awards and honors throughout his career, most notably for his faculty teaching award, distinguished service award from the American Academy of Otolaryngology, as well as named one of the ‘Best Doctors in America,’ a total of six times.

In essence, Mike is an outstanding physician, superb surgeon and an innovator. On a personal note, he is a colleague and friend.
The Dan C Baker lectureship was established in 1975 in memory of Dr. Baker who was a past president of the American Laryngological Association in 1974. I am honored to present this years Dan Baker lecturer: Dr. Stanley Shapshay

Dr. Shapshay has been a Professor in the Department of Otolaryngology at Albany Medical College since 2006 practicing the subspecialty of Laryngology. He has held the positions of Professor of Otolaryngology at Boston University School of Medicine, Tufts University School of Medicine and the Mount Sinai School of Medicine serving as Chairman, Department of Otolaryngology at Tufts University from 1994 to 2001. He is past president of the ABEA, ALA and the Triological Society. He is the recipient of many honors which include the Fowler Award from the Triological Society, the ALA Award and the De Roaldes Award from the ALA and the Chevalier Jackson Award from the ABEA. He has published 193 scientific publications in peer reviewed journals and 35 books and book chapters. Currently Dr. Shapshay resides with his wife, Ruth, in the town of Richmond located in beautiful Berkshire county of Western Massachusetts.

Dr. Shapshay have had a profound influence on many in this room. Over the past 40 years, he has consistently been the thought innovator and early adaptor for new technologies in our specialty, especially the use of the laser. He was one of developers in the 1970’s of the microspot CO2 laser surgical manipulator that took the laser from a mm laser to a .1 mm laser spot size. This is him presenting to me the original microspot laser in 2015. He was the leader in use of Nd-YAG laser use in laryngology and bronchology for both tumors and stenosis. He was instrumental in introducing to our specialty the pulsed dye laser for laryngeal applications and has the first paper on laser effects of this laser on vocal fold tissue in experimental animals.

I can think on no one with greater past and present insight on the role of lasers in our specialty it is with great pleasure that I convinced Dr. Shapshay to come and give the Dan Baker lecture. His topic will be titled:

“The Development and Evolution of Lasers in the Larynx and Airway(1972 – 2016)”
FORTY-SECOND DANIEL C. BAKER, JR., MD MEMORIAL LECTURE

“The Development and Evolution of Lasers in the Larynx and Airway (1972 – 2016)”

Stanley M. Shapshay, MD
Albany, New York

I began my Otolaryngology Residency at the Boston University Medical Center in July 1972 under the direction of M. Stuart Strong, MD when I discovered that there was something exciting going on - the application of the CO2 laser in the larynx. My chief resident told me about the canine experiments done by Dr. Geza Jako at the American Optical Gas Laser Research Laboratory in Southborough Massachusetts (Figure 1). Dr. Thomas Polanyi, a scientist, and his team of engineers developed the laser and the breakthrough was developing a micro-manipulator, which enabled coupling of the laser to a standard Zeiss operating microscope. Up to this point in time, microsurgery of the larynx was done with “cold” instruments and electrocautery or small cotton sponges soaked in epinephrine for hemostasis. Dr. Jako was a research professor at the Boston University School of Medicine and he was a persistence and diligent laboratory work that led to the first human application by Dr. Strong. The first clinical trial using the CO2 laser began April 1, 1971 at the Boston Veterans Hospital. It is important to note that 2-years of careful laboratory work studying soft tissue interaction of the laser and wound healing in the canine larynx was completed prior to embarking in clinical trials. Excellent and predictable soft tissue effects were observed and there was no significant delay in wound healing. Most appealing was the micro-hemostasis observed using the laser coupled to the operating microscope. Capillary sized blood vessels were coagulated enabling the endoscopic surgeon the ability to remove lesions without any significant bleeding. A variety of benign lesions, such as polyps and respiratory papillomas, were treated as well as keratosis and one case of carcinoma-in-situ. Our safety precautions were rather rudimentary - we did not want a fire in the operating room so we decided to use a red rubber endotracheal tube and wrap it with self-adhering aluminum reflecting tape obtained from Radio Shack. We were told to, “wear ordinary safety goggles” or “simply look away from the laser” when it was fired. The patients’ eyes were protected with wet gauze taped in place. My job, as the resident assigned to the case, was to arrive early prior to the surgery and set up the laser. The water-cooling system for the laser was external comprised of two hoses - one attached to the cold water faucet at the sink in the scrub room and the other for drainage into the sink. The very heavy articulating arm of mirrors needed to be attached to the laser source with two thumb screws - this required a few stepping stools since the laser machine was as tall as one of the old London phone booths (Figure 2). The laser was then fired for accuracy on an asbestos block to align the invisible 2-mm laser spot impact with the visible fiber-optic green light built into the manipulator. Alignment was manipulated by using two thumb screws for vertical and horizontal axis alignment. There were two green aiming lights - the upper one was the active light aligned with the laser. We had to check the safety of the wrapping on the endotracheal tube and the special positioning of the operating table for use of the gallows suspension system. Of course, when Dr. Strong arrived he checked everything himself. Dr. Charles W. Vaughan led the subsequent efforts to extend laser application to the resection of cancer trans-orally, which led to the concept of excisional biopsy. In 1982 during his fellowship year at Boston University, Dr. Kim Davis defined the anatomic limitations of endoscopic CO2 laser cordectomy. In a landmark anatomical paper, he noted the limitations of resection and suggested that “excisional biopsy or sometimes staging of the tumor using the laser must be within the framework of these limitations”. The mid portion of the vocal fold could be resected up to the thyroid cartilage, however the posterior limitation was the vocal process and the anterior commissure was not easily resectable due to the limits of endoscopic exposure. Multiple other US investigators who had visited BU, and subsequently began their own laser surgery programs duplicated the initial Boston University experience using the CO2 laser. Academic otorlaryngologists such as Andrews in Chicago and Lyons in New Orleans reported on their favorable experience with this new technology. Wolfgang Steiner visited from
Germany in the late 1970’s, in addition to several prominent European surgeons.

Dr. Vaughan, one of the most innovative surgeons I have ever met, suggested the concept of “following the tumor” endoscopically by using the laser under the operating microscope and, in essence, doing a subtotal laryngectomy without a tracheotomy (Figure 3). This was an interesting new concept particularly for supraglottic cancer. We were definitely pushing the proverbial envelope in an attempt to resect cancer without doing a total laryngectomy. A very early and somewhat traumatic memory for me was presenting a case of Dr. Strong’s at the New England Otolaryngology Society Meeting in Boston circa 1975. The case was that of a 70-year old male who had staged bilateral coracobrachialies with the laser for T1 cancer. The patient had failed radiation therapy and the larynx was preserved with reasonable function and no aspiration until he died of lung cancer a few years later. Dr. Strong was a bit late in arriving to the meeting, so I was flying solo so to speak. The comments from the head and neck panel of experts, who will go unnamed, were that “malpractice was committed - this patient needed to have a laryngectomy and this was no way to treat cancer”. Fortunately Dr. Strong arrived in time to point out that the patient refused to have a laryngectomy and that he expired of lung cancer - there was no cancer found in the larynx at autopsy.

**Use of the CO2 laser in the larynx 1985-2000**

Improvements in laser technology occurred during this era with several laser manufacturers producing smaller, internally cooled computerized lasers. New micro-manipulators were developed with smaller laser spot sizes - 250microns or 0.25mm using a 400mm lens on the micro manipulator.7 The articulating arm was also streamlined and the coupling ling to the micro-manipulator was simplified. New computerized or scanning devices were developed to allow for more precise automated incisions controlling the depth of laser penetration. New microsurgical instruments were also developed for more delicate procedures, such as micro-flap elevation and dissection and for laser resections. Leading laryngologists however, issued a challenge to the use of the CO2 laser for benign pathology because of concern about collateral thermal damage. In general, the consensus among laryngologists was to use the laser for tissue resection namely for neoplasms and to use “cold Instruments” for benign lesions.

**Use of the CO2 laser for the treatment of Larynx Cancer- 1984 - 2006**

The more conservative approach initiated at BU using the laser for early cancers of the larynx was validated by the 1984 paper presented by Blakeslee.8 One hundred and three cases of glottic cancer were treated with the CO2 laser and the 3-year follow-up data was presented on 35 patients with T1 squamous cell carcinoma (SCC). There was an 89% control rate for SCC and 100% control for verrucous carcinoma (12 cases) and spindle cell carcinoma (3 cases). This concept of excisional biopsy for early larynx cancer set the early standard of care in the United States. In addition, at this time new laryngoscopes with wide bore design for both glottic and supraglottic exposure were designed for transoral resection of cancer. Triangular shapes and bi-valve design became popular for greater access for extended endoscopic resection. Further improvements in laser delivery included more sophisticated supra pulsed application to resect tissue with more cutting and less thermal effects on collateral tissues. New microlaryngeal instruments were designed specifically for transoral laser microsurgery (TLMS), including suction and cautery. Vascular clips were used for better hemostasis during larger supraglottic cancer resections. Early papers on the use of the CO2 laser for resection of supraglottic cancer were reported by Davis and Zeitels.9,10 Successful treatment with results equal to that of radiotherapy, the “gold standard”, was reported for early SCC.

Challenge to the BU very conservative laser approach to treating larynx cancer came from Europe. The 1990 paper by Shapshay, et al presented their results of laser excision of early vocal cord cancer stressing indications, limitations and precautions.11 If the cancer was deeply invasive, radiation was given post-operatively to preserve function. Clinical experience presented by Eckel and Thumfart directly challenged this approach and questioned the use of radiation therapy.12 A paper by Thumfart in 1995 in fact described 4 types of endoscopic partial laryngectomy for Tis, T1a, T1b and T2.12 The type-4 resection was described as “laryngeal exenteration with thermal sterilization of the anterior commissure” which raised some controversy in the U.S. at the time. The limits of endoscopic resection of both glottic and supraglottic laryngeal cancer was explored by Dr. Wolfgang Steiner in Germany. In a series of papers during the mid 1990s, Steiner presented his techniques and results of a more aggressive endoscopic cancer resection for T1, T2 and selected T3 and T4 cancers.13-14 The concept of incision and excision of cancers was presented to define the depth of cancer invasion and the resection of the specimen in segments. At the 2005 Combined ALA/ABEA meeting, Dr. Steiner presented his series of 333 T1 cancers, and 212 T2 cancers with a 5-year control
rate of 89.3% for T1, 84% (T2a) and 74% (T2b). There was excellent laryngeal preservation in all groups. Perretti, et al from Italy corroborated these results in a large series presented in 2006.\textsuperscript{15}

Many academic head and neck surgeons visited Dr. Steiner to learn his techniques and reported similar results in their series of patients with early and more advanced larynx cancer using the TLMS technique. Experience with this approach was presented by Hinni, Salassa and Grant, et al for glottic and supraglottic cancer showing an excellent control rate, challenging the knee jerk response to choose chemoradiation therapy.\textsuperscript{16} A prospective multi-institutional study of 117 patients with T2-T4 glottic and supraglottic cancer was presented in 2007.\textsuperscript{17} A 5-year control rate of 74% was noted with 68% local regional control. Overall survival was 55% with acceptable morbidity and 92% had their larynx preserved. Adjuvant radiotherapy was given in 45 patients.

In summary, the use, benefit and safety of TLMS for early and selected advanced cases was clearly defined. Important criteria included careful patient selection, experience of the surgeon since larger endoscopic resections require training, and experienced pathologists. There does not appear to be any difference in cure rate and function between radiotherapy and TLMS for T1 and T2 cancers. Advantages of using the laser are lower costs, shorter treatment time and ability to readily repeat the therapy if needed.

In regards to voice outcomes, this appears to be related to the extent of resection. A study by Sjogren, et al from Amsterdam measured voice outcomes and used strobe evaluation on a series of patients with early larynx cancer treated with laser and radiotherapy.\textsuperscript{18} There were 18 patients treated with the laser and 16 treated with radiation therapy. The voice was breathy in the laser group compared to breathy with roughness and more jitter in the radiation therapy group.

**Use of Lasers in the Airway**

The 1st coupling of the CO2 laser to a bronchoscope took place in 1975 at BU - a program led by Dr. Charles Vaughan.\textsuperscript{19} This was a rudimentary and difficult to use instrument which had an aiming light that could be manipulated to coincide with the invisible CO2 laser. The coupling device was bulky and did not have built in suction or any significant magnification. Ossoff at Vanderbilt University Medical Center reported improvements in design some years later.\textsuperscript{20} Main indications for bronchoscopic CO2 laser surgery were for removal of respiratory papillomas and obstructing tumors of the airway. No fiberoptic was available for the CO2 laser- ordinary quartz fibers would ignite. Some laboratory trials at BU using the Argon laser, which could be used with a quartz fiber, were unsuccessful due to poor soft tissue interaction and risk of airway perforation.

Treatment of subglottic stenosis with the laser was generally done through a small laryngoscope- usually of the Dedo anterior commissure design placed on a suspension system. Removal of the stenosis was accomplished using the microsurgical CO2 laser setup with a venturi jet ventilation system, but unfortunately recurrence was the rule in a high percentage of patients. The 1st description of successful endoscopic laser treatment was by use of the laser to make radial incisions followed by dilation with or without adjuvant steroid treatment.\textsuperscript{21} Prognosis for successful treatment improved if the web was less than one cm in vertical length, the patient did not have a tracheotomy and there was no immune deficiency. The use of Mitomycin-C as adjuvant therapy to retard fibroblast ingrowth appeared to improve the results.\textsuperscript{22}

The limitations of the CO2 laser for tracheobronchial applications were apparent - lack of deep hemostasis for more vascular lesions and poor access without flexible fiber delivery. The application of the Nd-Yag laser in the tracheobronchial tree appeared to be a solution. Toty in Paris and Dumon in Marseilles described the 1st use of the Nd-Yag laser in the early ‘80s.\textsuperscript{23-24} The development of this laser prompted me to visit Dr. Dumon in France and learn this new technique of YAG laser bronchoscopy. New laser bronchoscopes were designed for fiber delivery and simultaneous suction. The YAG laser proved to be extremely useful because of its deep hemostasis for the palliation of malignant tracheobronchial lesions and for the treatment of vascular lesions.\textsuperscript{25}

Development of the 1st functional CO2 laser waveguide by the Omniguide company in Cambridge, Massachusetts in 2006 allowed use of the CO2 laser with greater ease in the trachea.\textsuperscript{26} Some caution was needed in the distal trachea and bronchi due to the air-cooling system in the waveguide, which raised the issue of possible gas embolism. The waveguide has proven extremely useful for laser cordotomy, benign subglottic and tracheal stenosis and for the treatment of tracheal respiratory papillomas.

**Angiolytic Application of Lasers for Benign and Malignant Lesions of the Larynx**

My interest in tumor induced angiogenesis started in the mid 1980s after attending a lecture given by Dr. Judah Folkman, a professor of surgery at Children’s Hospital in Boston. Dr. Folkman talked
about his research directed toward controlling new blood formation induced by tumors.\textsuperscript{27} I was actually interested in using a hamster cheek pouch model of cancer induction testing various topical antiangiogenesis agents and laser treatments using the pulsed dye laser (PDL) to block or destroy new tumor induced blood vessels. The concept of microvasculature targeting with PDL was tested in our laboratory at Tufts University and eventually led to a clinical trial using the 585-nanometer laser for the treatment of laryngeal papillomas. This initial trial on 3 patients with respiratory papillomas showed lesion regression with no apparent damage to the overlying epithelium. This trial and a subsequent study on 10 patients proved to be effective with complete regression of papillomas in 7 patients without complications.\textsuperscript{28} These patients were treated in the operating room using a micromanipulator under the operating microscope, carefully calibrating the laser power dosimetry. A flexible nasolaryngoscope with an operating channel was used in 2 patients and clearly showed that this procedure had the potential of being an outpatient treatment. About the same time, Bower and Waner, working at the Arkansas Children’s Hospital, reported similar results treating papillomas in children with the PDL.\textsuperscript{29}

Many years prior to the above research, Rox Anderson and co-workers described the concept of using pulsed angiolytic lasers in dermatology to treat vascular lesions.\textsuperscript{30} Selective photothermolysis was the concept of performing precise microsurgery by selective absorption of pulsed radiation. The chromophore for both the PDL and pulsed KTP, both visible lasers, is oxyhemoglobin. The lasers are selectively absorbed, passing through the overlying skin or mucosa, causing intravascular coagulation and “photoangiolyis” of the sub-epithelial microcirculation.

Utilizing first the PDL and then later more exclusively the pulsed KTP laser, Zeitels and his co-workers successfully treated a number of patients with laryngeal papillomas and vocal fold dysplasia in the operating room and under local anesthesia without sedation in the office setting.\textsuperscript{31} Vascular lesions such as ectasias and varices in singers were treated successfully with both the PDL and the pulsed KTP lasers, however the better hemostasis associated with the pulsed KTP laser made this the laser of choice. Vessel rupture often seen with the PDL was not experienced with the pulsed KTP due to its longer pulse width. Other advantages of the pulsed KTP laser are its ease of use because of its solid-state construction and the smaller diameter fiber - 0.3 or 0.4mm.\textsuperscript{32}

Despite the papers on the benefits of the pulsed KTP laser, several investigators such as Kaufman and Woo reported excellent clinical results using the PDL in the office for the treatment of various benign and pre-malignant pathologies.\textsuperscript{33-34} The indications, precautions and caveats for proper use were well described by these investigators in large clinical studies. It would appear that the most important factor for successful treatment was a good understanding of the soft tissue interaction using either the pulsed KTP or PDL lasers.

Pulsed KTP laser application for the treatment of early glottic cancer was presented by Zeitels and his group in 2008 as a new management strategy for the treatment of early laryngeal cancer.\textsuperscript{35} An endoscopic photo ablation technique was described in a series of 90 patients treated in the operating room setting.\textsuperscript{36} The tumors were not resected en-block but rather ablated until normal tissue was encountered. Pathologic margins were not obtained, rather the surgeon under the operating microscope controlled the margins of "resection". A continuous wave KTP, with a cooling technique to avoid excessive tissue coagulation was used in contact with the tumor on occasions for larger tumors. The pulsed laser mode was used at the junction of the cancer and normal overlying paraglottic tissue. The cancer resection was staged in bilateral cancers to preserve function. In a recent follow-up study of 117 patients, Zeitels and Burns reported cancer control of 96\% for T1 and 80\% for T2 glottic cancers.\textsuperscript{36} In the T2 group, all 10 recurrences were treated with radiotherapy. Fifty percent were controlled with radiotherapy and the other 5 expired from their disease. Larynx preservation and survival were 99\% with T1 and 89\% with T2 cancers. This very interesting and possible paradigm shift in the treatment of early laryngeal cancer must await further studies and corroboration by other investigators. The “ultra-narrow” margins described in the paper are indeed clinical margins and there is no correlation with pathologic evaluation. This bold departure from established cancer surgery principles will, of necessity, need rigorous prospective clinical trials with good follow-up data. Most head and neck surgeons at this time are reluctant to dismiss their pathologists from participating in cancer surgery.

**Photodynamic Therapy**

This very elegant concept of sensitizing cancers to light and then destroying them with the appropriate wavelength of light is not a new one. Dougherty and co-workers did some of the earliest work in the 1970s at the Roswell Park Cancer Center.\textsuperscript{37} Photodynamic therapy or PDT requires a photo sensitizer (PS), which will preferentially
accumulate in cancer tissue. Non-thermal visible light activates the PS producing toxic singlet oxygen and oxygen radicals, which prove lethal to the cancer cells. The tumoricidal properties of PDT are due to 3 combined effects: direct phototoxicity of cells, damage to the tumor vasculature and induction of highly inflammatory reactions that enable systemic immunity.\(^{(38)}\) PDT has been proven to be highly effective in small, localized and superficial tumors.\(^{(39)}\) The limitations of PDT have been prolonged and sometimes very severe photosensitivity of normal tissues in a significant number of patients treated. PDT is also limited to the treatment of small tumors due to limitations of the delivery of light penetration into tumor tissue, however several experienced investigators have reported very good clinical results for the treatment of laryngeal cancer.\(^{(41-42)}\)

In an attempt to improve the efficiency of PDT and better tissue delivery of the PS, Marchal and co-workers have presented an intriguing concept of using nano carriers to target tumors.\(^{(43)}\) Passive targeting is accomplished by using functionalized nano carriers to target overexpressed transmembrane receptors. EGFR remains the only validated molecular target for head and neck squamous cell carcinoma and photosensitized immuno-conjugates to EGFR have been developed for the intracellular delivery of photosensitizing agents. This interesting new research will need further animal studies prior to human trials. In addition, the authors point out that some photosensitizers hold high fluorescence yield and therefore could emerge as diagnostic agents or so called “theranostic agents”.

Due to systemic toxicity, mostly photosensitivity in about 20 to 40% of patients that may last up to 14 weeks, a topical application of ALA or 5-aminolevulinic acid was used extensively for photosensitization of skin and more recently in the larynx.\(^{(44)}\) ALA is a precursor of the endogenous fluorescent PS protoporphyrin IX produced in heme synthesis. Topical ALA is delivered onto the larynx 1 to 3 hours prior to the start of surgery. The surgery was done using the PDT laser to activate the ALA. In a series of 8 patients with laryngeal keratosis, PDT treatment was performed in the clinic setting under topical anesthesia in 64%. A total of 28 procedures were completed in 8 patients with a median follow-up of 34.5 months. There was a 78% reduction in keratosis with no major side effects of treatment.

**Diagnostic Imaging and Detection of Cancer - Laser Spectroscopy and Fluorescence Imaging.**

The concept of the “optical biopsy” was presented by Michael Feld and his co-workers at the Laser Biomedical Research Center, GR Harrison Spectroscopy Laboratory at the Massachusetts Institute of Technology in Cambridge, Massachusetts. In a report published in Nature in 2000, the MIT group showed the potential of light scattering spectroscopy to detect epithelial precancerous lesions and pre-invasive cancers.\(^{(45)}\) Our group participated in providing patients for oral cavity examination and the results were promising in detecting in-situ cancer and severe dysplasia. Unfortunately there was poor specificity for mild to moderate dysplasia and the device was somewhat tedious to use clinically. Further studies from this group using anatomy-based algorithms for detecting oral cancers using reflectance and fluorescence spectroscopy were reported.\(^{(46)}\) This very promising research is ongoing at multiple centers.

**Summary and Future Directions**

Since the 1st laser application in the larynx in 1971 there has been enormous progress in the application of new and more refined lasers and delivery systems for the treatment of laryngeal pathology. Laser applications in the larynx, both thermal such as the CO2 and selected angiolysis targeting, now appear to be mature and accepted therapeutic modalities in the practice of laryngology. What are the new frontiers or new directions for laser applications in the larynx and airway? It would appear that robotic technology use in the larynx through an endoscopic route is one of these areas of future development. Removal or treatment of pathology with or without lasers with a 360-degree range of movement without hand tremor is certainly appealing. Technical constraints such as limited access need to be resolved but this approach seems warranted.

Photodynamic therapy (PDT) still appears to be another promising area for future application based on new basic science discoveries. The application of nano technology for the delivery of photosensitizing agents in high concentration to the tumor target thereby limiting systemic phototoxicity is another very interesting frontier for both tumor treatment and detection. Further research into topical photosensitizers for PDT seems warranted for the difficult problem of field cancer change in the larynx. In general, I can envision more outpatient laser applications in the office-setting using non-thermal vascular seeking lasers to cause pathological involution via control of neo-vasculature associated with neoplastic lesions. Combining anti-angiogenesis agents, either systemic or topical, in biofilm-like delivery systems prior to laser application, may enhance this approach. Biofilm delivery systems of therapeutic agents are as diverse...
as chemotherapeutic and fibroblast inhibitors and an interesting area for further study.

In the diagnostic area, continued research for the development of the “optical biopsy” seems warranted. Research in advancements such as optical coherence technology, laser fluorescence and spectroscopy will hopefully provide the clinician with an accurate outpatient and intraoperative tool for cancer detection and for the control of surgical margins.

Finally, I am reminded by the advice of one of my mentors, “technology is valuable and at times even essential, however it is not a replacement for careful, thoughtful clinical evaluation and a thorough knowledge of anatomy, physiology and pathophysiology”.

References


INTRODUCTION OF
THE STATE OF THE ART LECTURER
SHIGERU HIRANO, MD, PhD
Kyoto, JAPAN

Peak Woo, MD
New York, New York

The state of the art lecture this year will be given by Dr. Shigero Hirano. Dr. Hirano is well known to members of the ALA. He is an active corresponding member since 2012.

Dr. Hirano attended Kyoto University and received his MD in 1990. He did two research fellowships in the USA. First in the Division of Head and Neck Surgery, University of California, Los Angeles from August 1999 to January 2000. Then as Research Fellow at the Department of Surgery, Division of Head and Neck Surgery, University of Wisconsin-Madison from April 2001 to May 2003. He received his PhD in 1998 from Kyoto University.

With over 18 grants, 128 peer reviewed publications and 5 book chapters, his academic output has been prodigious. He has over 55 international presentations.

His research has focused early on tissue regenerative medicine in laryngology for scarring, aging and stenosis. Intractable problems in laryngology.

Some of the honors he has received include: Regeneration of the vocal cord using autologous mesenchymal stem cells, the Broyles-Maloney Award ABEA and ALA poster Award Histologic characterization of human scarred vocal fold amongst many others. Despite this he maintains an active clinical practice as the Professor and chair, Department of Otolaryngology Head and Neck Surgery, Kyoto Prefectural University of Medicine.
Tissue engineering was the breakthrough in the late 20th century, and has been researched in various areas of medicine. Some of them have been clinically translated to human patients with severe diseases of main organs such as cardiovascular organs, neurological system, etc. Tissue engineering and regenerative medicine (TERM) have also received widespread attention in the larynx in order to overcome intractable diseases of the larynx. There are many targets of TERM in the larynx including the vocal fold mucosa, vocalis muscle, cartilage, laryngeal nerves, and laryngectomy. Regeneration of the vocal fold mucosa has been extensively researched to restore tissue property and function for stiffened vocal folds in such cases with vocal fold scar, sulcus, and atrophy.

Vocal fold scar occurs by inflammation or injury, and alters histological micro-architecture of the vocal fold mucosa. In general, the lamina propria of the vocal fold is occupied with thick disorganized collagen bundle, and hyaluronic acid is reduced or lost. This is also the case with aged atrophy of the vocal fold, which is featured by bowing of the vocal fold caused by reduction of hyaluronic acid. It is essential to address these histological alterations to treat vocal fold scar and atrophy. TERM has three efficient tools for tissue regeneration including cell, scaffold, and regulatory factors. Several cell types have been examined on therapeutic potential for vocal fold regeneration. Recent consensus is that immature cells, typically stem cells, are better than mature cells such as fibroblasts. Embryonic stem cell (ES) may be the ideal cell source, and some investigators confirmed the capacity of ES to regenerate the vocal fold in animal models. However, ES contain several concerns such as ethical issue, tumor formation, and rejection. Induced pluripotent stem cell (iPS) is an innovative technology which can reprogram somatic cells back to stem cells. Plenty of researches have been done for development of new treatments for life-threatening diseases using iPS. But iPS still has higher concern about tumor formation, and is difficult to use for larynx. To date, autologous mesenchymal stem cells (MSC) derived from bone marrow or fat are most promising cell source for possible clinical use for the larynx. It has been clarified that MSC has high potential to differentiate into several mature cells beyond germ layers, and MSC improved scarred vocal folds in animal experiments.

Scaffold is an important aspect in TERM. An ideal scaffold is to induce regeneration of target tissues, should be biocompatible and biodegradable. Several materials have been developed including collagen-gelatin compounds, hyaluronic acid based hydrogel, and acellular extracellular matrix (ECM) scaffold. Scaffolding is a simple regenerative way, and is most feasible for human cases. Scaffold can be implanted into the lamina propria of scarred vocal folds, and influx of cells and growth factors into the scaffold is expected from surrounding areas. The scaffold will be degraded over times, and new healthy tissue is expected to arise at the site of the scaffold. Several clinical outcomes were reported; however, the results are not consistent across individuals with scaffold only. Probably combined use of scaffold with cells and/or growth factors may be required.

Growth factor therapy is to apply exogenous growth factor, change phenotype of cells inside the tissue, and finally induce regeneration. Hepatocyte growth factor (HGF) and basic fibroblast growth factor (bFGF) have proven to be useful for vocal fold regeneration. They affect fibroblasts in the vocal fold and change the function. Gene expression in the cells indicated
upregulation of genes of hyaluronic acid synthase and MMP with down-regulation of procollagen type I. This function can soften the vocal fold mucosa, and is appropriate for the treatment of vocal fold scar and atrophy. Exogenous growth factor works as a trigger to change cell function, and in mean time, it stimulates production of endogenous growth factor in autocrine manner, which can elongate the effects of growth factor. GMP-compatible bFGF drug is available for human subjects in Japan, and clinical trials have shown that local administration of bFGF improves the function of the vocal fold in the patients with vocal fold scar and atrophy.

Final goal of TERM in the larynx should be regeneration of larynx after hemilaryngectomy or total laryngectomy. Since the larynx is a composite organ consisting of the cartilage, muscle, and mucosa, it is complicated to regenerate each part separately. Decellularization is a recent technology which allows regeneration of whole organ all at once. It is possible to create decellularized whole larynx as a “bioscaffold”. Since decellularization procedure eliminates immune response, Transplantation of whole larynx after laryngectomy without need of immunosuppressant will become possible. This is still in laboratory, but clinical application is expected in the future. Decellularized urinary bladder derived matrix (UBM) was developed in Pittsburg which holds ECM and growth factors without cells. UBM is now commercially available in USA, and has been applied to human patients with skin ulcer, volumetric muscle loss, esophageal mucosal defect, etc. It was proven that UBM was useful to regenerate hemi-larynx after hemilaryngectomy in canine model.

Very recently, bioengineered vocal fold mucosa was developed in University of Wisconsin-Madison which mimics the native vocal fold. This kind of TERM technology will provide us innovative strategy for regeneration of the laryngeal tissues.
Scientific Session

Identification of Paralyzed Laryngeal Muscles Using Low-Frequency Transcutaneous Stimulation

James T. Heaton, PhD; James B. Kobler, PhD; Robert E. Hillman, PhD, CCC-SLP; Steven M. Zeitels, MD

Introduction: Most cases of vocal fold (VF) immobility are attributable to denervation and/or dysfunctional reinnervation, and distinguishing between these entities could better inform treatment. One approach is to take advantage of the observation that denervated muscles have lower thresholds for low-frequency, slowly changing electrical currents (e.g. 3 Hz sinusoidal) than innervated muscles. We systematically tested stimulation waveform parameters in denervated canines to better characterize the time course of this phenomenon with the goal of developing a useful paradigm for clinical testing.

Methods: Two dogs were examined by suspension laryngoscopy and transoral electromyography before and after unilateral recurrent laryngeal nerve transection. On weeks 1, 2, 4, 6, and 12 after unilateral denervation, waveforms of varying shape (square, sine, triangular, exponential), frequency (1-60 Hz), and amplitude (0.2-24 mA) were delivered to the laryngeal neck surface using bilateral pad electrodes.

Results: VF fibrillation potentials and visible atrophy indicated persistent denervation across the 3-month survival period. 3 Hz sinusoidal stimulation proved most efficacious in causing contraction of the denervated vfs, with thresholds as low as 0.2 mA, whereas healthy muscle thresholds were typically 4-7 mA. This selective activation of denervated muscle was observed within a week, and persisted throughout the study.

Conclusions: Denervated VFs can be identified using relatively low-amplitude, low-frequency transcutaneous electrical stimulation at levels that are well below excitation thresholds for innervated muscle. This technically simple approach is likely more tolerable than VF electromyography, but future work is needed to determine whether low-frequency stimulability of laryngeal muscles persists after marked atrophy or partial reinnervation.

A Fenestration Approach to Arytenoid Adduction for Unilateral Vocal Fold Paralysis: A 10-Year Study

Ryoji Tokashiki, MD; Hiramatsu Hiroyuki, MD; Masaki Nomoto, MD

Introduction: Arytenoid adduction (AA) is a highly recommended treatment for every grade of unilateral vocal fold paralysis (UVFP) because it reproduces natural adduction. In our surgical approach, we performed AA through the fenestration made on the thyroid ala without releasing the cricothyroid and cricoarytenoid joints (Tokashiki 2007 Laryngoscope). This procedure resulted in high rates of voice improvement with few complications. Herein, we assess the use of fenestration as a surgical procedure over the past 10 years.

Materials and Methods: We enrolled 125 UVFP patients between 2008 and 2014. All patients underwent AA combined with type 1 thyroplasty under local anesthesia. Vocal cord medialization was confirmed endoscopically during the operation. For all cases, maximum phonation time (MPT) and mean airflow rate (MFR) were measured before and after operation.

Results: All patients showed voice improvement. Post-surgery, 97% patients achieved an MPT > 10 s and an MFR < 210 ml/s. The other 3% of patients had only marginal voice improvement, which was attributed to the sulcus of the healthy side, arytenoid cartilage adhesion, and low lung capacity. We observed the 4 cases of adductor brach paralysis of which vocal cord abduction was normal; 2, posterior cricoid muscle (PCA) dissection with voice improvement; 2, without PCA dissection with marginal improvement. Only 2 of 125 patients needed tracheostomy because of laryngeal edema.

Conclusions: AA is a necessary and effective procedure to treat UVFP. A fenestration approach enables surgeons to perform AA successfully and safely, resulting in voice improvement in all treated patients.
SCIENTIFIC SESSION

Netrin-1 Influences Posterior Cricoarytenoid Reinnervation after Recurrent Laryngeal Nerve Injury

Ignacio Hernandez-Morato, PhD; Shira Koss, MD; Sansar Sharma, PhD; Michael J. Pitman, MD

Introduction: After injury recurrent laryngeal nerve (RLN) reinnervation is synkinetic, resulting in vocal fold immobility. Netrin-1 is influential in nerve regeneration and guidance. It is also elevated in rat laryngeal muscles after RLN injury. The aim of this study is to evaluate the effect of different concentrations of Netrin-1 on PCA reinnervation in the rat.

Methods: Netrin-1 (2.5, 5, 10, 15, 20μg/ml; four rats per group) was injected into posterior cricoarytenoid muscle (PCA) 3 days following RLN transection and anastomosis. To count the number of motoneurons reinnervating the PCA, Cholera Toxin retrograde tracer was injected into PCA seven days post nerve injury. Larynges and brainstems were harvested at 10 DPI. Axons and motor endplates were respectively stained with beta-tubulin III and alpha-bungarotoxin. The frequency of neuromuscular junctions in the PCA and the position of labelled RLN motoneuron were analysed and compared across concentrations and with controls.

Results: Changes in the pattern of RLN reinnervation occurred in all muscles after Netrin-1 injection at all concentrations. Compared to controls and other concentrations, 10μg/ml resulted in the least frequency of synapses in the PCA. Additionally, the number of labelled motoneurons in the area consistent with lateral (LTA) and medial thyroarytenoid (MTA) muscle motoneurons was greater than controls, suggesting increased synkinesis after Netrin-1 injection.

Conclusion: Netrin-1 injection decreases synapse formation in the PCA. Of those axons that form synapses, more originate from the MTA and LTA motoneurons. 10pg/ml was most effective. These findings suggest the Netrin-1 may inhibit abductor axons synapse formation.

Neuromuscular Compensation Mechanisms in Vocal Fold Paralysis and Paresis

Karuna Dewan, MD; Aaron Feinstein, MD, MHS; Andrew Vahabzadeh-Hagh, MD; Dinesh Chhetri, MD

Introduction: Vocal fold paresis and paralysis are common conditions, present in up to one of six new patients evaluated for dysphonia. Treatment options include augmentation laryngoplasty and voice therapy. The optimal management for this condition is unclear. The objective of this study was to assess neuromuscular compensation mechanisms that could potentially be used in the treatment of vocal fold paresis and paralysis.

Methods: In an in vivo canine model we induced unilateral right recurrent laryngeal nerve (RLN) paresis and paralysis, while activating the left RLN and bilateral cricothyroid (CT) muscles in a variety of combinations of activation levels. Phonatory aerodynamics, acoustics, and laryngeal vibration were measured.

Results: In induced right RLN paralysis condition, unilateral or bilateral CT activation generally led to less effective phonatory conditions. Moreover, effectiveness of CT activation depended upon the level of left RLN activation: at low levels of left RLN activation, the right CT was more effective while at higher levels of left RLN activation the left CT was more effective. Effectiveness was defined as improved acoustic and aerodynamic profile.

Conclusions: This study provides insights into how the activation of specific intrinsic laryngeal muscles may play compensatory roles vocal fold paralysis and paresis. The ability and effectiveness of one muscle to compensate appears dependent upon the activation state of the other intrinsic laryngeal muscles.
SCIENTIFIC SESSION

Effect of Laryngeal Synkinesis on Voice Quality in Patients with Unilateral Vocal Fold Paralysis

R Jun Lin, MD; Michael C. Munin, MD; Clark A. Rosen, MD; Libby J. Smith, DO

Objective: Intra-laryngeal muscle synkinesis associated with unilateral vocal fold paralysis (VFP) is thought to preserve thyroarytenoid-lateral cricoarytenoid muscle complex tone, resulting in a better voice quality despite the presence of VFP. This study compares voice handicap in patients with unilateral VFP with and without laryngeal electromyography (LEMG) evidence of synkinesis.

Study design: Retrospective review of LEMG data and VHI-10 scores of patients diagnosed with permanent unilateral VFP.

Methods: LEMG was performed within 1 to 6 months post-onset of VFP. Patients were stratified into 2 groups: (1) RLN neuropathy with and (2) without synkinesis. Synkinesis was diagnosed if the sniff to phonation maximum amplitude ratio is ≥ 0.65 on LEMG. VHI-10 scores at 6-month follow-up were recorded, which were also 3 months after the most recent temporary vocal fold injection.

Results: 449 patients with unilateral VFP were reviewed. 84 patients met the inclusion criteria with 16 in group 1 and 68 in group 2. There was no significant difference in age, timing of LEMG from onset of VFP, number of patients undergoing temporary vocal fold injection or use of nimodipine. Average sniff to phonation ratio was 1.11 for group 1. Average VHI-10 scores at 6 months post-onset of VFP were 14.44±10.61 for patients with LEMG-identified synkinesis (group 1) and 21.24±10.26 for patients with no LEMG evidence of synkinesis (group 2). This was statistically significant (p = 0.02).

Conclusion: Unilateral VFP patients with LEMG evidence of laryngeal synkinesis are more likely to have a better voice quality than those without synkinesis.

Double-Blind Placebo Controlled Trial of the Treatment of Chronic Laryngitis with Amitriptyline: A Pilot Study

Minyoung Jang, MD; J. Pieter Noordzij, MD; Daniel J. Stein, MD

Introduction: For refractory laryngopharyngeal symptoms, a neuropathic etiology has been suggested. Uncontrolled trials of neuro-modulating medications have shown benefit, but it is unknown if this was due to placebo effect. Thus a double-blind placebo controlled study to ascertain amitriptyline’s effectiveness in treating laryngopharyngeal symptoms was initiated.

Methods: Patients were randomized to receive placebo or amitriptyline for 8 weeks, with a starting dose of 12.5mg daily and allowed to increase up to 50mg daily per a predetermined protocol. Pre- and post-treatment questionnaires with both subjective and objective measures including a modified Reflux Symptom Index (mRSI) and Voice Handicap Index-10 (VHI) were used to assess efficacy.

Results: Eighteen patients completed the study. The majority had symptoms for more than 1 year. Throat clearing, sensation of excess mucus in their throat, and globus were the most distressing symptoms. Total mRSI and VHI scores worsened for both groups after treatment, and the average difference in scores after treatment was not significantly different between both arms. However, more patients taking amitriptyline felt their symptoms had subjectively improved (6 out of 8, 75%), while the remainder noted no change. In the placebo group, only 4 out of 9 subjects (44%) felt their symptoms were better and 2 felt worse. Subjects took an average of 25mg daily by the end of the 8-week treatment period in both arms.

Conclusions: In this double-blinded study, more patients on amitriptyline noted improvement by qualitative but not quantitative measures. Interpretation of these results may be limited by the small sample size, but they highlight the need for larger randomized controlled trials.
Introduction: Cough is an airway protective mechanism resulting from a coordinated series of respiratory, laryngeal, and pharyngeal muscle activity. The cough aerodynamic sequence of inspiration, compression, and expulsion protects the lungs through removal of secretions and foreign material from the airways. Patients with laryngeal/airway disorders often exhibit weakening and slowing of cough resulting in aspiration pneumonia. In this project, we develop a biomechanical model to test laryngeal integrity by tracking the trajectory of airway penetrants in patients with cough impairment secondary to disease.

Methods: Computational Fluid Dynamics (CFD) technique was used to simulate fluid flow in the upper airway reconstructed from MRI images acquired from participants. Cough pressure drop, flow velocity, wall pressure and wall shear stress were obtained and compared to healthy controls. The CFD model allowed for turbulent particle interaction, collision, and break up under turbulent cough flow. Penetrants were tracked and allowance made for variation on penetrant characteristics including density, size, and texture (solid, liquid). Aspiration risk was determined through measurement of the percentage of particles remaining in the lower airway following cough.

Results/Conclusion: Low velocities and pressures were recorded in patients with Parkinson Disease (PD) and Head and Neck Cancer (HNC), decreasing airway clearance. Analysis of penetrant trajectories revealed reduced clearance of penetrants in patient (PD and HNC) models compared to that observed in healthy controls. Biomechanical modeling is useful for describing cough dynamics within the lower airway/laryngeal valve and increases our understanding of how these dynamics contribute to increased risk of aspiration in patient groups.
Objectives: There are no cardiovascular (CV) pre-procedure screening parameters for patients undergoing unmonitored, in-office laryngeal procedures (IOLP). Studies have shown significant changes in CV measures during IOLP. The aim was to develop and evaluate a pre-IOLP CV screening protocol.

Methods: (1) Review of IOLP literature and consultation with an anesthesiologist and cardiologist led to the development of CV parameters and questions related to four metabolic equivalents (METS) of work as a patient-screening tool before IOLP. (2) A separate cohort was screened with only a modified CV protocol. All patients were screened for heart rate (HR) and blood pressure (BP) elevation prior to the procedure. Need for further CV evaluation was characterized as systolic blood pressure BP >160, diastolic BP >100, and/or HR >110 beats/minute. Patients whose BP/HR exceeded these values were referred to their PCP before re-screening. If parameters were exceeded again on the day of the IOLP, the procedure was done under monitored anesthesia care.

Results: (1) 56 patients were screened prior to IOLP and the “fail” rate was 40% largely related to four METS questions. (2) 216 patients were screened prior to IOLP and 16 patients (7.4%) met the criteria for further CV evaluation - ten (4.6%) BP alone, four (1.8%) HR alone, and two (0.9%) HR and BP.

Conclusions: Patients with CV abnormalities were identified by the screening protocol. Less than 10% of patients may require CV management prior to proceeding with IOLP. Utilization of a CV screening protocol may improve the safety of IOLP.
Objectives: To characterize the compositional and mechanical properties of human tracheal cartilage to provide more precise targets for the development of tissue engineered constructs for tracheal repair. Study design: Laboratory-based study.

Methods: Twenty human cadaveric tracheas were harvested. Distal segments from eight tissues were subjected to clinically relevant compression testing. Normalized force and displacement were recorded and stiffness was calculated. Histologic staining, Fourier transform infrared imaging spectroscopy (FT-IRIS) data on collagen and proteoglycan (PG) content, and near-infrared (NIR) fiber optic probe spectroscopic data on water content were evaluated on all twenty tracheal specimens, and differences in compositional properties assessed. Correlations were made based on age and compressive stiffness.

Results: The average compressive stiffness of native human trachea was 16.16 kPa ± 6.87. Stiffness correlated significantly with FT-IRIS determined collagen content, (R = 0.7, p=0.05). A principal component analysis of the NIR spectral data enabled separation based on age groups, likely due to differences in collagen content and water content. The NIR-determined water content at 5200 cm⁻¹ was significantly higher in younger samples (50 years) (p = 0.018). Further, together, the spectroscopic-determined compositional values predicted mechanical properties in a multiple linear regression model (R² = 0.89, p = 0.01)

Conclusions: Human tracheal cartilage was found to be amenable to clinically relevant compression mechanical testing. Establishment of normative mechanical and compositional values will enable more directed research in regenerative medicine for tracheal repair. FTIR imaging and NIR fiber optic analysis can be used to investigate compositional differences in tracheal tissue, with the potential to improve the characterization of diseased tissue and tissue-engineered constructs.
Introduction: Cricotracheal resection (CTR) has a high success rate in managing subglottic stenosis (SGS), but can result in vocal impairment with lowering of vocal pitch and reducing pitch range. This study examined the outcomes of a revised CTR technique, designed to mitigate these adverse effects on vocal function.

Method: Pre-surgical and post-surgical groups included adult females who provided both pre and post recordings (n=11) and 9 with post-surgery recordings only. All patients received the revised CTR procedure. Acoustic quantification of periodicity, cepstral peak, signal-to-noise, and fundamental frequency was undertaken for connected speech and sustained vowel samples. Auditory-perceptual ratings of overall quality and monotonicity were performed. Cross-sectional and pre-post analyses were completed.

Results: Aggregate analyses revealed that both pre and post-treatment SGS patients demonstrated voice disorders in the moderate severity range. Pre-post comparisons indicated that mean sustained vowel fundamental frequency decreased slightly from 215 Hz (SD=40 Hz) to 201 Hz (SD=65 Hz). Voice disorder severity based on the cepstral spectral index of dysphoniaTM for sustained vowels decreased (improved) from 41 (SD=41) to 25 (SD=21) points; no change was observed for connected speech. Connected speech semitone standard deviation (2.2 semitones) also did not change from pre- to post-treatment. Auditory-perceptual ratings demonstrated similar results with little pre-post surgery differences.

Conclusions: These preliminary results indicate that the revised CTR procedure is promising to minimize adverse voice effects while also meeting airway outcome goals for SGS. Future research is needed to determine causative factors for pre-treatment dysphonia, and to optimize treatments in this population.
SCIENTIFIC SESSION

The Feasibility of Gamma Radiation Sterilization for Decellularized Tracheal Grafts: Bacterial Bioburden Calculation and Ultrastructural Characteristics

Christopher M. Johnson, MD; DeHuang Guo, PhD; Rachel Latremouille; Stephanie Ryals, BS; Marsha Reuther, MD; Gregory Postma, MD; Paul Weinberger, MD

Introduction: Stem cell-derived tracheal transplantation is dependent upon the use of decellularized tracheal grafts. It has been assumed that a sterilization step such as gamma radiation would damage the delicate extracellular matrix of the graft thus rendering it less viable for cellular repopulation, although this has not been thoroughly investigated.

Methods: Fifteen murine tracheas of strain C57/B-6 were obtained. Thirteen were subjected to a detergent-enzymatic decellularization process. Eight of these were irradiated, exposing five tracheas to a radiation level of 25kGy and three to 5kGy. Two were left untreated. Bioburden calculations were then obtained from three decellularized tracheas (DT), three DTs exposed to 25kGy (DT25) and three DTs exposed to 5kGy (DT5) by homogenization, serial dilution, and streak plating. Two untreated, two DTs and two DT25s were prepared and examined using both scanning and transmission electron microscopy.

Results: The non-irradiated DTs had a calculated bacterial bioburden of 7.8x10(-7) to 3.4x10(-8) colony forming units per gram. Both the DT25 and DT5 specimens were found to have a bioburden of zero. Electron microscopy of untreated fresh tracheas and DTs showed a slight qualitative degradation of cartilage ultrastructure due to the decellularization process. In contrast, examination of DT25 shows significant degradation including poor overall preservation of cartilage architecture with disorganized collagen fibers.

Conclusions: Although an effective means of sterilization (even at low doses), gamma radiation appears to significantly degrade the architecture of decellularized tracheal grafts. These ultrastructural changes may prove detrimental to graft viability, however additional investigation is necessary.
Prevention of Vocal Fold Scarring by Local Application of Basic Fibroblast Growth Factor in a Rat Vocal Fold Injury Model

Ryo Suzuki, MD; Shigeru Hirano, MD, PhD; Yoshitaka Kawai, MD; Takuya Tuji, MD; Nao Hiwatashi, MD, PhD, Yo Kishimoto, MD, PhD; Ichiro Tateya, MD, PhD

 Objectives/Hypothesis: Vocal fold scarring, which causes severe hoarseness, is intractable. The optimal treatment for vocal fold scarring has not been established, so prevention of scarring is important. The aim of this study was to clarify the effectiveness of basic fibroblast growth factor (bFGF) for prevention of post-surgical vocal fold scarring.

 Study Design: Prospective animal experiments with controls. Method: The vocal folds of Sprague-Dawley rats were injured unilaterally or bilaterally after local application of a 10 µL solution of bFGF. Larynges were harvested for histological and immunohistochemical examination 2 months post-operation and for quantitative real-time polymerase chain reaction (qRT-PCR) analysis 1 week post-operation.

 Results: Histological examination showed significantly increased hyaluronic acid (HA) and decreased deposition of dense collagen in the bFGF–treated group at 100 ng/10 µL compared with the sham-treated group. Immunohistochemical examination showed significantly decreased collagen type III deposition in the bFGF–treated group at 100 ng/10 µL compared with the sham-treated group. qRT-PCR revealed that hyaluronan synthase 2 (Has2), Has3 and hepatocyte growth factor (Hgf) were upregulated in bFGF–treated groups compared with sham-treated group.

 Conclusions: The current results suggest that local application of bFGF at the time of injury has the potential to prevent vocal fold scarring. Preventive injection of bFGF could be applied at the time of phonosurgery to avoid postoperative scar formation.

Mesenchymal Stem Cells Have Anti-Fibrotic Effects on Transforming Growth Factor-Beta 1 Stimulated Vocal Fold Fibroblasts

Nao Hiwatashi, MD, PHD; Benjie Bing, MD; Iv Kraja, BS; Ryan C. Branski, PhD

 Introduction: Mesenchymal stem cells (MSCs) hold significant therapeutic promise for vocal fold scar, yet the precise mechanism(s) underlying the tissue level changes remain unclear. In addition to directly altering healing, we hypothesize that MSCs interact with native fibroblasts to favorably affect healing. Furthermore, we hypothesize these interactions vary based on the source of MSCs.

 Methods: Vocal fold fibroblasts (VFFs), adipose-derived stem cells (ASCs), and bone marrow derived stem cells (BMSCs) were extracted from Sprague-Dawley rats and a co-culture model was employed culturing VFFs +/- TGF-β1 (10ng/ml) +/- MSCs on cell culture inserts. Mono-culture MSCs were also prepared as a control for comparison with co-cultured MSCs. Both extracellular matrix (ECM) and components of the TGF-β1 signaling pathway were analyzed via polymerase chain reaction and SDS-PAGE.

 Results: Significantly decreased TGF-β1 mRNA and α-smooth muscle actin protein was observed in VFFs in response to TGF-β1 in the co-culture model with both MSCs (p<0.05, p<0.01). BMSCs significantly downregulated collagen I (p<0.05), Smad3 (p<0.01), and TGF-β1 receptor I (p<0.05) mRNA in VFFs. As for MSCs, hyaluronic synthase-1 and 2 increased in co-cultured BMSCs when compared with mono-cultured BMSCs at baseline and in response to TGF-β1 stimulation (p<0.01).

 Conclusions: MSCs had a favorable effect on VFF ECM regulation and TGF-β1 signaling suppression. Bidirectional paracrine signaling was also observed as VFFs had anti-fibrotic effects on MSCs. These data provide critical insight into the regenerative effects of MSCs and provide a foundation for clinical application as targeted therapeutics for vocal fold scar remain largely elusive.
Early Versus Late Tracheostomy: A Cost-Effectiveness Analysis

C. Carrie Liu, MD, MPH; Luke Rudmik, MD

Introduction: The timing of tracheostomy in critically ill patients requiring mechanical ventilation is controversial. Numerous randomized controlled trials, as well as meta-analyses of these randomized controlled trials, suggest that early tracheostomy may be associated with improved clinical outcomes. However, an early tracheostomy strategy may place patients at risk for unnecessary surgery. To assist in clinical decision-making, this economic evaluation was performed to examine the cost-effectiveness of the early and late tracheostomy strategies.

Methods: This economic evaluation was performed using a decision tree model with a 90-day time horizon. The economic perspective was that of the United States healthcare third-party payer. The primary outcome was the incremental cost per tracheostomy avoided. Probabilities were obtained from meta-analyses of randomized controlled trials. Costs were obtained from the published literature and the Healthcare Cost and Utilization Project database. A multivariate probabilistic sensitivity analysis was performed to account for uncertainty surrounding mean values used in the reference case.

Results: The incremental cost-effectiveness ratio for the late tracheostomy strategy compared to the early tracheostomy strategy was $93,254 per tracheostomy avoided. With a willingness to pay threshold of $50,000, the early tracheostomy strategy is cost-effective with 59% certainty.

Conclusion: The adaptation of an early versus a late tracheostomy strategy depends on the priorities of the decision-maker. Up to a willingness to pay threshold of $95,000 per tracheostomy avoided, the early tracheostomy strategy has a higher probability of being the more cost-effective intervention.

Anterior Glottic Web Formation for Voice Feminization: Experience on 27 Patients

Taner Yilmaz, MD; Oğuz Kuscu, MD; Tevfik Sözen, MD; Ahmet Emre Süslü, MD

Introduction: Voice feminization is needed for male-to-female transsexuals, males with testicular feminization and females with constitutional androphonia. Among several surgical options anterior glottic web formation affords various advantages to patients: Endoscopic surgery without skin incision and scar, outpatient surgery, potential reversibility and low risk for vocal fold and airway damage. Its disadvantage may be difficulty of technique.

Methods: This is an individual prospective cohort study, performed at a tertiary referral center, that is a university hospital. All 27 cases of androphonia were treated with endoscopic anterior glottic web formation during a 5-year period and followed for at least 1 year postoperatively. Voice Handicap Index (VHI-30) including physical, functional, emotional and total scores, acoustic analysis with /a/ including Fo (Hz), jitter (%), shimmer (%), noise to harmonic ratio were determined pre- and postoperatively.

Results: Twenty-one patients were male-to-female transsexuals, 3 were males with testicular feminization, 3 were females with constitutional androphonia. Their pre- and postoperative mean total VHI scores were 38 and 24, respectively; this difference was statistically significant (p<0.05). Seven patients (26%) (5 transsexuals and 2 males) needed laser reduction glottoplasty for voice feminization because they were not satisfied with voice result.

Conclusion: Anterior commissure web formation is a successful surgical option for voice feminization. However, additional surgery may be necessary for patient satisfaction.
Changes in the Three Dimensional Geometry of the Vocal Fold Medial Surface Resulting from Individual and Combined Intrinsic Laryngeal Muscle Activation

Andrew M. Vahabzadeh-Hagh, MD; Zhaoyan Zhang, PhD; Dinesh K. Chhetri, MD

Introduction: Although the geometry of the medial glottal channel is critical to the resulting voice and treatment of glottic insufficiency, visualization of the medial surface is almost impossible in the clinical setting. In this study, we describe the temporal sequence and precise three-dimensional configuration of the vocal fold medial surface with selective activation of individual intrinsic laryngeal muscles (ILMs; thyroarytenoid, lateral cricoarytenoid, posterior cricoarytenoid, and cricothyroid). Further, we evaluate the changes in medial surface contour upon combined activation of the thyroarytenoid muscle with the other ILMs.

Methods: An in vivo canine hemilarynx model was utilized. India ink was used to mark fleshpoints in a grid-like fashion along the medial surface of the vocal fold. A glass prism provided two distinct views of the medial surface. Selective and combined ILM activations were performed using neuromuscular stimulation of respective laryngeal nerves and motion was captured using a high-speed digital camera. The image-processing package DaVis (LaVision Inc.) was used for time series cross-correlation analysis for 3D deformation calculations of the medial surface.

Results: Activation of the thyroarytenoid yields robust medial bulging that begins on the inferior aspect of the mid-membranous vocal fold. Combined activation with other ILMs provides unique changes to the shape and dynamics of the deformation of the glottal channel.

Conclusions: Further understanding of the three-dimensional geometry of the vocal fold medial surface may better guide our efforts to restore phonatory posture and predict the changes brought on by our interventions for glottic insufficiency.

Creation of a Novel Immortalized True Vocal Fold Laryngeal Cell Line

Jessica E. Southwood, MD; Tina Samuels, MS; Joel Blumin, MD; Jonathan Bock, MD; Nikki Johnson, PhD

Objectives/Hypothesis: The true vocal fold (TVF) is a mucosal subsite prone to inflammatory and oncologic disease. Specific cell lines useful for in vitro studies are not widely available, and a non-cancer derived TVF cell line has not been described. Our goal was to create an immortal TVF cell line suitable for in vitro investigation.

Study Design: Experimental study. Methods: Squamous epithelium specimens obtained of the TVF of the larynx were collected from patients without known laryngeal inflammatory or neoplastic disease. Cultures of harvested tissue underwent immortalization by transduction with human papillomavirus E6/E7-encoding lentivirus. TVF primary and transformed cells were characterized by light microscopy and immunohistochemistry.

Results: Primary cultures established from the TVF displayed normal epithelial cell morphology and cytokeratin expression. These cells demonstrated 20 passages in culture. Cultures of TVF laryngeal epithelial cells had a 90% success rate.

Conclusion: A novel immortalized TVF laryngeal epithelial cell line has been established. This cell line enables further investigation into laryngeal inflammatory and neoplastic disease.
Objective: Although vocal fold leukoplakia is being treated with in-office KTP laser, there is no data in the literature on its long-term efficacy in disease control and preservation of voice quality. This study hypothesizes that treatment of vocal fold leukoplakia by in-office KTP laser results in adequate long-term disease control with maintenance of vocal quality and minimal morbidity.

Methods: A multi-institutional retrospective chart review (2008-2015) of 46 patients with vocal fold leukoplakia treated by in-office KTP laser was performed. The mean follow-up was 39.9 months, with a median follow-up of 40.0 months. Main outcomes include: 1) rate of disease control, 2) percentage disease using image J analysis, 3) subjective vocal assessment using VHI-10.

Results: Patients underwent an average of 2.2 (range: 1-6) in-office KTP laser treatments with average 12.7 months between treatments. Thirty-one patients (67%) were managed successfully (control of disease) with in-office KTP laser treatment alone. Thirteen patients (28%) required return to the operating room, and 2 patients (4%) underwent radiation therapy. Two patients (4%) progressed to invasive cancer. Twenty-six patients (57%) had no evidence of disease at last evaluation. Overall disease regression was 55.4% and VHI-10 score decreased by an average of 3.3.

Conclusions: Serial outpatient KTP laser treatment of vocal fold leukoplakia appears to be effective for disease control with minimal morbidity and preservation of good voice quality.

Reconstructive Trans-Oral Laser Microsurgery for Posterior Glottic Web Laryngeal Stenosis

Ihab Atallah, MD, PhD; Ahmad Al Omari, MD; Paul Castellanos, MD

Objective: To demonstrate that reconstructive trans-oral laser microsurgical techniques (R-TLM) can be used for the treatment of symptomatic posterior glottic web-based laryngeal stenosis (PGWS) in a large cohort of patients utilizing a postcricoid mucosal advancement flap technique (PCMAF).

Materials and Methods: A consecutive series of patients with PGWS who underwent R-TLM using a PCMAF were reviewed for outcomes. After laser excision of the PGWS scar and mobilization of fixed cricoarytenoid joints, a PCMAF was raised using micro-instruments and a scanning free beam CO2 laser. The flap was advanced and attached over the scar bed using a technique with multiple novel features that make it easy to adopt.

Results: Fifty-two patients were treated. One quarter had a tracheostomy at presentation with Grade II to IV PGWS; half had Grade III-IV. In all cases, R-TLM including the PCMAF was the only treatment. No open reconstructions were performed. No airway stents were used. No patient, regardless of the grade of stenosis, required a tracheostomy to undergo this operation. All tracheostomy patients were successfully decannulated. All patients without a tracheostomy had significant improvement of their respiratory symptoms on the Utah Dyspnea Index (mean delta =14.75; P value < 0.01).

Conclusion: R-TLM using the PCMAF is a feasible, safe, and effective alternative to open approaches for airway reconstruction for PGWS. This novel trans-oral technique includes a much simpler endoscopic suturing alternative to knot tying among other new features. It is reproducible and reliable for laryngologists familiar with laryngeal microsurgery.
SCIENTIFIC SESSION

Does Narrow Band Imaging (NBI) Improve Preoperative Detection of Glottic Malignancy: A Matched Comparison Study

Hagit Shoffel-Havakuk, MD; Barak Meidan, BSc; Yaara Haimovich, BSc; Meir Warman, MD; Moshe Hain, MD; Doron Halperin, MD; Yonatan Lahav, MD

Introduction: The primary suspicion for glottic malignancy during an office laryngoscopy, relies on lesions' appearance. Previous studies investigating laryngeal use of NBI are mostly descriptive. However, the additive value of NBI relatively to white light (WL) has not been examined yet.

Methods: An observational matched study, comparing NBI with WL images of 45 vocal fold lesions, suspected for malignancy (21 carcinoma; 22 dysplasia; 2 benign). All images were presented randomly and evaluated by six otolaryngology specialists. The observers were asked to estimate the lesions' size, location and pathology. The results for the two image modalities were compared with each other and with the final pathology.

Results: The observers estimated the lesions' size to be larger in the NBI images compared with WL, by an average of 2.41mm² (p-value=0.04). In 64.6% of cases the observers' estimated pathology by NBI and WL resembled. When there was a disagreement, the estimated pathology was 'malignant' in 24.3% by NBI, compared with 11.1% by WL. Overall, 44.7% of the lesions were estimated to be malignant by NBI, compared with 33.8% by WL (p-value=0.001). The sensitivity and specificity rates for detection of malignancy by NBI were 58.6% and 61.2% respectively, compared with 48.7% and 76.1%, by WL.

Conclusions: While assessing NBI images, observers tend to estimate vocal fold lesions to be larger and suspicious for malignancy. Compared with WL, NBI demonstrates increased sensitivity for detection of malignancy, however, with decrease specificity. The use of NBI during an office examination may allow earlier detection of malignancy.
**SCIENTIFIC SESSION**

**Whole Organ Dynamic Nanomechanical Vocal Fold Analysis**

Gregory R. Dion, MD; Paulo G. Coelho, DDS, PhD; Stephanie Teng, MD; Malvin L. Janal, PhD; Mila R. Amin, MD; Ryan C. Branski, PhD

Introduction: Quantification of clinical outcomes after vocal fold (VF) interventions is challenging with current technology. High speed digital imaging and ex vivo optical coherence tomography (OCT) assess intact laryngeal function but do not provide critical biomechanical information. We developed a protocol to quantify tissue properties in intact ex vivo VFs using dynamic nanomechanical analysis (nanoDMA) to obtain precise biomechanical properties and nanoscale assessment.

Methods: Three pig larynges were bisected in the sagittal plane, maintaining an intact anterior commissure, and subjected to nanoDMA testing at nine locations with a 250µm flat-tip punch and frequency sweep load profile (10-105Hz, 1000µN peak force) across the free edge of the VF and inferiorly along the conus elasticus.

Results: Storage, loss and complex moduli increased inferiorly from the free edge. Storage moduli increased from (presented as mean and 95%CI range) 32.7KPa (14.9-50.54) at the free edge, 46.3KPa (28.5-64.1) 5mm below the free edge, and 71.3KPa (53.6-89.1) 1cm below the free edge (p=0.02), loss modulus from 11.6KPa (7.7-15.6) to 16.7KPa (12.7-20.6) to 22.6KPa (18.6-26.6) at the same locations (p=0.65). Another larynx repeatedly frozen and thawed during technique development had similar storage, loss, and complex modulus trends with increased values across locations.

Conclusions: NanoDMA of the intact hemilarynx provides a platform for quantification of biomechanical responses to a myriad of therapeutic interventions to complement data from high speed imaging and OCT.

**Swallowing Function after Chemoradiation for Head and Neck Cancer: A Pre Versus Post- Treatment Instrumental Comparison**

Matina Balou, PhD, CCC-SLP, BCS-S; Sonja Molfenter, PhD, CCC-SLP; Nicholas Sanfilippo, MD; Beverly Smith, RN; Melissa Lumish, BS

Purpose: Patients who receive concurrent chemotherapy and radiation (chemo/XRT) for oral/oropharyngeal cancer (O/OP Ca) have adverse clinical outcomes, yet validated pre vs post swallowing assessment and use of evidence-based protocols are not universal.

Method(s): Videofluoroscopy (VF) was collected from 40 newly diagnosed patients with O/OP Ca (24 male) aged 38-76. All subjects received radiotherapy (70Gy, 7 weeks) combined with 3 weekly doses of cisplatin and were prescribed daily prophylactic swallowing exercises. VF was conducted pre-treatment and again within 4 weeks post-treatment. Two boluses of 3 and 5ml thin Varibar were analyzed per subject from pre and post VF (N=320 swallows). Outcome measures included Penetration Aspiration Scale (PAS) and ordinal ratings of residue in the valleculae (Vres) and pyriform sinuses (PSres). Within-subject analyses were conducted by bolus volume using McNemar’s test.

Result(s): The proportion of subjects with Vres post-treatment was significantly greater than pre-treatment for both 3 and 5ml swallows (3ml PRE = 65%, 3ml POST = 85%, p=.021, 5ml PRE = 71%, 5ml POST = 93%, p=.065). There were no significant differences for PSres. While the proportion of subjects with unsafe PAS (≥3) scores was greater post-treatment results narrowly missed reaching statistical significance (p=.065).

Conclusions (including clinical relevance): Chemo/XRT for oral/oropharyngeal cancer causes worsening of pharyngeal clearance, specifically in the valleculae. Our results also support the common clinical pattern of worse airway protection post chemo/XRT. Future work will identify underlying physiological causes for these findings.
**SCIENTIFIC SESSION**

**Novel Model for the Evaluation of Stem Cell Therapy for Profound Dysphagia**

Maggie A. Kuhn, MD; Amanda B. Black, MS; M. Tausif Siddiqui, MD; Jan A. Nolta, PhD; Peter C. Belafsky, MD, PhD

Introduction: Dysphagia is common and costly. Treatments are limited and innovative therapies are required. The tongue is essential for safe, effective swallowing and is a natural target for regenerative therapy. Myoblasts (muscle stem cells) hold potential to restore dynamic function, and their application in the damaged tongue is appealing. We examine the safety and efficacy of human myoblast implantation into a novel mouse tongue model.

Methods: Adult immune deficient mice were randomized to surgical (hemiglossectomy) and non-surgical groups. Animals underwent lingual injection of human myoblasts or saline (control). Groups were followed for 12 weeks. The primary outcome was myoblast survival measured by In Vivo Imaging System (IVIS). Secondary outcomes included animal survival, weight and social behaviors.

Results: Sixteen animals were included. Human myoblasts survived to the endpoint demonstrating 132% and 15% bioluminescence by IVIS at 12-weeks in hemiglossectomy and non-surgical groups respectively. All but one animal (hemiglossectomy with saline injection) survived to the study endpoint. Mean weight increased from baseline (25.5 +/- 0.8 gm) in all groups with greatest change observed in non-surgical mice with saline injection (30.0 +/- 1.2 gm) and smallest in hemiglossectomy mice with saline injection (27.8 +/- 1.3 gm). All animals resumed expected grooming and social behaviors.

Discussion: Regenerative therapy holds great potential for oral and oropharyngeal swallowing dysfunction. The tongue is an ideal target given its propensity for disability and easy accessibility. Our results establish a novel model to study muscle stem therapy and lay foundation for future animal studies and application in human trials.

**Deglutition and Respiratory Patterns during Sleep in the Aged**

Kiminori Sato, MD, PhD; Shun-ichi Chitose, MD; Kiminobu Sato, MD; Hirohito Umeno, MD

Introduction: Deglutition is a vital function, and the clearance of the pharynx by deglutition, which removes matter that could be aspirated, is important in protecting the airways and lungs against aspiration. The deglutition and respiratory phase patterns during sleep in the healthy aged were investigated in this study.

Methods: Ten aged adults (average age 71) were examined via time-matched digital recordings of polysomnography and surface electromyography of the muscles (thyrohyoid and supranyoid muscles) related to swallowing.

Results: During sleep, swallowing was infrequent and absent for long periods. The mean number of swallows per hour during total sleep time was 0.8 and the mean longest deglutition-free period was 135 minutes. Most deglutition occurred in association with spontaneous electroencephalographic arousal both in REM and non-REM sleep. Deglutition was related to the sleep stage. The deeper the sleep stage, the lower the mean deglutition frequency. There was no deglutition during deep sleep. Overall muscle tone is inhibited during REM sleep. However, deglutition also occurred in association with spontaneous EEG arousal as frequently as in non-REM sleep stage 2. The deeper the sleep stage, the lower the mean arousal frequency, and the lower the mean ratio of arousal with deglutition to arousal. Approximately 39% of swallows were followed by expiration, 34% were followed by arrested breathing and 28% were followed by inspiration.

Conclusion: Deglutition was infrequent and displayed unique patterns during sleep in the aged. Sleep-related deglutition may adversely influence aspiration-related diseases (aspiration pneumonia, etc) in the aged.
Feasibility of Expiratory Muscle Strength Training for Rehabilitation of Airway Protection in Head and Neck Cancer Following Radiation Therapy

Bari Hoffman Ruddy, PhD; Christine Sapienza, PhD; Erin Pearson Silverman, PhD; Henry Ho, MD; Nikhil Gadahad Rao, MD; I Giselle Carnaby, PhD

Introduction: Cough and swallow impairments frequently manifest in patients with head and neck cancer (HNC), both as a symptom of the disease and as a side-effect of treatments such as radiation therapy or surgery. Aside from the physiological effects of these impairments (increased risk of aspiration and lung infection etc.), patients frequently experience decreased quality of life (QOL) and depression, frequently withdrawing from social situations that involve eating or drinking. Expiratory muscle strength training (EMST) is a device-driven therapy for rehabilitation of cough and swallow function. EMST is typically carried out in the home environment and requires very little direct oversight by the treating clinician. This study examined the feasibility of EMST for rehabilitation of cough and swallow following radiation therapy for HNC.

Methods: Six participants were recruited for inclusion in this study. Each were undergoing radiation therapy for HNC. Baseline measures of cough strength (peak expiratory flow), expiratory pressure generating capacity (maximum expiratory pressure) and swallow related quality of life (EAT-10) were obtained prior to initiating a five-week course of EMST at 75% of MEP. Baseline measures were repeated after 5 weeks of EMST.

Results/Conclusion: Prior to EMST, all participants demonstrated markedly reduced measures of cough strength. After treatment, cough strength improved by 44.34% on average. Average improvements of 19% were observed on the EAT-10, a measure of swallow related quality of life, pre- to post-EMST. These preliminary results support the use of EMST for rehabilitation of cough and swallow impairments in this high-risk patient population.
Introduction: In laryngectomised individuals, rehabilitation options include esophageal speech, tracheoesophageal puncture (TEP), and electrolarynx devices enabling patients to communicate. These do not generate natural sounding speech; at best they are monotonous or robotised. We present a non-surgical, non-invasive alternative which combines whisper signal analysis with direct pitch insertion and formant enhancement, to ‘reconstruct’ missing speech. This pilot study assesses the acoustic features of laryngectomisees speech and required enhancement for natural speech regeneration.

Method: Audio recordings were made of five laryngectomised patients in a sound proof room from three randomisations of a balanced word list. Formant contours of speech samples in /hVd/ structure were analysed through combined segmentation extraction methods. Formant characteristics were used to establish a vowel formant space for laryngectomy speech. Data was translated by spectral enhancement and pitch insertion algorithm into phonated words. A subjective listening test using mean opinion scores (MOS) was conducted for five normal hearing listeners proficient in English. Subjects were randomly presented with reconstructed words and each subject scored word quality over a five-point scale.

Results: All audio recordings were able to be analysed. Vowel formant information was adequately produced in all samples. Frequency of the first two formants were measured and were comparable to corresponding formant frequencies in phonated speech. Mean opinion scores demonstrated excellent recognition of words and vowels. Reconstructed words were recognisable to naive listeners.

Conclusions: Computational speech regeneration demonstrates promising results in reproducing acoustic features of laryngectomisee speech. This approach generates a more natural voice than alternative methods, using a non-invasive, portable external device.
A High-Quality Cost-Effective Rigid Laryngoscopy Setup

Fan Zhang, MD; J. Scott McMurray, MD; Erin E. Devine, MS; Chao Xue, MD; Timothy M. McCulloch, MD; Jack J. Jiang, MD, PhD

Objective: The objective of this work is to evaluate the utility of a cost-effective modified rigid laryngoscopy setup that uses a portable light source and high-resolution commercially available digital camera for use in smaller otolaryngology and family practice clinics.

Methods: A cost effective laryngoscopy set-up was used to obtain images of the larynx using both a traditional light source and a portable light source. Varying shutter speeds and ISOs were evaluated and the optimal settings were determined for the new modified setup.

Results: Picture quality was adequate and the portable light source was bright enough. ISO from 640 to 1600 with shutter speeds ranging from 1/60 to 1/160 are ideal under the normal light source, while it is better to set the ISO between 4000 and 10000 with shutter speeds from 1/60 to 1/100 under the portable light source. Picture quality was adequate with a resolution of 2768 pixels x 1848 pixels with 350dpi x 350dpi.

Conclusion: Results show that the modified setup obtains images of adequate quality for use in the clinic. Additionally, since the larynx required the most illumination for endoscopic imaging in the head and neck, a similar setup would work for imaging the ear and nose. This setup may make laryngoscopic exams more accessible to patients at smaller laryngoscopy clinics or family practice providers.

A Novel Approach to Injection of the Cricoarytenoid Joint: An Anatomic Feasibility Study

Sunthosh Sivam, MD; Alison Burkett, BS; C. Blake Simpson, MD

Introduction: Cricoarytenoid joint (CAJ) inflammation related to autoimmune disease can result in medial fixation of the vocal folds necessitating urgent tracheotomy. Further treatment often includes local steroid administration. Trans-oral intra-articular cricoarytenoid steroid injection in the operative setting was first described in 1977 and is the current approach despite lacking evidence regarding its accuracy. We aim to establish a percutaneous trans-cricothyroid membrane injection of the CAJ as an effective and novel method.

Methods: Ten human cadaveric cricoarytenoid joints were used to obtain trajectory measurements of a 27-gauge 1½-inch needle placed between the cricothyroid membrane and contralateral CAJ. Twenty cricoarytenoid joints were then used to assess the efficacy of applying those measurements for injections of methylene blue. Successful injection was defined as methylene blue being observed within the joint capsule.

Results: The needle makes a 70±1.87 degree (CI 95%) angle relative to the plane parallel to the anterior lamella of the cricoid and enters the cricothyroid membrane 5±0.77 mm (CI 95%) lateral to the midline. It enters the CAJ capsule 4±0.80 mm (CI 95%) anteroinferiorly from the vocal process and traverses 17±2.42 mm (CI 95%) from the cricothyroid membrane to the contralateral CAJ. Twenty CAJ injections were attempted using the described measures with an 85% success rate. There were 3 failures.

Conclusion: The current approach to CAJ injection utilizes microlaryngoscopy in an operative setting. This study is the first to describe the accessibility of the CAJ through percutaneous injection using reliable landmarks, potentially allowing access to the joint in an office-based setting.
A Novel Transfection Modality for In Vivo SIRNA Delivery to Vocal Fold Fibroblasts

Iv Kraja, BS; Benjie Bing, MD; Nao Hiwatashi, MD; Bernard Rousseau, PhD; Kent Kirshenbaum, PhD; Ryan C. Branski, PhD

Gene silencing through siRNA interference holds substantial therapeutic promise for a variety of disease processes including vocal fold (VF) scar. Sustained gene suppression, however, is challenging due to the inherent instability of siRNA oligonucleotides in vivo. Whereas commercially-available, lipid-based reagents show good transfection efficiency in vitro, they have limited efficacy in vivo. Our laboratories are optimizing protocols for transfection mediated by synthetic cationic oligomers incorporating N-substituted glycine oligomers and a phospholipid head group. These “lipitoids” were designed for proteolytic resistance and enhanced stability upon association with nucleic acids to form nanoparticle complexes. Their application was initially reported for delivery of plasmid DNA. We compared siRNA transfection efficiency by lipitoids to a commercially-available transfection reagent in both an immortalized human vocal fold fibroblast (VFF) line as well as rat and rabbit primary VFF cultures. The target gene was Smad3, a TGF-β signaling protein particularly relevant for anti-fibrotic therapies. Both molecules effectively knocked down Smad3 mRNA for up to 96 hours, yielding a 60-80% gene knockdown compared to control across all cell types. Knockdown was highly-dependent on reagent concentration and the number of administrations. Lipitoid was more concentration-dependent, resulting in a 50% decrease in Smad3 with a 5-fold increase in concentration. Contrary to expectation, neither serum nor media type altered transfection efficiency. These data suggest that lipitoid performance rivals commercially-available transfection reagents. Yet, the chemical diversity and modular synthesis of lipitoids likely facilitate the development of reagents optimized for in vivo performance and pharmacological attributes to enhance therapeutic efficacy of RNA-based therapeutics.
Aerosolized Acidified Pepsin Exposure: In an In-Vivo Pig Model

Abigail Durkes, DVM, MS; M. Preeti Sivasankar, PhD, CCC-SLP

Objective: This study investigates vocal fold changes in response to repeated, aerosolized acidified-pepsin exposures in an in vivo porcine model. We hypothesized that daily inhalation of acidified-pepsin to simulate reflux would elicit a vocal fold response histologically and ultrastructurally; as well as changes in the gene expression of epithelial junctional proteins, ion transporter proteins, and pro-inflammatory cytokines.

Study Design: Prospective, in vivo study Methods: Twelve pigs were randomly assigned to a reflux or sham group in which pigs inhaled acidified pepsin (pH=4) or saline through a nose cone attached to a nebulizer. The pigs were challenged 3 times per day, 5 days per week, for 4 weeks for a total of 60 exposures. Vocal fold tissue morphology and ultrastructural alterations were examined via light microscopy and transmission electron microscopy. Complementary DNA microarray analysis of vocal fold epithelium was conducted and followed up with real-time polymerase chain reaction investigating the gene expression of E-cadherin (Ecad), zona occludin-1 (ZO-1), cystic fibrosis transmembrane conductance regulator (CFTR), epithelial sodium channel (SCNN1α), and inflammatory mediator tumor necrosis factor-α (TNF-α).

Results: Animals were successfully trained to receive multiple daily inhaled challenges of aerosolized acidified pepsin. There were no significant differences in histology, epithelial ultrastructure, intercellular space, microridge height, or gene transcripts after inhalation of acidified-pepsin.

Conclusions: These data offer a potential novel experimental methodology to test similar inhaled laryngeal challenges on healthy pigs. The success of this methodology could easily transition to chronic inhalation experimentation.

Altered Pharyngeal Structure and Dynamics among Patients with Cervical Kyphosis

Derrick R. Randall, MD, MSc; Peter C. Belafsky, MD, MPH, PhD

Background: Deformities of the anterior cervical spine are an established cause of dysphagia. While osteophytes and spinal fusion hardware have been reported to alter bolus flow and contribute to swallowing dysfunction, the relationship between abnormal spine curvature and swallowing dysfunction is less well established. The purpose of this investigation was to evaluate associations between kyphosis and objective evidence of swallowing dysfunction on fluoroscopy.

Methods: All videofluoroscopic swallow studies (VFSS) performed at our institution between 08/01/14 and 08/01/15 were retrospectively reviewed to identify patients with abnormal cervical kyphosis, according to Cobb or Jackson angle measurements. Patients with kyphosis were age- and gender-matched to persons without kyphosis. VFSS and demographic parameters were collected and compared between groups.

Results: 36 patients with cervical kyphosis exceeding two standard deviations beyond established age-specific normal ranges were identified. The mean age of the entire cohort was 61.6 (SD±19.1) years. Mean pharyngeal area was 3.34 cm² greater in kyphosis patients compared to controls (95% CI = 1.47 – 5.21 cm²; p = 0.0007). This was associated with a 0.57 sec (95% CI = 0.045 – 1.09 sec) increase in hypopharyngeal transit time (p = 0.034) and a non-significant decrease in hyoid elevation (p = 0.074). There was no significant difference in the pharyngeal constriction ratio (PCR), a surrogate measure of pharyngeal strength (p = 0.83).

Conclusion: Patients with cervical spine kyphosis have a significantly dilated pharynx (p = 0.0007) and elongated hypopharyngeal transit time (p = 0.034). Absence of a difference in PCR suggests adequate compensation as a group.
POSTERS

Analyzing the Area under the Curve of Pharyngeal PH Probes in the Diagnosis and Treatment of Reflux Disease

Joel Jones, MD; Amy Nguyen, MD; Hema Pappu, MS; Kevin Sykes, PhD; James David Garnett, MD

Introduction: Recent efforts have focused on the implications of gastroesophageal reflux disease (GERD) in extraesophageal areas and 24-hour pharyngeal pH probes are gaining favor in diagnosing laryngopharyngeal reflux (LPR). Traditionally, when practitioners analyze results of pH probes, qualitative terms are used to describe the level of severity in a somewhat subjective fashion with little correlation to numerical data. We analyzed the graphical area under the curve (AUC) from pharyngeal probes and compared the results with Reflux Symptom Index (RSI) scores. This was in effort to evaluate the AUC as a predictor of patient reported symptoms.

Methods: A review of 165 patients at a tertiary medical center from October 2013 to April 2015 yielded 66 patients who had completed a 24-hour pharyngeal pH probe and a pre-treatment RSI questionnaire. Patients with a history of laryngeal surgery were excluded. RSI scores based on patient reported symptoms from 0 to 45 were recorded. The AUC was calculated for pH values below a threshold of 5.5 using the trapezoidal rule. RSI scores were then correlated with AUC values using a Spearman’s correlation statistic.

Results: There was a weak, but statistically significant correlation ($r^2=0.325$, $p=.008$) between AUC values (pH-seconds) and RSI scores.

Conclusions: We developed a new method to analyze the graphical AUC of pharyngeal pH probes and found a correlation with RSI scores. The AUC may be helpful as a single value in distinguishing the severity of LPR and tailoring treatment options for patients.

Anti-Fibrotic Effect of Pirfenidone on the Ferret Vocal Fold Scar Fibroblast in Vitro

Haruka Kodama, MD; Yutaka Toya, MD, PhD; Eiji Yumoto, MD, PhD; Yoshihiko Kumai, MD, PhD

Introduction: Pirfenidone (PFD) is the strong anti-fibrotic agent which has been already clinically approved in Japan for idiopathic pulmonary fibrosis. Objective of this study is to examine the anti-fibrotic effects of PFD on the fibroblasts isolated from ferret scarred vocal fold (VF) in vitro.

Methods: Normal fibroblasts (NFs) were isolated from lamina propria of normal ferret VF bilaterally. Scar fibroblasts (SFs) were isolated from ferret scarred VF which was electro-cauterized 2 weeks before harvesting. NFs and SFSs were incubated in the presence of 10ng/ml transforming growth factor β (TGF-β), with or without PFD (concentration range from 0mg/ml as control to 1.0mg/ml). After the 48 hour incubation, mRNA expression of α smooth muscle actin (α-SMA), TGF-β, collagen type 1 were examined by real time PCR. SFs were cultured in collagen gel with or without PFD for 48hours, and extent of gel contraction was quantitatively examined.

Results: In SFs with concentration of 1.0 mg/ml of PFD, 1) mRNA expression of collagen 1 was significantly ($p < 0.05$) decreased, 2) mRNA expression of TGF-β was significantly ($p < 0.05$) increased, 3) the mRNA expression of αSMA was not significantly different and 4) collagen gel contraction was significantly ($p < 0.05$) suppressed compared to the control without PFD.

Conclusion: This is the first paper that demonstrated the anti-fibrotic effects of PFD (especially reduction of collagen type I expression and gel contraction) on the fibroblasts isolated from ferret scarred VF in vitro.
Anticoagulation and Antiplatelet Therapy in Awake Transcervical Injection Laryngoplasty

Jennifer Dang, MD; Julina Ongkasuwan, MD

Introduction: Vocal fold paralysis occurs in 20-30% of surgeries in the region of the aortic arch. Early injection laryngoplasty can aid with post-operative pulmonary toilet in these high-risk cardiovascular patients. The purpose of this study is to determine whether continuing antiplatelet and anticoagulation therapy before awake transcervical injection laryngoplasty surgery is safe and if there is any increase in bleeding complications in these patients.

Methods: This is a retrospective review of patients undergoing awake injection laryngoplasty surgery for vocal fold paralysis between 2013-2015 at a tertiary academic center specializing in aortic and mediastinal diseases. Records were reviewed for patients regarding baseline antiplatelet or anticoagulation therapy, and whether these medications were stopped or continued preoperatively. The primary outcome was bleeding complications.

Results: Of the 67 surgeries reviewed, 32 (47%) were performed for patients on antiplatelet therapy, and 54 (80%) for patients on anticoagulation therapy. None of the patients on antiplatelet therapy had their treatment discontinued. Of the patients on anticoagulation, 12 (22%) had their therapy held prior to surgery. There was no observed difference in bleeding complications between patients who were continued on antiplatelet or anticoagulation treatment versus those whose therapy was withheld.

Conclusion: These results suggest that patients undergoing awake transcervical injection laryngoplasty for vocal fold paralysis can be maintained on antiplatelet or anticoagulation therapy without an increased risk of bleeding. Further larger studies are needed to confirm these findings.

Blunt Laryngeal Trauma Secondary to Sporting Injuries

Dulani Mendis, B.Sc, MBA; Jennifer Anderson, MD

Introduction: Laryngeal injuries are uncommon but can be potentially fatal or cause significant morbidity in voice/airway function. Despite protective gear, the larynx is still susceptible to blunt trauma particularly during high velocity sporting pursuits. The objective of this study is to present a case series of patients who sustained blunt laryngeal trauma during a sports activity and to contextualize their management in comparison to the published literature.

Methods: Of twenty-seven blunt laryngeal trauma patients referred for tertiary care, thirteen sustained blunt trauma secondary to a sporting event. A retrospective case-based analysis was undertaken and a comprehensive review of the literature was performed.

Results: Within the study group, ten patients had a possible fracture on imaging of which eight underwent operative intervention. Two patients with stable un-displaced fractures were managed conservatively. Sporting injuries were sustained from hockey, baseball, martial arts, lacrosse, cycling/buggy racing, soccer and skiing. Sixty-one percent of patients presented with features of airway compromise (shortness of breath with or without stridor) and all presented with persistent dysphonia. Injuries were identified and managed early-on as appropriate to protect the airway and to prevent permanent laryngeal deformity for the best voice and airway outcome.

Conclusion: Early identification and treatment of laryngeal injuries has been reported to improve outcomes; salient management goals being airway protection and voice preservation. A high index of suspicion should be maintained for blunt laryngeal trauma particularly during sporting events as evidence of significant trauma maybe scant early on and imaging can be equivocal.
POSTERS

Career Trends of Recent Laryngology Fellowship Graduates

Brianna Crawley, MD; Priya Krishna, MD, MA; Thomas Murry, PhD; Daniel Fisher, PhD

Introduction: Over the past several decades, laryngology has reemerged as a significant independent subspecialty of otolaryngology. As the demand for fellowship-trained laryngologists has grown, so has the number and diversity of training programs. This study was undertaken to assess the placement and career directions of recent graduates from laryngology fellowships.

Methods: The directors of all 28 laryngology fellowships in the United States that graduated fellows between 2010 and 2014 were contacted. A list of all recent fellows was compiled and a short survey was administered by email, phone, or in person.

Results: Of 78 recent fellowship graduates, 17 are practicing in the same metro area as their fellowship, 44 are practicing outside that metro area, and 14 are practicing internationally. Of the fellows who responded to our survey, 62% entered academia, 22% entered private practice, and 16% describe their practices as combination private/academic. Four completed more than one fellowship in otolaryngology; pediatric ENT or Head and Neck Surgery. Twelve recent fellows report their practice is 100% laryngology, 29 report between 50 and 99% laryngology, and 10 report less than 50% laryngology. Twenty-nine state the practice they have now is exactly the one that they want, while 22 desire some changes. Half of all fellowship graduates are participating in laryngology research.

Conclusions: This survey characterizes the current practices of the laryngology fellows of the last five years. The results of this survey may be useful to residents considering fellowship training, centers considering establishing laryngology fellowships, and practices recruiting fellowship graduates.

Cervical Osteophytes Increase the Risk for Foreign Body Impaction: A 171 Patients Case-Control Study

Hagit Shoffel-Havakuk, MD; Sharon Chanovitc, MD; Meital Adi, MD; Oded Cohen, MD; Yaara Haimovich, BSc; Doron Halperin, MD; Yonatan Lahav, MD

Introduction: The effects of structures in the neck, as the thyroid gland and osteophytes, on deglutition have been previously discussed; yet, the relationship between these structures and the impaction of foreign bodies (FB) has not been examined.

Methods: A retrospective case-control study of 171 patients who underwent computed tomography (CT) scans, over the years 2008-2014. 57 patients with an esophageal or hypopharyngeal FB; the other 114 comprised the control group, selected using the ‘neighbor control’ method. CT scans were reviewed for measurements of cervical anatomical structures.

Results: The mean age was 63±13 years and 55±17 years in the case and control groups, respectively (p-value=0.003). Age was the only demographic or clinical characteristic found to have a significant difference. Overall, 24 patients had cervical osteophytes; 28% (16) of the patients with impacted FB, compared with 7% (8) in the control group (p-value<0.001). Of the patients with osteophytes and impacted FB, 62.5% had the FB wedged at a vertebral level corresponding to their osteophytes; another 18.75% had the FB within 3 vertebrae above the osteophytes. Stepwise logistic regression model revealed that osteophytes were significant factor independent of older age (p-value=0.004). Adjusted odds ratio, for FB impaction in the presence of osteophytes was 4.04.

Conclusions: Ventral cervical osteophytes increase the risk for FB impaction in the upper digestive tract. This risk is independent of older age. These findings can be of value in preventive medicine, and emphasize the importance of looking for cervical spine changes in patients with recurrent FB impaction.
Compound Motor Action Potential Duration and Latency Are Markers of Recurrent Laryngeal Injury

Neel K. Bhatt, MD; Andrea M. Park, MD

Introduction: Compound motor action potential (CMAP) - derived from the summation of muscle fiber action potentials – can quantify innervation following injury to the recurrent laryngeal nerve (RLN) in canines. In the recovery period after RLN injury, CMAP amplitude can recover to pre-injury values. CMAP duration (the total time of CMAP) and latency (the time between the nerve impulse and the onset of action potentials) have not been assessed. We present the study of CMAP latency and duration and their utility as markers of RLN injury.

Methods: Control canine hemilaryngeal preparations with no injury (n=14) were compared to hemilaryngeal preparations with RLN stretch (n=5), crush (n=4), cautery (n=4), or transection/repair (n=9) injury followed by six months of recovery. We compared CMAP duration and latency between experimental and control groups.

Results: Six months following injury, CMAP duration and latency were significantly increased compared to control (p<0.01 and p<0.001, respectively). Transection/repair injury had the most significant increase in CMAP duration (4.40±0.98ms vs. 2.63±0.50ms) and latency (5.45±1.11ms vs. 2.69±0.49ms) compared to control (p<0.001 in both). Using receiver operator characteristic (ROC) curve and logistic regression, CMAP duration and latency were highly discriminatory between controls and RLN injury (c-statistic of 0.88 and 0.95, respectively).

Conclusions: CMAP duration and latency are both quantitative measures that may have clinical utility as markers of RLN injury – even with return of vocal fold motion. CMAP latency had superior discrimination between injured and uninjured RLNs. Increase CMAP duration and latency may be explained by incomplete myelination and/or decreased nerve conduction velocity.

Conditional Survival for Nonsquamous Cell Carcinoma of the Larynx

Mark Fritz, MD; Sonya Marcus, MD; Gregory Dion, MD; Milan Amin, MD

Introduction: Non-squamous cell carcinomas make up less than 5% of malignant laryngeal neoplasms, and less rigorous treatment guidelines exist with little survival data available. We sought to determine the conditional survival and prognostic information for patients with non-squamous cell carcinoma of the larynx.

Methods: A cross-sectional population analysis was conducted to evaluate cases with any malignant pathology of the larynx from 1973-2012 using the Surveillance, Epidemiology and End Results (SEER) 8.2.1 data set. The 5-year conditional survival was then computed to ten years after diagnosis including all predominant non-squamous cell carcinoma (SCC) pathologies and SCC pathologies.

Results: A total of 68,330 cases were found consisting of 94 different pathologies. Squamous cell carcinoma subtypes were most predominant (95.4%). Chondrosarcoma was the highest nonsquamous cell pathology (n=160, 0.2%) followed by small cell carcinoma (n=145), spindle cell carcinoma (n=111), and adenocarcinoma (n=111). Squamous cell carcinomas increase in 5 year observed conditional survival from 55.0% at the time of diagnosis to a plateau of 66.1% three years after diagnosis. Other pathologies show this general trend save for a few exceptions. Basaloid SCC and small cell carcinoma start out at 35.7% and 18.9% before rising to >69% at 6 years after treatment. Chondrosarcoma of the larynx has the best five year observed conditional survival at 78.9% increasing to 90.7% at year five.

Conclusion: 5 year observed conditional survival appears to plateau within the first few years for most pathologies of the larynx. However, not all patients with laryngeal malignancies should be counseled the same way.
POSTERS

Cost Effectiveness of Routine Computed Tomography in the Evaluation of Idiopathic Vocal Fold Paralysis

Houmehr Hojjat, MD; Peter F. Svider, MD; Adam J. Folbe, MD; Syed N. Raza, MD; Ross M. Mayerhoff, MD

Objectives: To evaluate the cost-effectiveness of routine Computed Tomography (CT) in individuals with vocal fold paralysis (VFP) Study Design: A decision tree was constructed to determine the incremental cost effectiveness ratio (ICER) of CT imaging in VFP patients. Univariate sensitivity analysis was utilized to calculate what the probability of having an etiology of the paralysis discovered would have to be to make CT head, neck, and thorax with contrast more cost effective than no imaging.

Patients Method: The studies included patients who presented with vocal fold paralysis. The majority of patients had unilateral VFP. The decision pathways utilized were using CT neck and thorax with IV contrast after diagnostic laryngoscopy vs. laryngoscopy alone. The probability of detecting an etiology for the paralysis and the associated costs were extracted to construct the decision tree. The main outcome measure was the ICER of using imaging to detect lesions that would explain the VFP. The only incorrect diagnosis was missing a mass in the no imaging decision branch, which rendered an effectiveness of 0.

Results: The ICER of using CT was $3547, which is below most acceptable willingness to pay (WTP) thresholds, making it a cost effective choice. Additionally, univariate sensitivity analysis indicates that at WTP threshold of $30,000 and $50,000, when the probability of having a lesion causing VFP was above 2.2% and 1.3% respectively, obtaining CT imaging was the most cost effective choice.

Conclusion: This economic evaluation strongly supports obtaining CT imaging in patients with newly diagnosed VFP.

“Defatting Starplasty” Tracheostomy in Morbidly Obese Adults

Jonathan P Giurintano, MD; Joshua Wood, MD; Francisco Vieira, MD

Introduction: “Starplasty” tracheostomy is an alternative to traditional tracheostomy previously described in the pediatric literature, designed to facilitate recannulation after accidental decannulation by creating a semi-permanent stoma. “Defatting” tracheostomy with cervical lipectomy has been described in the literature for safely performing tracheostomy in morbidly obese patients. We report our experience combining the two techniques, performing a novel “defatting starplasty” tracheostomy in the severely obese adult population.

Methods: We present a case series of three patients with Type III obesity (mean age 42, mean BMI 46.5) who underwent defatting starplasty tracheostomy for respiratory insufficiency. One patient was neurologically devastated, and one had Trisomy 21. Defatting starplasty tracheostomy was performed rather than conventional tracheostomy because of concerns for accidental decannulation given the patients obese habitus and decreased neurological status. Technique included creating a six-point “star” skin flap, performing wide cervical lipectomy and inferiorly based Bjork flap, and suturing the six skin flaps to the cut edges of the trachea with prolene suture, creating a semipermanent stoma.

Results: There were no intraoperative or postoperative complications in the first 30 days, and no patient experienced wound breakdown at the stoma site. First tracheostomy tube changes were easily performed in all three patients on post-operative day 7, and no patients have experienced tracheostomy-related complications.

Conclusion: “Defatting starplasty” tracheostomy is a safe technique for placing standard tracheostomy tubes in adult patients at increased risk for morbidity or mortality after accidental tracheostomy decannulation, particularly those with Type III obesity or neurological devastation.
POSTERS

Development of a Voice Disorders Related Work Productivity Inventory Utilizing Cognitive Interviewing Techniques

John Paul Giliberto, MD; Quibel Zhu, MD, PhD; Tanya K. Meyer, MD

Background: Voice disorders impair workplace productivity primarily by reduced efficiency while at work (presenteeism). General work productivity measures such as the Work Productivity and Activity Impairment (WPAI) or the World Health Organization Health and Work Performance (HPQ) are quantitative but not disease specific. Voice Handicap Index (VHI) was developed to evaluate psychosocial consequences of voice disorders and had weak correlation to work productivity measures. The purpose of this study was to develop a novel questionnaire to evaluate work productivity in patients with voice disorders.

Design: At a tertiary medical center, patients with full time paid employment suffering from benign voice disorders were given the WPAI, HPQ, VHI and 20 Voice related statements (VRS) developed by laryngologists and speech pathologists. Cognitive interviews were conducted and recorded with all patients.

Results: Ten patients (7 females, 3 males) completed the questionnaires and cognitive interview. Six had benign vocal fold lesions, 3 had motion disorders and 1 had spasmodic dysphonia. Themes that emerged during interviews include: avoiding oral communication/telephone, use of voice associated with strain/fatigue, anxiety over voice use causing emotional toll/distraction and voice disorder inhibiting stress relief/social interactions. All participants felt that the VRS statements covered distinct domains from the VHI. VHI was not significantly correlated to VRS values (p<0.26).

Conclusions: Cognitive interview techniques were used to refine a battery of 20 work related voice related statements. Participants felt that the VRS statements covered distinct domains from the VHI, WPAI, HPQ and were an important qualitative measure of their impairments in the workplace.

Development of an In Vivo Model of Laryngeal Burn Injury

Gregory R. Dion, MD; Stephanie Teng, MD; Renjie Bing, MD; Milan R. Amin, MD; Ryan C. Branski, PhD

Introduction: Inhalation injury significantly increases morbidity and mortality in burn patients. Approximately 1 in 5 burn patients have acute injury to the larynx, trachea, and/or lungs and as many as 70% present with long-term laryngeal abnormalities. Although inhalation injury to the lung has been studied extensively, no models exist to study laryngeal burn injuries. As such, we developed an in vivo, rabbit model to create precise and reproducible laryngeal burns with resultant tissue damage as a foundation for future interventional studies in this challenging patient population.

Methods: Six rabbits underwent tubeless tracheotomy. A custom temperature control device was designed to apply heated air (70-80°C, 150-160°C, or 310-320°C) +/- smoke (unbleached cotton at 40°C or 150-160°C) to the larynx, endoscopically, minimizing adjacent tissue damage. Pain, nutrition, and level of activity were monitored. Direct laryngoscopy followed by laryngeal harvest was performed 24 hours following insult.

Results: All animals survived injury with appropriate pain control; PO intake was initiated and all were adequately ventilating via tracheostomy. Burn sequelae were noted under direct visualization 24 hours after injury, and gradated levels of edema and burn were noted as a function of temperature. Edema obstructed true vocal fold visualization at increased temperatures. These injury patterns correlated with graded tissue damage on histology.

Conclusions: We created an in vivo model of laryngeal burn employing a custom burn application device resulting in graded tissue injury. This model is critical for investigation of the mechanisms underlying burn injury, and ultimately, the development and evaluation of therapies.
Does Trial Vocal Fold Injection Accurately Predict Outcomes of Permanent Medialization Thyroplasty?

Lukas Dumberger, BS; Robert A. Buckmire, MD

Introduction: Use of temporary injection augmentation when voice outcome is uncertain, or trial vocal fold injection (TVFI), is often employed prior to permanent medialization. We aimed to determine if voice outcomes of the trial vocal fold injection are predictive of, or correlate, with voice outcomes after type I Gore-Tex medialization thyroplasty (GMT) in patients with non-paralytic glottic incompetence (GI).

Methods: Thirty-five patients with non-paralytic glottic incompetence (GI) who underwent Gore-Tex medialization thyroplasty and trial vocal fold augmentation and with enough data for analysis were retrospectively reviewed. Change in voice-related quality of life (VRQOL) after TVFI was compared to change in VRQOL 3-9 months after type I GMT. Similar comparisons were made for change in glottal function index (GFI) and change in total scores for grade, roughness, breathiness, asthenia, and strain (GRBAS). Pearson sample correlation coefficients were calculated.

Results: Change in VRQOL after TVFI showed good correlation with change in VRQOL after type I GMT, n=35, (r=0.55). Change in GFI after TVFI showed a strong correlation with change in GFI after type I GMT, n=19, (r=0.74). Change in GRBAS after TVFI showed excellent correlation with change in GRBAS after type I GMT, n=13, (r=0.90).

Conclusion: Trial vocal fold injection is a valuable tool for patients in whom benefit of permanent medialization is unclear, which is often the case in patients with non-paralytic GI (atrophy, scar, and paresis). Surgeons can expect and counsel patients that voice outcomes after type I GMT can be reasonably predicted by those following TVFI.

Effect on Aspiration with Injection Laryngoplasty for Patients with Unilateral Vocal Fold Immobility

Raluca Tavaluc, MD; Casey Pitts, BS; Elena Woodson, MD*
Gina Palma, SLP; Melin Tan, MD

Objectives: Injection laryngoplasty (IL) is a well-recognized form of treatment for patients with unilateral vocal fold immobility (UVFI). Patients with UVFI have well known dysphonia and often times are at increased aspiration risk. The improvement in voice with IL is well documented; however, the effect on aspiration with IL is not clear. We aim to review subjective and objective changes in aspiration risk for patients undergoing IL for UVFI.

Methods: We retrospectively reviewed our experience with IL for UVFI over a 4 year period. All patients underwent swallow evaluation by modified barium swallow (MBS) or flexible endoscopic evaluation of swallow (FEES) and completed the Eating Assessment Tool (EAT-10) and Voice Handicap Index (VHI-10) questionnaire before and after office-based IL with cymetra for UVFI.

Results: A total of 34 patients underwent IL for UVFI. Of these, 11 patients met the inclusion criteria for subjective swallow evaluation and 8 patients for objective swallow evaluation. The follow-up period for swallow evaluation was 2 months, ranging from 2 days to 6 months. The change in mean EAT-10 was 4.6. The change in Pen-Asp scale was negligible. IL did not improve aspiration in those who were seen to aspirate prior to the injection, despite improvement in voice.

Conclusion: IL is well known to improve voice in patients with UVFI. However, despite a subjective change in improvement of dysphagia, there is little appreciable improvement with objective swallow testing.
POSTERS

Effects of Artificial Tracheal Fixation on Tracheal Epithelial Regeneration

Yuta Nakaegawa, MD; Ryosuke Nakamura, PhD; Yasuhiro Tada, MD, PhD; Toshiaki Takezawa, PhD; Tatsuo Nakamura, MD, PhD; Koichi Omori, MD, PhD

Objective: We developed an in situ regeneration-inducible artificial trachea, and have used it for tracheal reconstruction. We previously reported that epithelialization was promoted by the artificial trachea coated with vitrigel. Various studies have been conducted for tracheal reconstruction, but no studies have examined the effect of artificial tracheal fixation on tracheal regeneration. The purpose of the present study was therefore to evaluate the effectiveness of artificial tracheal fixation for regeneration of the tracheal epithelium.

Methods: Artificial tracheae coated with vitrigel were implanted into rabbits. Tracheal defects of 5 × 10 mm were covered with artificial trachea which size was 9 × 14 mm. Regeneration of the tracheal epithelium on the artificial tracheae was evaluated by bronchoscopic examination, scanning electron microscopy analysis, and histological examination. The artificial tracheae fixed on the tracheal defects were classified into three groups by the number of fixation points. One group had no fixation points and the other two groups had four or eight fixation points.

Results: After 14 and 28 days of artificial trachea implantation, the luminal surface of the implantation area was mostly covered with epithelium in all cases. Although tracheal stenosis did not occur in the eight points fixation group, stenosis was found in the other groups. In particular, severe stenosis was observed in the no fixation group. Histological examination revealed that, at 14 and 28 days, there was no significant difference in epithelial regeneration among all groups.

Conclusion: Fixation of the artificial trachea prevents stenosis of the tracheal lumen.

Endoscopic Management of Subglottic Stenosis

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Objectives: Subglottic stenosis is a complex disorder whose optimal management is not established. Endoscopic techniques include balloon dilation, radial incisions with CO2 laser or cold knife, and combinations of techniques. Adjunctive measures include mitomycin-C application and glucocorticoid injection. Although endoscopic techniques are less invasive than open techniques, patients may be subject to multiple interventions.

Methods: Adult patients with subglottic stenosis treated with endoscopic techniques between 1995-2015 were identified retrospectively by diagnosis and procedure codes. Patients with prior open surgeries, prior laryngeal surgeries, glottic stenosis, or vocal fold paralysis were excluded. We used descriptive statistics and one-way ANOVA for comparisons of interval to next operation.

Results: There were 109 patients with etiologies including intubation (32.1%), granulomatosis with polyangitis (8.3%), other autoimmune diseases (5.5%), idiopathic (46.8%) and other causes (7.3%). Among the 229 operations, both laser and balloon dilation were used in 56.0%, while balloon dilation alone was used in 38.5% and laser alone in 5.5%. Mitomycin-C application and steroid injection were used in 66.1% and 43.1% of cases, respectively. Mitomycin-C application demonstrated a statistically significant improvement in the mean interval to next procedure from 299 to 441 days (p=0.045). There was no significant difference for grade of stenosis (p=0.435), surgical technique (p=0.255), or steroid injection (p=0.887).

Conclusions: Endoscopic surgery for subglottic stenosis is a critical aspect of patient management. Surgical technique should be individualized to the patient and disease process. Mitomycin-C application was seen to extend the time interval between endoscopic treatments, though further study is required to elucidate this finding.
POSTERS

Gender Differences in Onabotulinum Toxin A Dosing for Adductor Spasmodic Dysphonia

Michael Z. Lerner, MD; Benjamin A. Lerner, MD; Amit A. Patel, MD; Andrew Blitz, MD, DDS

Objectives: The objective of this study was to determine the influence of gender on Onabotulinum toxin A dosing for the treatment of adductor spasmodic dysphonia symptoms.

Methods: A chart review of the senior author’s database of botulinum toxin injections was performed. Patients diagnosed with adductor spasmodic dysphonia that received Onabotulinum Toxin A (BoNTA) injections to the thyroarytenoid muscle for at least 5 years were included for study. Patients that received alternate formulations of botulinum toxin (myobloc, dysport, or xeomin) and patients with alternate diagnoses, such as abductor spasmodic dysphonia, tremor and oromandibular dystonia, were excluded. Average BoNTA dose was calculated for each patient and statistical analysis was performed comparing the male and female groups.

Results: A total of 201 patients (52 males and 149 females) met inclusion criteria. The average follow-up times for the male and female groups were 10.2 ± 3.6 and 11.1 ± 4 years, respectively. The average BoNTA doses for the male and female groups were 0.6 ± 0.42 and 1.3 ± 1.1, respectively. Statistical analysis was performed using a two-tailed t-test yielding a p-value of 0.000007.

Conclusions: The data from this retrospective chart review reveal a statistically significant correlation between female gender and higher average BoNTA dose for symptom control in adductor spasmodic dysphonia. Explanations for this observation are speculative and include a possible inverse relationship between optimal BoNTA dose and vocal fold mass and possibly greater neutralizing antibody formation among female patients.

Histologic Evaluation of Micronized Alloderm after Injection Laryngoplasty

Michael Oldenburg, MD; Steve Voss, BS; Joaquin Garcia, MD; Tiffany Chen, BS; Jeff Janus, MD; Dale Ekbom, MD

Introduction: Micronized alloderm is a commonly used injectable material for vocal fold augmentation. However, the histologic response to injection, as well as the rate of resorption, has not been elucidated. This study aims to evaluate the histologic response as well as the rate of resorption after injection augmentation laryngoplasty in an animal model.

Methods: A left vocal cord paralysis was induced in five New Zealand White Rabbits by sectioning of the left recurrent laryngeal nerve. Two week after sectioning injection augmentation was performed with 100 µL of micronized alloderm. Two animals were sacrificed 4 weeks after injection and 3 animals were sacrificed 12 weeks after injection. Histologic sections were taken in an axial plane and stained with hematoxylin and eosin. All slides were evaluated by a single pathologist.

Results: In all five cases, histological analysis revealed an extensive lymphocytic inflammatory response infiltrating the peripheral margins of injection. After 4 weeks the injected areas of maximum dimension were 54 and 40 mm (average 47 mm). At 12 weeks, the maximum areas of injection were 0, 8, and 15 mm (average 7.6 mm) representing a resorption of 84% of the material between 4 and 12 weeks.

Conclusion: Injection laryngoplasty using micronized alloderm induces a robust inflammatory response characterized by a lymphocytic infiltrate and granuloma formation. In addition, the majority of the injected material appears to be resorbed in the first 12 weeks. This information provides important insight into the mechanism of injection augmentation laryngoplasty in humans.
Histology of the Normal Murine Trachea: An Atlas of the MUS Musculus Trachea for the Development of a Model for Tracheal Tissue Engineering Research

Christopher M. Johnson, MD; Rachel Latremouille, MD; DeHuang Guo, PHD; Leslie Peard, BS; Roni J. Bollag, MD, PhD; Marsha Reuther, MD; Paul M. Weinberger, MD

Introduction: Tissue-engineered tracheal transplantation holds great promise as a treatment option for long-segment tracheal stenosis, however it is apparent that further research is necessary to evaluate the functional correlates of the procedure. Murine models hold great promise in this regard as both a practical and cost-effective option, however there is scant literature describing normal murine tracheal anatomy.

Methods: Freshly excised C57/BL-6 murine tracheas were formalin fixed and embedded in paraffin. Standard Hematoxylin and Eosin (H&E) and Masson’s Trichrome-stained sections were examined under light microscopy and imaged.

Results: An academic veterinarian and a human pathologist examined the specimens and a histological atlas was created to provide detailed descriptions of the characteristics of native murine trachea. In addition, this atlas also describes commonly encountered histological artifacts that may have otherwise been viewed as abnormal if observed under experimental conditions.

Conclusion: It is the hope of the authors that by providing this normative data, we will foster an interest in this animal as a dependable model for tracheal stenosis research, and provide a baseline standard to evaluate histomorphological deviation in tissue engineering experimentation.

How to Avoid Over Injection of Calcium Hydroxylapatite – Benefits of Double Bent Needle by Thyrohyoid Approach

Masaki Nomoto, MD, PhD; Ryoji Tokashiki, MD, PhD

Introduction: Calcium hydroxylapatite(CaHA) is widely used for unilateral vocal fold paralysis(UVFP), because it is long lasting and hard material for injection laryngoplasty. However the longevity and hardness become a demerit if it is over injected. Over injection makes the voice worse and prevent mucosal wave. We usually perform CaHA injection using a 60mm 23G double bent needle(DBN). There is no over injection, because we perform this method under surface anesthesia during phonation. In this study, we evaluated the efficacy and the complication.

Methods: DBN was inserted by thyro-hyoid approach. The tip can be moved back and forth and around, so the needle can be inserted into a wide range in the vocal fold. Seven patients were available for evaluation. MPT, MFR and VHI10 were collected from pre-operation to 20 months later.

Results: MPT and VHI10 improved at 1 month in all cases. These values lasted for 20 months. MFR improved at 1 month in 6 of 7 cases. This value lasted for 20 months. There were no case in which voice change worsened due to over injection. All injections were completed.

Conclusions: Our injection method was easy to perform and complete at a high rate. Because it is possible to insert needles into a wide range in the vocal fold, it seemed to be very effective in treating UVFP. DBN method is reduces the risk of voice worsening, because it is performed during phonation.
POSTERS

Human Adipose Tissue Derived Extracellular Matrix and Methylcellulose Hydrogels for Stable Vocal Fold Augmentation

Seong Keun Kwon, MD, PhD

Glottal insufficiency results from various etiologies and can induce voice changes, swallowing difficulties, and aspiration. This condition is usually managed by injection laryngoplasty using various synthetic materials or autologous tissue. An ideal material for injection laryngoplasty should be easily injectable in an outpatient setting. It should medialize the vocal fold permanently, be highly biocompatible and not induce an inflammatory response. However, none of the currently used synthetic materials possess all of these characteristics. Autologous fat injection requires a liposuction procedure that needs to be performed under general anesthesia in an operating room. Another concern with fat injection is the possibility of unpredictable early resorption. Recently, human adipose tissue derived extracellular matrix (ECM) solid grafts have shown to have greater biostability than autologous fat. Here, we present a new injectable hydrogel that was made from ECM. ECM was isolated from human adipose tissue and was subsequently solubilized. Injectable ECM hydrogels were prepared by blending of ECM and methylcellulose (MC), which exhibited thermosensitive sol-to-gel transition. ECM/MC hydrogel was injected at the twenty paralyzed vocal folds of rabbit, and followed for 8 weeks. Endoscopic evaluation showed sustained vocal fold augmentation by ECM/MC hydrogel in paralyzed vocal fold. High speed imaging showed symmetric and regular vocal fold vibration. Increased collagen fibers and fatty granules was identified without significant inflammation. Volume of injected hydrogel remained stable for 8 weeks. Overall, these results indicate that the ECM/MC hydrogel can augment paralyzed vocal folds stably and has potential as a promising material for injection laryngoplasty.

Improved Laryngeal Function Outcomes in Palliative Head & Neck and Thoracic Cancer Patients following Injection Laryngoplasty

Steven A. Zuniga Jr., MD; Chetan Safi, BS; Barbara Ebersole, MA, CCC-SLP; Kathleen Moran, MS, CCC-SLP; Liane McCarroll, MS, CCC-SLP; Nausheen Jamal, MD

Objective: Many oncologic palliative care patients experience vocal fold motion impairment (VFMI) as a result of disease progression or treatment. While VFMI detracts from quality of life due to vocal restriction and aspiration in all such patients, those with reduced pulmonary reserve are at risk for greater morbidity. Outcomes related to voice and swallowing were analyzed in this population before and after injection laryngoplasty (IL) to treat VFMI.

Methods: Retrospective review of palliative head & neck and thoracic cancer patients over a one-year period at a tertiary care medical center presenting with VFMI with hoarseness and aspiration that were unable to tolerate a normal diet. Palliative patients who underwent IL for VFMI were included. Subjective and objective measures were recorded before and after IL, including perceptual assessment of voice and swallowing, Eating Assessment Tool-10 scores (EAT-10), and fiberoptic endoscopic evaluation of swallowing (FEES).

Results: 5 palliative patients were identified with hoarseness and gross aspiration requiring modified nutritional intake that had undergone IL. EAT-10 improved significantly pre-injection to post-injection. 4 of 5 patients were advanced to a normal diet. Perceptual voice assessment by an experienced speech pathologist showed improvement in vocal quality.

Conclusion: IL is a safe and effective means of improving voice and swallowing outcomes and limiting aspiration-related morbidity in palliative cancer patients. Given that this patient population commonly has reduced pulmonary reserve, the reduction of aspiration-related events is critical. Improvement in vocal quality and diet normalcy are also important quality of life issues in end-of-life care.
POSTERS

Inflammatory Reaction to Hyaluronic Acid: A Newly Described Complication in Vocal Fold Augmentation

Laura Dominguez, MD; Kathleen Tibbetts, MD; C. Blake Simpson, MD

Introduction: The use of hyaluronic acid (HA) in vocal fold injection has increased in recent years due to its safety and favorable biomechanical profile. While adverse reactions to this biomaterial are rare, transient inflammatory reactions to HA when used as a facial filler have been reported in the dermatology literature. The purpose of this review was to identify the rate of inflammatory reaction to HA when used in vocal fold augmentation.

Methods: A retrospective review was performed of patients who underwent vocal fold augmentation with HA in the past 5 years. Those with post-injection inflammatory reactions were identified.

Results: A total of 147 patients were injected with HA with 50.2% performed under local anesthesia. Six patients had a post-operative inflammatory reaction for an overall adverse reaction rate of 4%. Four of these injections were performed under local anesthesia. Of those who had an inflammatory reaction, the most common post-procedure complaints were sore throat, dysphonia, and shortness of breath. Videostroboscopy revealed vocal fold erythema, edema, and loss of pliability. Five patients were treated with steroids. One patient was lost to follow-up but all others recovered completely with recovery time ranging from 3 weeks to 5 months.

Conclusion: Reactions to HA are rare but can result in a worsening dysphonia and decreased vocal fold pliability that may take months to improve. The reaction may be related to small amounts of protein linked to HA. This complication should be recognized early and treated with steroids to increase likelihood of recovery.

In-Office Calcium Hydroxylapatite Injection/Augmentation of the Oropharynx for Adult Velopharyngeal Insufficiency: An Initial Report

Amit Patel, MD; Michael Z. Lerner, MD; Andrew Blitzer, MD, DDS

Introduction: Velopharyngeal insufficiency (VPI) results from inadequate closure of the nasopharynx from the oropharynx during tasks such as speech and swallowing. It is most commonly encountered in the pediatric population as a result of congenital defects such as cleft palate. Mild to moderate VPI in pediatric patients has been treated with calcium hydroxylapatite (CaHA) injections into the posterior pharyngeal wall under general anesthesia. VPI in adults is less common and can result from a number of different causes. We report for the first time in the literature two cases of VPI in the adult population treated successfully with oropharyngeal augmentation with CaHA in the office setting.

Methods: Case review and report, description of technique.

Results: The first is a 68 year-old male with a 15 year history of VPI, eventually diagnosed with negative dystonia of the palate. The second patient is a 71 year-old male with a history of tonsillar carcinoma treated with chemotherapy and radiation who developed VPI six years after completion of treatment. Both patients were successfully treated with in-office CaHA injection/augmentation of the posterior and lateral pharyngeal walls and soft palate. Important considerations were building a “pillar” of CaHA along the pharyngeal wall to resist migration of the material, multiple injection sites vs. single injection sites, and conservative injection of the soft palate to prevent it from being weighed down and worsening VPI.

Conclusion: Calcium Hydroxylapatite injection/augmentation in the office setting of the oropharynx for VPI is a safe, effective procedure in the properly selected patient.
Langerhans Cell Histiocytosis of the Cerebellum: An Unusual Cause of Laryngeal Dysmotility in an Adult

Amit Patel, MD; Michael Z. Lerner, MD; Andrew Blitzer, MD, DDS

Introduction: Langerhans Cell Histiocytosis (LCH) is an idiopathic, poorly understood disease, involving proliferation of dendritic cells. It is typically seen in children and can range in severity from unifocal disease, also known as eosinophilic granuloma, to multifocal disseminated disease, also known as Letterer-Siwe Disease. We present an unusual case of Langerhans Cell Histiocytosis of the Cerebellum causing laryngeal dysmotility in an adult.

Methods: Case Report and literature review

Results: A 64 year-old male presented with dysarthria, dysphagia, gait instability, and lymphadenopathy. Examination revealed myoclonic jerks of the soft palate and pharynx, uncoordinated movement of the vocal folds, and severe supraglottic hyperfunction with sphincter-like closure of the supraglottis on voicing. Work-up revealed lesions of the cerebellum and jaw, and biopsy ultimately proved the diagnosis of LCH. The patient has undergone multiple rounds of chemotherapy, radiation treatment, and bone marrow transplant. The supraglottic hyperfunction has been variably treated with botulinum toxin injection. Literature review revealed one other case of cerebral LCH presenting with dysarthria in an adult. Cerebellar control of the larynx is poorly understood and remains an area that requires further research.

Conclusions: We present a rare case of LCH presenting with primarily dysarthria and laryngeal dysmotility. Many diseases that cause neurodegeneration can present with dysarthria. LCH should be counted among these, however, this case report serves to highlight the need for further study of the neural mechanisms of control of the larynx.

Laryngeal Cysts: Simplifying Classification and Management

Richard Heyes, MBChB; David G. Lott, MD

Introduction: Laryngeal cysts represent a diverse collection of swellings in the laryngeal region and account for 5% of benign laryngeal lesions. Laryngeal cysts can affect all ages with presenting symptoms determined by the site and type of cyst, and the age of the patient. In infants, cysts can present as a cause of airway obstruction and failure to thrive, while in adults they typically cause dysphonia and throat discomfort. We aim to provide clarity on how to classify laryngeal cysts and review contemporary treatment philosophies.

Methods: A database search of PubMed, Embase and Cochrane Library with MeSH terms ‘laryngeal; larynx’ and ‘cyst; ductal; saccular; valeculla; oncocystic; classification’ was undertaken to identify publications of interest.

Results: Over the last fifty years multiple classification systems for laryngeal cysts have been proposed with variation based on site, mucosal depth, pathophysiology, and histologic appearance. No classification system to date adequately describes both adult and infant cysts, and oncocytic cyst are poorly represented. We attempt to unify these classification systems with a view to an improved relevance to management. There is wide variation in treatment approaches to laryngeal cysts with conservative management, aspiration, marsupialization, complete endoscopic excision, laser excision, and external excision all practised.

Discussion: Current classification systems are of little aid in determining individual treatment approaches to laryngeal cysts and this may account for the lack of uniformity in their management. We believe improved otolaryngologists knowledge on the subtypes of laryngeal cysts and the evidence relating to their management will benefit patients.
POSTERS

Laryngeal T Regulatory Cells in the Setting of Smoking and Reflux

Marie Jetté, PhD; Christine Seroogy, MD; Susan Thibeault, PhD, CCC-SLP

Introduction: Chronic laryngitis, characterized by inflammation of laryngeal tissue, is the most commonly diagnosed organic voice disorder, yet treatments targeting suspected etiologic factors (e.g., reflux) have demonstrated limited efficacy. A major barrier to development of improved medical therapies for chronic laryngitis is a fundamental gap in knowledge about the pathophysiology of laryngeal inflammation. The first line of mucosal immune defense is the barrier, including epithelium, local microbiota, and resident immune cells. T regulatory cells (Tregs) are a specialized subset of CD4+ T cells that suppress or dampen immune responses to prevent damaging immunopathology. As Tregs have been shown to preferentially accumulate at sites of infection and Treg responses may contribute to persistence of infection by impairing antibacterial immunity, we sought to quantify these cells in laryngeal tissue exposed to smoking and reflux.

Methods: Using an epigenetic assay, we quantified T cells and Tregs in disease-free laryngeal biopsies representing four inflammatory states: (1) tobacco-exposed tissue; (2) refluxate and tobacco-exposed tissue; (3) refluxate-exposed tissue; and (4) normal, unexposed tissue.

Results: While there was epigenetic evidence of Tregs in all tissues, we found no differences in Tregs or Treg/Tcell ratios relative to smoking and reflux in laryngeal tissue collected from 42 non-treatment-seeking participants. There was a decrease in T cells in smokers regardless of reflux status.

Conclusions: Our findings indicate that laryngeal inflammation is not directly mediated by loss of Tregs in response to smoking and reflux in local tissue. It remains possible that Treg dysfunction may contribute the pathophysiology of laryngeal inflammation.
POSTERS

Laryngoscopic/Stroboscopic Diagnosis of Vocal Fold Paresis

Christine Estes, MM, MA-CCC-SLP; Lucian Sulica, MD;
Elisabeth Mauer, MS; Paul Christos, Dr.P.H., MS

Introduction: Vocal fold paresis remains a diagnostic challenge despite increasing appreciation of its clinical importance. This study is undertaken to assess consistency of laryngoscopic and stroboscopic assessment in a cohort of fellowship-trained laryngologists.

Methods: Thirty-four stroboscopic examinations (32 unique, 2 repeat; half with history, half without) were reviewed by 31 fellowship-trained laryngologists for presence/absence of paresis, laterality, and pattern of nerve involvement. Evaluators reported degree of confidence in diagnosis and top 3 examination findings supporting their decisions. Interrater and intrarater reliability were assessed with respect to each aspect of diagnosis. Frequency and importance of laryngoscopic/stroboscopic characteristics were assessed for exams with high intrarater consensus for paresis.

Results: High intrarater reliability was achieved (Cohen’s kappa 0.804). Twenty-three examinations (72%; 12 paresis:11 no paresis) generated greater than 70% interrater agreement (Fleiss’ kappa 0.457, moderate agreement). There was less agreement regarding laterality (6R:6L; Krippendorf’s alpha 0.152, slight agreement) and nerve distribution (Krippendorf’s alpha 0.050, slight agreement). The availability of history appeared to decrease interrater agreement adversely (Fleiss’ kappa 0.337 vs 0.570, p<0.001). Laryngoscopic characteristics ranked highest in importance for paresis diagnosis were decreased VF abduction (12.4%), slow/sluggish VF motion (11.5%), glottic insufficiency (11.3%), decreased tone of the VFs (10.4%), and decreased VF adduction (9.7%).

Conclusions: There is moderately high interrater agreement among subspecialty-trained clinicians regarding the presence of paresis, but substantially less regarding laterality and nerve distribution. Of note, gross motion abnormalities rather than stroboscopic findings are most compelling in diagnosis.

Long-Term Consequences of Vocal Fold Hemorrhage

Lewis Kerwin, MS3; Christine Estes, MM, MA-CCC-SLP; Lucian Sulica, MD

Introduction: The long-term morbidity of vocal fold hemorrhage (VFH) is widely considered a threat to voice by both patients and physicians, largely in the absence of evidence in favor or against. This study aims to assess long-term outcomes of VFH.

Methods: Clinical records of patients with VFH seen between September 2006 and May 2014 were reviewed for demographic and occupational information, recurrence of VFH, and treatment. Follow-up telephone surveys were conducted to evaluate long-term outcomes using the VHI-10, Singing Voice Handicap Index-10 (SVHI-10) when applicable, and a condition-specific questionnaire to assess long-term effects of VFH on occupation and vocal function.

Results: 41 patients (19 M:22 F; mean age 39.8; age range: 21-79; 32 performers) with mean post-VFH followup of 55 months (range:15–108 months) completed the questionnaire. Thirty-eight (94%) patients remain in the same profession. Thirty-five (85.4%) had VHI-10 scores within normal limits (< 11. The number of VFH events (1-3) was not significant (p=0.971), nor was surgical intervention vs no surgical intervention (p=0.869). Responses on the condition-specific questionnaire showed agreement/high agreement with statements related to positive vocal function characteristics and disagreement/strong disagreement with statements related to negative vocal function characteristics with uniformly better ratings from patients who experienced 3 hemorrhages, as compared to 1 or 2.

Conclusion: VFH appears to have few long-term consequences related to vocal function or occupation, regardless of number of occurrences. Paradoxically, repeated VFH appears to improve patient perception of vocal health, possibly by increasing awareness.
POSTERS

Long-Term Follow-Up of Amitriptyline Treatment for Idiopathic Cough

Marisa Ryan, MD; Seth M. Cohen, MD, MPH

Introduction: Neuromodulators are effective in treating chronic cough. Long-term results of using amitriptyline or nortriptyline for chronic cough have not been published. Our objective was to evaluate treatment outcomes of these medications including long-term results.

Methods: We evaluated a cohort of adults treated for cough at the Duke Voice Care Center with amitriptyline or nortriptyline over a one-year period with a survey and retrospective chart review. We characterized demographics, symptoms, treatment variability and treatment effects. We calculated logistic regression of cough improvement by demographics, symptoms of throat irritation, cough duration, concurrent speech therapy and dosage.

Results: 89% were taking the medication at the first clinical follow-up at a mean 2.5 months and overall 67% reported ≥50% improvement. 36% of patients were taking the medication 2 to 3 years later at the time of the survey and overall 54% reported a ≥50% improvement. No statistically significant predictors of cough improvement with medication were identified. During the interval 2 to 3 years, 66% of patients titrated the medication to effect and 33% restarted the medication. Occurrence of side effects was the most frequent reason for stopping the medication.

Conclusion: Amitriptyline or nortriptyline can be an effective and well-tolerated part of long-term management of chronic cough in adults. Titrating the dose and restarting the medication are often necessary. Larger studies and randomized control trials are needed to better understand the outcomes of using neuromodulators to treat chronic cough.

Long-Term Outcomes in Unilateral Vocal Fold Paralysis Patients

Conor W. McLaughlin, MD; Brad Swendseid, MD; Mark S. Courey, MD; Sarah Schneider, MS-CCC-SLP; Jackie L. Gartner-Schmidt, PhD; Katherine Yung, MD

Introduction: At presentation, unilateral vocal fold paralysis (UVFP) patients have different treatment options, including conservative management (CM), temporary injection laryngoplasty (IL), or permanent medialization (PM). This study aims to evaluate long-term outcomes for UVFP patients relative to intervention.

Methods: A retrospective chart review was performed of UVFP patients who presented to the UCSF Voice and Swallowing Center over a 10-year period. All patients had follow up of at least 12 months after symptom onset and at least 6 months after IL (mean follow up=23.7 months). Videolaryngostroboscopy examinations were reviewed. Maximum glottic closure was quantified with the image processing software ImageJ to determine the normalized glottic gap area (NGGA). Perceptual voice analysis was performed using CAPE-V at corresponding time points.

Results: 57 patients met inclusion criteria. 7 patients underwent CM, 20 patients underwent IL, 10 patients underwent IL followed by PM, and 20 patients underwent PM. NGGA at presentation was similar amongst groups (p=0.23) with CM patients having a trend towards smaller NGGA. Regardless of intervention, no statistically significant difference in NGGA was observed at last clinic follow-up (p=0.51). Although change in NGGA from preoperative visit to last follow-up appeared to be generally greater for patients who underwent PM, this change was not noted to be statistically significant (p=0.21). CAPE-V data is pending.

Conclusion: At presentation, UVFP patients have similar NGGA. Therefore, treatment recommendations cannot be made on the size of the glottic gap alone. Furthermore, in many patients, temporary IL results in long-term benefit with a glottic closure equivalent to that obtained with PM.
**POSTERS**

**Medialization Laryngoplasty following Injection Augmentation**

Valeria Silva Merea, MD; Solomon Husain, BS; Lucian Sulica, MD

Objective: To assess the role of vocal fold injection augmentation (IA) on outcome of subsequent medialization laryngoplasty (ML).

Methods: The study is a retrospective cohort study with follow-up telephone survey. Clinical records of patients with unilateral vocal fold paralysis or paresis (VFP) who underwent ML between April 2006 and March 2015 were reviewed. Patients who underwent IA prior to ML were compared to those who did not with respect to demographic information, symptoms, Voice Handicap Index-10 (VHI-10), etiology of VFP and revision rate. Among patients undergoing IA, the effect of injection material and interval from IA to ML on revision rate were assessed. Follow-up telephone surveys were conducted to evaluate long-term outcomes using VHI-10 and a condition-specific questionnaire.

Results: One-hundred thirty-five patients (70M:65F) with vocal fold paralysis (125) or paresis (10) underwent ML (96L:39R). Fourteen patients (10.4%) required revision. Fifty-six (41.5%) patients had prior IA; five (8.9%) underwent revision. Seventy-nine (58.5%) did not undergo IA; nine (11.4%) required revision. This difference was not statistically significant (p=0.78). Augmentation material did not affect revision rate (p=1.00). Patients whose ML was within 5 months of their last IA showed a trend towards increased rate of revision (p=0.11). No difference in follow-up VHI-10 score was found between patients who had IA prior to ML and those who had not (p=0.54).

Conclusion: IA does not appear to affect revision rate or long-term outcome of subsequent laryngeal framework surgery. ML performed within 5 months of last IA may have a higher rate of revision.

**Modified Type II Thyroplasty’s Effects on Laryngeal Function in Ex Vivo Canine Model**

William Calawerts, BS; Graham Johnson, BS; Erin Devine, BS; Rui Fang, MD; Jack Jiang, MD, PhD

Objective: To explore the effects of a modified type II thyroplasty on phonation behavior using excised canine larynges as a model for human larynges.

Study Design and Methods: A modified type II thyroplasty was performed on nine excised canine larynges. Each larynx was phonated in a specially designed booth while recording acoustic, aerodynamic, and high-speed video data. The modified type II thyroplasty created a mirrored pair of thyroid cartilage windows at the level of the vocal folds. By abducting the surgically created thyroid windows to varying levels, we were able to incrementally relieve compression of the vocal folds. Mucosal wave kymographs were generated from high-speed videos to obtain amplitude of vocal fold oscillation, fundamental frequency, and vocal fold lip phase differences. The audio recordings of phonation were post processed to obtain percent jitter, percent shimmer, signal to noise ratio and correlation dimension.

Results: The phonation threshold pressure significantly decreased with increasing percent angle abduction of the thyroid windows (P<0.0001). There was no significant relationship between all of the other acoustic or mucosal wave parameters (expect left intra-fold phase shift and increased abduction of the surgically created thyroid windows, indicating that larynx function was preserved.

Conclusion: The modified type II thyroplasty presented here is a possible alternative to traditional type II thyroplasty and has been show to decrease phonation threshold pressure while maintaining function of the larynx.
Muscle Tension Dysphagia: A New Clinical Taxonomy with Implications for Management

David Lott, MD; Christina Kang, MM, CCC-SLP

Purpose: To determine the etiology underlying many “functional” dysphagia patients and to develop a management strategy.

Methods: IRB approved 28-month chart review of 67 patients with reported dysphagia who exhibited normal oropharyngeal and esophageal swallowing function as evidenced by videofluoroscopic swallow study. Early data from a follow-up prospective study will be presented.

Results: Laryngeal muscle tension was present during transnasal laryngoscopy in 97% of patients. Eighty-two percent of patients had concurrent symptoms corresponding to subcategorical disorders of laryngeal hyperresponsiveness such as paradoxical vocal fold motion, globus pharyngeus, and muscle tension dysphonia. Laryngopharyngeal reflux was evident in 52% of patients. All patients (100%) who underwent voice therapy directed toward unloading muscle tension had resolution of dysphagia symptoms. An update on a follow-up prospective study evaluating therapy will be presented.

Conclusion: We propose muscle tension dysphagia as a new clinical category of dysphagia. It is a primary laryngeal muscle tension disorder manifested as dysphagia rather than a voice or breathing disorder. Similar to muscle tension dysphonia, muscle tension dysphagia can either be primary or secondary. Most secondary cases correspond to laryngeal hyperresponsiveness. The underlying laryngeal muscle tension found in 97% of patients and the 100% symptom response to unloading therapy suggests the need to change the management of this patient population to targeting muscle tension rather than traditional swallow therapy.

Muscle Tension Dysphagia: Symptoms, Diagnostic Findings, and Treatment

Jeanne L. Hatcher, MD; Michael M. Johns III, MD; Nancy McColloch, CCC-SLP

Introduction: Functional dysphagia is a nonspecific diagnosis encompassing all non-organic causes of dysphagia. The purpose of this study is to describe muscle tension dysphagia as a distinct entity, and discuss symptoms, findings on examination, diagnostic testing, and therapy.

Methods: This is a retrospective case series; sixty-seven consecutive patients undergoing modified barium swallow studies (MBSS) with penetration-aspiration scores of zero were identified. Patients with isolated complaints of dysphagia alone were included for analysis.

Results: 13 of 67 patients (19.4%) complained of isolated dysphagia with a penetration-aspiration score of zero on MBSS. Two were excluded due to inadequate records; none had history of reflux. All 11 had normal head and neck examinations and normal laryngeal endoscopies with the exception of increased perilaryngeal, suprathyroid, and tongue base tension. Ten of 11 had normal MBSS. One revealed stasis in the pyriform sinuses, which cleared with liquid wash or second swallow. Six have had complete resolution of symptoms after reassurance and one dysphagia therapy session. Four are currently in therapy, showing improvement. One was lost to follow-up.

Conclusions: Muscle tension dysphagia may be a unique clinical entity. Patients with muscle tension dysphagia present with dysphagia in the absence of any significant laryngopharyngeal pathology other than excessive muscle tension in the perilaryngeal, suprathyroid, and/or tongue base. Many respond to dysphagia therapy. Prospective investigation is warranted in this process to better define its clinical characteristics and correlation with other laryngological disorders including muscle tension dysphonia, dyspnea, and laryngeal spasm.
POSTERS

Optimal Bovine Collagen Concentration to Achieve Tracheal Epithelial Coverage of Collagen Sponges

Ryo Suzuki, MD; Ryosuke Nakamura, PhD; Yuta Nakaegawa, MD; Yukio Nomoto, MD, PhD; Ichiro Fujimoto, PhD; Akihiro Hazama, MD, PhD; Koichi Omori, MD, PhD

Objectives: Artificial tracheas prepared using collagen sponge and polypropylene mesh have been implanted in patients who received tracheal resections, but epithelialization in the reconstructed area was slow. We determined the optimal bovine atelocollagen concentration necessary for rapid and complete tracheal epithelial coverage of collagen sponge implants.

Study Design: Preliminary animal experiment.

Methods: Collagen sponges were made using lyophilizing 0.5%, 0.7%, and 1.0% atelocollagen solutions and analyzed using scanning electron microscopy. Partial tracheal defects were prepared in rabbits and reconstructed using sponges. Epithelial regeneration in the reconstructed area was evaluated by endoscopic, histological, and scanning electron microscope analyses.

Results: All sponges had a membranous structural framework, and numerous fibrous structures filled the spaces within the framework in the 0.5% sponges. The membranous structure in the 0.7% sponges branched at many points, and inter-membrane spaces were frequently observed. Conversely, the membranous structure in the 1.0% sponges was relatively continuous, thick, and closely arranged. Two weeks after implantation, the tracheal defects were entirely covered with epithelium in 2/4 and 3/4 of the 0.5% and 0.7% sponge-implanted rabbits, respectively. The collagen sponges remained exposed to the tracheal lumen in 4/4 rabbit sponges and 0.7% sponge group. Ciliogenesis in the center of the epithelialized region was detected only in the 0.7% sponge group.

Conclusion: Collagen sponges prepared from various concentrations of bovine atelocollagen had different structures. Complete epithelial coverage was achieved in more rabbits implanted with sponges prepared using a 0.7% bovine atelocollagen solution than with those from 0.5% and 1.0% solution.

Outpatient Surgery for Vocal Fold Cysts Using a Double-Bend Needle

Yusuke Shoji, MD; Masahumi Toyomura, MD; Masaki Nomoto, MD; Ryoji Tokashiki, MD

Introduction: The recommended treatment for vocal fold cysts is complete enucleation using laryngomicrosurgery. However, the surgical wound may result in scarring and protracted sclerosis of the vocal fold mucosa (Sataroff 1995). Opening the lateral part of the cyst widely is thought to cause less damage to the vocal fold mucosa. We investigated the short-term voice improvement and long-term cyst recurrence rates of vocal fold cysts treated under topical anesthesia with the ‘wide-opening’ method using a double-bend needle.

Method: The study reviewed 46 patients (28 men, 20 women; mean age 51.4±14.4 (range 20–81) years; follow-up period, 1–36 months) who underwent wide-opening surgery for vocal fold cysts using a 23G double-bend needle under topical anesthesia. To evaluate short-term voice improvement and long-term cyst recurrence rates of vocal fold cysts treated under topical anesthesia with the ‘wide-opening’ method using a double-bend needle.

Result: Of the 46 patients, 44 had retention cysts and two had epidermoid cysts. Every parameter improved significantly (p<0.01) between the two assessments. There was no postoperative worsening of the VHI or recurrence seen at the follow-up endoscopy.

Conclusion: Outpatient surgery for vocal fold cysts under topical anesthesia is simple and effective, with a high completion rate. The invasion of the vocal folds is minimal. It results in short-term voice improvement and has a very low recurrence rate.
POSTERS

Ovine Model for Teaching External Laryngotracheal Surgery

Ahmed M.S. Soliman, MD; David Ianacone, BS; Glenn C. Isaacson, MD

Objective: To develop an animal model for teaching open laryngotracheal surgical procedures

Methods: The head and neck from 5 pre-pubescent sheep was harvested after humane anesthesia. After 5 days to allow for rigor mortis to resolve, the specimens were supported with sandbags on an operating table. Tracheotomy, laryngofissure, anterior cartilage grafting, tracheal resection with primary anastomosis and laryngectomy with closure of the pharynx were performed readily.

Results: All procedures were readily performed. In addition, postsurgical endoscopy was also performed.

Conclusions: The sheep head and neck provides an inexpensive, realistic, and safe model for surgical training in a variety of open laryngotracheal procedures. This is particularly relevant given the recent emphasis on surgical simulation and the relative rarity of some of these procedures.

Perception of Pain and Discomfort during Office-Based Laryngology Procedures

Brianna Crawley, MD; Elizabeth Renk, MD; Jeffrey Hata, MD; Sabrina Marquez, MA; Pryia Krishna, MD, MA; Thomas Murry, PhD

Introduction: Laryngologic office procedures are gaining importance in the treatment of voice and swallowing disorders. Patient tolerance limits the procedures that can be performed without the benefit of monitored anesthesia care. Few studies in the surgical literature have examined patient perception and predictors of pain using validated questionnaires. No existing publications have addressed perception of pain during outpatient otolaryngologic procedures.

Methods: With IRB approval, patients scheduled for in-office vocal fold injection augmentation were prospectively enrolled at the Voice and Swallowing Center between 9/2014-9/2015. A validated pain questionnaire was administered before, during, and after the procedure and on post-procedure days 1, 3, and 7. Pre and post-procedure vital signs were recorded and heart rate (HR) was continuously monitored. Phone questionnaires were completed on post-procedure days 1 and 3.

Results: 27 patients consented to participate in our study (15F, 12M; age 34-96). HR increased significantly during the procedure. Most patients experienced moderate pain of sharp or stabbing character, though more than half also acknowledged “tiredness/exhaustion” and fear. Males reported greater increase in pain during the procedure than females. Of 15 who completed follow-up questionnaires, the majority described at least mild pain 3 days following the procedure. 2 patients reported bruising on their neck. Most patients did not treat their post-procedure pain with medications.

Conclusions: This is the first study examining patient perception of pain during an outpatient laryngology procedure using validated questionnaires and extended follow-up. The results may offer guidance for patient counseling, preparation, and treatment to improve tolerance and success.
PHARYNGEAL DYSFUNCTION AND INJURY AFTER ANTERIOR CERVICAL DISECTOMY AND FUSION (ACDF): WORKUP, MANAGEMENT AND OUTCOMES

Keith A. Chadwick, MD; Joshua S. Schindler, MD

Introduction: Dysphagia is a common complaint after anterior cervical discectomy and fusion (ACDF). The incidence of pharyngeal injury among these patients is low but represents a significant complication requiring intervention. The primary objective was to evaluate presenting symptoms, workup and management of pharyngeal injury after ACDF.

Methods: Institutional review board approval was obtained. The study is a retrospective consecutive case series in an academic institution. Inclusion criteria included patients with esophageal injury after ACDF that presented to our institution between January 2006 to October 2015 (n=22). Outcomes reviewed included time to presentation, presenting symptoms, method of repair and oral intake status.

Results: Presenting symptoms included dysphagia, hoarseness, neck pain, abscess, aspiration pneumonia and stridor. Six patients presented within a week, five within 1 year and eleven over 1 year after ACDF. Management was variable except for removal of the fusion plate, which occurred in 21/22 patients. 18 patients underwent esophageal repair with reinforcing tissue (regional or free flap reconstruction). Post-operatively, 4 patients required revision for esophageal diverticula. 16/22 patients were able to resume oral intake.

Conclusions: In patients with a history of ACDF and persistent dysphagia, clinicians should maintain a high index of suspicion for morbid complications such as esophageal perforation. These patients may need to undergo MBS, CT scan and endoscopy for complete evaluation. In cases of esophageal perforation, the fusion plate must be removed prior to or in conjunction with repair. Our study and literature review indicate that the majority of patients will eventually resume oral intake.

POOR VOICE OUTCOME AFTER SUPERFICIAL PLACEMENT OF A HYALURONIC ACID INJECTABLE DURING VOCAL FOLD AUGMENTATION

Sonya Marcus, MD; Milan R. Amin, MD

Introduction: Vocal fold augmentation with hyaluronic acid (HA) is a therapeutic option in the treatment of glottic insufficiency. Studies also suggest that HA may be efficacious for superficial vocal fold injection in the treatment of scar and lamina propria defects. However, we present a case which resulted in a poor voice outcome after superficial placement of an HA injectable.

Methods: Case report and review of the literature. We report the case of a 71 year old female with a history of bilateral vocal fold bowing who underwent bilateral injection augmentation with HA at an outside institution. Following the injection she experienced a worsening of her hoarseness. On endoscopic exam with stroboscopy in clinic a right vocal cord polypoid lesion was noted related to superficial injection of HA. The patient elected for revision surgery.

Results: The patient was taken to the operating room. Intraoperatively, the right vocal fold was noted to have polypoid change along the entire length similar to a Reinke’s edema type change. The polypoid material was removed via microflap excision. The patient tolerated the procedure well and her voice quality improved post-operatively.

Conclusion: Surgeons should be aware of the potential complications of hyaluronic acid injectables. In our patient, superficial injection resulted in a suboptimal outcome. Voice quality improved with microflap excision.
**POSTERS**

**Prognostic Value of Posterior Cricoarytenoid Muscle Atrophy in Unilateral Vocal Fold Paralysis**

Tack-Kyun Kwon, MD, PhD; Dmitriy Kogay, MD; Young Ju Jin, MD; Hyo Sang Kim, MD; Sung Jun Han, MD; Seong Dong Kim, MD

Posterior cricoarytenoid muscle (PCA) is the only abductor intrinsic muscle of the larynx innervated by recurrent laryngeal nerve. Because PCA is located behind the cricoid cartilage separate from other intrinsic laryngeal muscles, it is clearly seen in the CT scan as enhancing soft tissue. The objective of this study is to investigate a prognostic value of PCA atrophy in patients with unilateral vocal fold paralysis (UVFP). Among 1273 vocal fold paralysis patients cohort, we reviewed recent 91 patients who underwent CT scan with laryngeal cut. The degree of PCA atrophy is graded in 4 scale compared to the contralateral healthy side and compared to the laryngeal electromyography (LEMG) and clinical outcome. We were able to identify PCA in 93.5% (86/91) of CT scans and to guess the paralysis side correctly in 89.5% (77/86). There was a significant correlation between PCA muscle atrophy and interference grading of LEMG (p=0.035) and clinical recovery of UVFP (p=0.010). In the patients who showed severe PCA atrophy over 3 months after onset, we can expect poor prognosis of vocal fold recovery (negative predictive value=0.9~1). Although we didn’t consider the synkinetic neural regeneration, we suggest that the degree of PCA can possibly provide a prognostic information with higher negative predictive value.

**Quantification of Rat Supraglottic Laryngeal Sensation Threshold**

Derrick Gale, MD; Neel Bhatt, MD; Randal C. Paniello, MD, PhD

Introduction: Laryngeal adductor response (LAR) to air puff is used as a reliable method in evaluating sensation thresholds (ST) in human laryngeal sensory disorders. This method, typically performed via endoscopy, has been difficult to perform in small subjects such as rodents. The aims of this study were to; (1) evaluate binocular microlaryngoscopy in rats as novel methodology to evaluate laryngeal sensory disorders; (2) determine sensory discrimination thresholds at varying target locations; and (3) describe the ideal depth of anesthesia.

Methods: Rats were induced with 45/4.5-55/5.5 mg/kg of ketamine/xylazine. The level of anesthesia was monitored by spontaneous glottic closure and corneal reflex testing. Serial air puffs were delivered at varied pressures with pulse time kept constant at the epiglottis, arytenoid, and piriform sinus, and STs were determined by direct visualization of the larynx using a binocular microscope. Topical lidocaine was then applied to the larynx and ST determined.

Results: A total of 30 trials were performed in 16 rats. Mean ST was 43.8 +/- 18.9 mmHg at the arytenoid, 52.4 +/- 22.4 mmHg at the epiglottis, and not detectable at the pyriform sinus. Topical lidocaine effectively ablated the LAR in each trial. The LAR was difficult to induce while corneal reflex was absent and difficult to distinguish from spontaneous glottic closures while under lighter sedation.

Conclusion: Air pulse stimulation in rats is a simple, reliable, and effective way to determine laryngopharyngeal sensory thresholds in rats and can be used as an efficient and affordable method for experimentation involving laryngeal sensory disorders.
POSTERS

Repeat Imaging in Idiopathic Vocal Fold Paralysis: Is It Necessary?
Julia Noel, MD; Caroline Jeffrey, MD; Edward Damrose, MD

Introduction: In patients presenting with impairment in vocal fold motion without a clinically apparent cause, imaging plays a critical role in the initial evaluation for extra-laryngeal pathology. However, for those determined to have idiopathic paralysis, there is no consensus regarding the need or timing of follow-up imaging.

Objective: This study seeks to determine the rate of delayed detection of specific etiologies for patients initially diagnosed with idiopathic vocal fold paralysis and determine an optimal time interval for repeating imaging.

Methods: Retrospective chart review was performed at a tertiary referral center of patients carrying a diagnosis of vocal fold movement impairment between 1998 and 2014. Patients were considered idiopathic if laryngoscopy and initial imaging (CT or MRI) excluded an obvious cause. Length of follow-up and the presence of late lesions and their method of detection were noted.

Results: 3,210 patient charts were reviewed. Of patients receiving an initial diagnosis of idiopathic paralysis, the rate of detection of a specific etiology is less than 0.01 per person-years. Lesions detected include skull-base lesions, pulmonary cancers, and occult thyroid malignancy.

Conclusions: Patients with an initial diagnosis of idiopathic vocal fold paralysis rarely have an alternate diagnosis in the long-term. Although repeat imaging can be offered, the yield is low.

Rescue Strategies for Balloon Malfunction during Airway Dilation
E. Brandon Strong; Daniel J. Cates, MD; Derrick R. Randall, MD; Peter C. Belafsky, MD, PhD

Background: Balloon dilation has become a common method to manage airway stenosis. Device failure has resulted in death. An optimal rescue strategy for device malfunction has not been proposed.

Methods: An innovative model of subglottic stenosis was developed. The pressure required to completely rupture a dilator spontaneously with needle decompression through a flexible endoscope was determined. The time and optimal conditions to withdraw a partially decompressed balloon from a standardized 9.5 mm stenosis were assessed.

Results: Complete device rupture allowing immediate removal occurred spontaneously at 12 atm and with puncture at pressures ≥8 atm. Needle puncture at pressures <8 atm caused partial decompression and balloons could not be removed immediately. Balloons at 2 atm required numerous attempts to puncture and required prolonged device removal (F = 23.95, p = 0.0001). Balloons inflated to 6 atm required a median of 8.3 seconds for device removal (range = 0 – 42.6 seconds) in comparison to 66.5 seconds (range 30.2 – 87.5 seconds) at 2 atm. (p = 0.036).

Conclusion: A pressure ≥8 atm is required to consistently cause complete balloon dilator rupture with a 23G needle through a flexible endoscope. A partially decompressed balloon takes 8.3 – 66.5 sec to be removed from a 9.5 mm stenosis, depending on inflation pressure and balloon orientation. Although counterintuitive, increasing inflation pressures of a malfunctioning balloon and placing a patient in a horizontal position may expedite balloon removal. A comprehensive rescue strategy is proposed.
Rheumatoid Nodule with Spontaneous Regression from Immunosuppressant Therapy

Melissa Mortensen, MD; Alisa Timashpolsky, BS

Objective: We report a case of a unilateral rheumatoid nodule found on the vocal fold of a patient with diagnosed Rheumatoid Arthritis that recurred 18 months after surgical resection and regressed with restarting her immunosuppressants.

Methods: This is a case report and review of the literature concerning the occurrence of rheumatoid nodules on the vocal folds in the setting of rheumatoid arthritis.

Results: Laryngeal manifestations of Rheumatoid Arthritis (RA) are broad and can lead to permanent aphony if not treated properly. We describe a case of a rheumatoid nodule that developed on the vocal fold in a female patient with a known history of RA who discontinued treatment with Methotrexate and Etanercept and started high dose corticosteroids. The patient developed near aphony over the course of six months and was found to have a unilateral rheumatoid nodule on her left vocal fold. After surgical resection, her nodule recurred on the same side of the vocal fold but more posteriorly than the first. After restarting Methotrexate and Etanercept, the nodule decreased in size and her symptoms improved.

Conclusion: Previous literature has postulated that rheumatoid nodules occur in locations that are under a greater amount of shearing forces, such as the middle third of the vocal fold during phonation. In the current case, the location of the rheumatoid nodule was in the distal most third of the vocal fold, and was unilateral. Further research must be done to understand the etiology of rheumatoid nodules in the larynx and how to better prevent and treat them in the future.

Subepithelial Infusion Assisted Transoral Office Based Resection of Vocal Fold Lesions

Matthew J. Lutch, MD; Amanda N. Martin, ENS, MC, USNR
Nancy Jiang, MD

The gold standard for vocal fold polyp resection is phonosurgical resection under general anesthesia. We present a feasible and safe alternative combining transoral superficial lamina propria infusion and resection under transoral endoscopic guidance. Ten patients with substantial medical comorbidities and/or direct exposure issues were treated with this approach. Pre and post procedure stroboscopies were reviewed by a separate fellowship trained laryngologist and speech pathologist; 100% of patients had improved mucosal wave and glottic closure. This technique represents a satisfactory alternative to the gold standard and can be considered for patients for whom general anesthesia is a relative contraindication.
Subglottic Metastasis from an Anterior Tongue Adenoid Cystic Carcinoma

Richard Heyes, MBChB; Ramkishan Balakumar, MBChB, MRCS; Krishan Ramdoo, MBChB, MRCS; Taran Tatla, MBBS, FRCS

Introduction: This 69-year-old female was initially diagnosed with adenoid cystic carcinoma (ACC) of the left anterior tongue. After having a partial glossectomy and postoperative radiotherapy, she was found to have a right subglottic mass 6 years later. This was confirmed to be a metastatic ACC to the subglottis. She was also found to have metastatic disease in the bone, lungs, fundus and brain. We present a unique presentation of subglottic metastasis from an adenoid cystic carcinoma of the anterior tongue.

Method: A database search of PubMed, Embase and Cochrane Library with MeSH terms ‘metastatic carcinoma; larynx; subglottic’ and ‘tongue; adenoid cystic carcinoma; metastasis’ was undertaken to identify any potential case studies that have been reported.

Results: ACC is a malignant tumor which commonly affects the salivary glands. It can involve other sites of the aero-digestive tract including the oral cavity with only a few documented cases affecting the anterior tongue. Our literature search revealed no cases associated with metastasis to the subglottis from this region. We hypothesize that metastasis occurred via a lymphatic route and a review of the contemporary literature relating to the lymphatics of the upper aero-digestive tract is presented.

Conclusion: There are documented cases of metastatic spread of ACC to areas such as lungs and bone. However, this is the first documented case of a metastatic spread of ACC from the tongue to the subglottis. The uninterrupted physiologic lymphatic drainage from the oral cavity to the larynx may be a potential explanation.

Subglottic Metastasis of Rectal Adenocarcinoma

Richard Heyes, MBChB; Ramkishan Balakumar, MBChB, MRCS; Krishan Ramdoo, MBChB, MRCS; Taran Tatla, MBBS, FRCS

Objective: To present an incredibly rare case of subglottic metastasis of rectal adenocarcinoma, and describe how a specialist airway multidisciplinary team created an environment where tracheostomy was avoided by surgical innovation with a novel use of fibrin glue.

Study Design: Case report and MEDLINE literature review.

Methods: Medical records for the patient were extensively reviewed. Imaging, pathology, and intraoperative video and stills are available. Extensive literature reviews of colorectal laryngeal metastasis and of the use of fibrin glue in the airway were performed.

Results: A 56-year-old female with a background of rectal adenocarcinoma presented with a four week history of dyspnoea, cough and mild dysphonia. This progressed to airway compromise and on otolaryngology consult a large subglottic mass was identified. Review by our airway team was swift and surgery was performed that day. Intubation was performed with the aid of video laryngoscopy and bougie ‘railroading’ of the endotracheal tube. The bulk of the subglottic mass was removed by traction, with carbon dioxide laser removing the underlying remnant and mucosa. Fibrin glue was applied over this area in two cycles. Histology confirmed rectal adenocarcinoma metastasis. The patient suffered no complications and was discharge one week postoperatively.

Conclusions: To our knowledge this is the fifth description of laryngeal metastasis of rectal adenocarcinoma. We describe how a specialist multidisciplinary team managed an unusual otolaryngology consult and prevented tracheostomy with the use of fibrin glue. We present this case to aid physicians should they encounter a similar presentation of a subglottic mass.
POSTERS

Subjective and Objective Response to Botulinum Toxin Injection for Adductor Spasmodic Dysphonia

Mi Jin Yoo, MD; Melin Tan, MD; Phyllis Bieri, MD; Nicole Free, BS, CCC-SLP; Linda Carroll, PhD

Introduction: Botulinum toxin (BT) injection is an established treatment for adductor spasmodic dysphonia (SD). The aim of this study is to analyze subjective and objective measures in patients with adductor SD undergoing BT injection.

Methods: Twenty-nine subjects with adductor SD (aged 48-91) who underwent BT injection were included in the study. Objective aerodynamic parameters using the Phonatory Aerodynamic System (PAS) were collected pre injection, immediate post injection, and four weeks post injection. Subjective measures using 100mm visual analog scale were collected pre injection, one week post injection, two weeks post injection, and four weeks post injection.

Results: Aerodynamic parameters showed significantly increased airflow (p=0.043) and significantly decreased laryngeal resistance (p=0.044) four weeks post BT injection. Subglottal pressure was not significantly changed. Subjective measure showed significantly reduced effort and strain post injection. The greatest significance was at one week (p=0.0001) compared to two weeks (p=0.01) and four weeks (p=0.003). Patient reported reduced pitch breaks post injection with greatest significance at one week (p<0.0001) compared to two weeks (p=0.0078) and four weeks (p=0.013). Patients reported improvement in overall voice consistency post injection with greatest significance at one week (p=0.0003) compared to two weeks (p=0.0022) and four weeks (p=0.0014). Subjective improvement did not always associate with improved aerodynamic parameters.

Conclusions: BT pharmacologic effects at the neuromuscular junction is well known. Patients with adductor SD showed greatest subjective improvement one week after BT injection. Potential nonpharmacologic effects of BT injection effects not limited to the neuromuscular junction are noteworthy.

Surgical Excision of Synovial Sarcoma of the Hypopharynx using the Laparoscopic Ligasure Vessel Sealing System

Benjamin Yang, BS; Kevin Caceres, MD; Ibrahim Alava, MD

Objective: Synovial Sarcomas (SS) are an extremely rare form of soft tissue neoplasm composing less than 1% of all adult malignancies. We present an interesting case of hypopharyngeal SS resected using a novel surgical technique employing the laparoscopic Ligasure Vessel Sealing System (LVSS).

Methods: Review of literature, case report Case Description: A 30 year old female with a childhood history of a soft tissue sarcoma of the neck and previous excision presented with new onset throat pain, dysphagia, dysphonia, and weight loss. Flexible laryngoscopy revealed a large left, posterior, hypopharyngeal, pedunculated mass. CT scan demonstrated a 3x5cm hypoattenuating mass in the left pyriform sinus causing narrowing of the supraglottic airway. PET/CT revealed fluorodeoxyglucose uptake at the left posterior pharyngeal wall and cervical lymph nodes. Direct laryngoscopy and bronchoscopy were performed. A laparoscopic Ligasure device was used to remove the mass quickly with minimal blood loss. Histopathology identified spindle cell synovial sarcoma. FISH analysis demonstrated SYT gene rearrangement with t(X;18) chromosomal translocation.

Results: Hypopharyngeal synovial sarcoma resected via direct laryngoscopy with laparoscopic Ligasure Vessel Sealing System.

Conclusions: Hypopharyngeal SS remains a rare and ill-defined disease process, with few cases reported in the literature. Management remains controversial, but is focused on complete surgical excision with adjuvant radiation therapy. We present a novel method of laryngeal mass excision using the laparoscopic Ligasure via direct laryngoscopy, allowing for complete ablation and an efficient operative experience.
Surgical Management of Bilateral Vocal Fold Paralysis: A Cost-Utility Analysis

Matthew R. Naunheim, MD, MBA; Phillip C. Song, MD; Ramon A. Franco, MD; Blake C. Alhire, MD, MPH; Mark G. Shrime, MD, MPH, PhD

Objectives: Endoscopic management of bilateral vocal fold paralysis (BVFP) includes transverse cordotomy and/or arytenoidectomy, and has become a well-accepted alternative to tracheostomy. However, the costs and quality-of-life benefits of endoscopic management have not been examined with formal economic analysis. This study undertakes a cost-utility analysis of tracheostomy vs. endoscopic management of BVFP.

Study Design: Cost-utility analysis. Methods: A literature review was conducted to identify a range of costs and outcomes associated with the surgical options for BVFP. Additional costs were derived from 2015 Medicare reimbursement data, and all were adjusted to 2015 dollars. A cost-utility analysis was performed to evaluate both therapeutic strategies. Probabilistic sensitivity analysis was used to assess confidence levels regarding the economic evaluation.

Results: The incremental cost effectiveness ratio (ICER) for endoscopic management versus tracheostomy was $26,159/QALY, indicating that endoscopic management is the cost-effective strategy in the short-term. Assuming a willingness-to-pay (WTP) threshold of $50,000/QALY, the probability that endoscopic management is cost-effective is 61%. When costs of long-term care are included, tracheostomy is dominated by endoscopic management.

Conclusion: Endoscopic management of BVFP is more likely to be cost-effective than tracheostomy. Though endoscopic transverse cordotomy and partial arytenoidectomy require additional expertise and specialized equipment, there are both utility gains and long-term cost advantages to an endoscopic strategy.

The Ability of Extraesophageal Endoscopic Findings to Predict Proton Pump Inhibitor (PPI) Response in Suspected Laryngopharyngeal Reflux

Neelima Agrawal, BS; Rena Yadlapati, MD; Alcina Lidder, BS; Caroline PE Price, BA; Michiel Bovd, MD; John Pandolfino, MD; Bruce K. Tan, MD, MS

Introduction: Laryngopharyngeal reflux (LPR) has a poorly understood pathophysiology, subjective endoscopic diagnosis, and variable response to empiric proton-pump inhibitor (PPI) therapy. While an endoscopic metric of endolaryngeal findings, the Reflux Finding Score (RFS), has been proposed, extra-laryngeal criteria may have diagnostic utility. We aimed to assess correlations between laryngoscopic findings and (1) 24-hour oropharyngeal pH; and (2) PPI response in patients with suspected LPR.

Methods: Subjects with laryngeal symptoms ≥1 month with and Reflux Symptom Index (RSI) ≥13 were recruited from a tertiary care center. Following baseline questionnaires, video laryngoscopy, and a 24-hour oropharyngeal pH probe study (Restech Dx-pH), subjects received 8-12 week omeprazole trials and completed post-treatment questionnaires. Baseline laryngoscopies were scored using the RFS and additional extraesophageal criteria (nasopharyngeal discharge, posterior oropharyngeal wall cobblestoning, epiglottis shape, epiglottis retroflexion, base of tongue retrulsion, lingual tonsil hypertrophy, and inter-arytenoid medial wall redness) were scored in a blinded manner. PPI response was defined as ≥50% improvement in RSI.

Results: Of 33 subjects included, 45% had a PPI response. Mean baseline RFS scores did not differ between responders (3.7±1.9) and nonresponders (4.7±2.4, p=0.2). The mean total extraesophageal findings score was greater for responders (6.5±2.3) compared to nonresponders (5.0±2.7, p=0.04). No significant associations were found between oropharyngeal acid exposure and PPI response. Cobblestoning, epiglottis shape, lingual tonsil hypertrophy, and inter-arytenoid redness positively correlated with pH at different thresholds (Table 1).

Conclusion: Extralaryngeal endoscopic findings correlated with PPI response and degree of oropharyngeal acid exposure and should be considered in LPR’s workup and management.
SCIENTIFIC SESSION

The Novel Use of the Ligasure Vessel Sealing Device in Endoscopic Laryngeal Surgery

Jay Ferrell, MD; Benjamin Yang, BS; Uma Ramaswamy, MD; Ronda Alexander, MD; Ibrahim Alava, MD

Introduction: Although the Ligasure Vessel Sealing System (LVSS) has seen increased use in the field of head and neck surgery, there are currently no reports in the literature regarding its use in endoscopic airway surgery. Compared to traditional sharp instruments, electrocautery, and endoscopic lasers, the Ligasure device can provide improved hemostasis in addition to controlled, effective resection of laryngeal masses. In this study, we present a recent case series highlighting a novel method for utilizing the Ligasure device for endoscopic resection of various laryngeal masses.

Methods: Retrospective review of all patients undergoing endoscopic management of laryngeal masses with the Ligasure at a large, academic medical center.

Results: Three patients underwent successful endoscopic management of their laryngeal masses using the LVSS. Case 1 is a 54 year old woman with a supraglottic schwannoma causing progressive dysphagia and airway obstruction. Case 2 is a 30 year old woman with a history of a previously excised soft tissue sarcoma presenting with a secondary laryngeal synovial sarcoma. Case 3 is a 44 year old woman who presented with worsening upper airway symptoms secondary to endolaryngeal extension of a third branchial cleft cyst. In all cases, the laryngeal mass was completely excised en bloc, and there were no immediate or delayed postoperative complications.

Conclusions: The Ligasure device is a safe and effective surgical tool that can be used in the endoscopic resection of well-defined laryngeal masses. However, larger prospective studies are needed to better elucidate its ideal role in endoscopic airway surgery.
POSTERS

**Time to Achievement of Stable Botulinum Toxin Dose Regimens in Patients with Spasmodic Dysphonia and Essential Voice Tremor; A Guide for Patient Counseling**

Allison Slijepcevic, BBA; C. Ellis Wisely, BA; Laura Mattrka, MD; Brad DeSilva, MD; L. Arick Forrest, MD

Introduction: Spasmodic dysphonia (SD) and dysphonia of essential tremor (ET) cause significant patient morbidity that can be addressed with botulinum toxin therapy. Patients are counseled that there is a trial-and-error period while determining therapeutic dosing regimens; no studies have previously defined the length of this period for each disorder.

Objective: To define the time to achievement of stable botulinum toxin dosing regimens for treating SD and ET.

Materials and Methods: This study is an IRB-approved retrospective chart review of 116 patients treated with botulinum toxin therapy for SD or ET at the Ohio State University from 2008 to 2013. Thirty-seven new patients with SD or ET were assessed for time and number of injections needed to achieve stable dose regimens. Thirty established patients with stable dose regimens were assessed for dose changes over time.

Results: Patients with SD required an average of 240 days and 2.3 injections to reach dose stability, while ET patients required an average of 150 days and 1.9 injections to achieve dose stability. Patients with stable dose regimens required an increase in dose units with chronic treatment. Table 1 shows parameters of stable botulinum toxin regimens.

<table>
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<th>Time to Stable Dose (days)</th>
<th>Injections to Achieve Stable Dose</th>
<th>Stable Dose Changes Over Time (% increase)</th>
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<td>SD</td>
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<tr>
<td>ET</td>
<td>150</td>
<td>1.9</td>
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**Parameters of stable botulinum toxin regimens.**

Conclusions: Patients with SD require increased time and number of injections to reach stable dose regimens compared to patients with ET. Patients who achieve dose stability require increasing doses of botulinum toxin therapy over time.
POSTERS

Tracheal T-Tubes for Management of the Unreconstructable Trachea

Mark A. Varvares, MD

Introduction: Management of long segment tracheostenosis continues to be a significant challenge to the otolaryngologist, head and neck surgeon. This is particularly true in patients who are either medically unreconstructable due to significant comorbidities or surgically unreconstructable from failed prior attempts at repair or a segmental stenosis that exceeds the ability to repair with currently established techniques. In such cases it would be ideal to allow the patients to have as “normal” a physiology with respect to respiratory and phonatory functions as possible and maintain a patent airway. The tracheal T-Tube offers an excellent “permanent” solution to the problem of the unreconstructable trachea.

Methods: Single institution, retrospective case review of 3 patients. Institutional Review Board approval waived as customary at our institution for limited case series.

Results: Three patients underwent tracheofissure and placement of a tracheal T-tube after failed prior attempts at repair of tracheostenosis. The tracheal T-tubes have been maintained for 11, 15 and 30 years in these patients who have enjoyed normal phonatory and respiratory function with the lateral port of the T-tube plugged and the tube functioning as an airway stent. There have been no major complications related to the use of the T-tube.

Conclusion: The tracheal T-tube is a viable alternative to the long term management of the unreconstructable trachea, allowing the patients near normal phonatory and respiratory function.

Treatment of Tonsillar Cancer in Professional Singers Allowing Return to Professional Career

Alycia Gene Spinner, MD; Robert C. Wang, MD

Objective: Professional singing is a demanding career, and requires full function of the larynx, oral cavity and pharynx. Although “organ-preserving” chemotherapy and radiation (CXRT) is often the preferred therapy for tonsillar cancers with neck metastasis, professional singers can be unable to return to their careers due to the resultant xerostomia and radiation injury to the vocal cords and the surrounding laryngopharynx. We sought to devise treatments for singers to allow successful return to their careers.

Method: Three professional singers diagnosed with tonsillar carcinoma with neck metastasis were treated with transoral resection (2 of 3 robotically assisted) of tonsillar cancer, selective neck dissection, contralateral submandibular gland transposition for salivary preservation and postoperative shielding of the larynx and pharynx during adjuvant radiation or chemoradiation.

Results: All three made uneventful recoveries and continued to perform professionally without perceptible changes in their singing voice. Recordings of singing by these artists after treatment are presented.

Conclusion: Patients seeking to sing professionally after treatment for lateral oropharyngeal and neck carcinomas may benefit from transoral resection, modified functional neck dissection, contralateral submandibular gland transposition and targeted radiation avoiding the larynx, pharynx and transposed salivary gland as much as possible. Treatment using these techniques have successfully preserved singing capabilities in three professional singers.
POSTERS

Two Unusual Presentations of Laryngocele

Richard Heyes, MBChB; Ramkishan Balakumar, MBChB, MRCS; Krishan Ramdoo, MBChB, MRCS; Taran Tatla, MBBS, FRCS

Introduction: Laryngocele is a pathological dilatation of the appendix of the laryngeal ventricle. It is a rare presentation, with an estimated annual incidence of 1 per 2.5 million. We report two drastically different presentations of laryngocele and of our management. These cases highlight the diversity of laryngocele presentation.

Methods: Case series and MEDLINE literature review.

Results: Case 1 - A 55-year-old female developed severe swelling of the face, neck and anterior chest wall following right knee arthroscopy. Imaging confirmed facial and cervical subcutaneous emphysema, with pneumomediastinum without pneumothorax, and a small tract of air extending from the left larynx into surrounding soft tissues. A diagnosis of ruptured internal laryngocele was made. After three weeks of unsuccessful conservative management, the laryngocele was resected with carbon dioxide laser after using methylene blue dye and water to inflate the cavity to identify its extent. Case 2 - A 74-year-old male presented to our Emergency Department with stridor, severe respiratory distress and confusion. He had a large firm neck mass anteriorly extending to the sternocleidomastoid. He was reviewed by our specialist airway anesthesiologist who intubated the patient with video laryngoscope assistance, with surgical tracheostomy available. Imaging demonstrated a combined left laryngocele. Thick pus was aspirated but this was culture negative. After operative endoscopic evaluation, an external approach excision was undertaken.

Conclusion: Laryngoceles can be combined or internal, and presentation and management options vary according to laryngocele subtype. We describe cases of each subtype and compare our management to recently published accounts.

Unilateral Laryngoscopic Findings Associated with Response to Gabapentin Therapy in Patients with Chronic Cough

John Paul Giliberto, MD; Daniel Dibildox, MD; Albert Merati, MD

Background: Chronic cough is a debilitating, often multifactorial problem. Vagal neuropathy has been proposed as an etiology for some cases. Gabapentin has been used to treat chronic cough with some success. However, 30-40% of patients do not respond to therapy and up to 30% of patients limit their titration of gabapentin dose because of side effects. The purpose of this study was to evaluate laryngoscopic findings in a series of patients with the clinical diagnosis of chronic cough in hopes of identifying any predictors of response to neuromodulator therapy.

Methods: Retrospective review at an academic tertiary medical center. Patients with chronic cough were identified by ICD9. Charts were screened for patients who received gabapentin.

Results: Twenty seven patients with chronic cough were started on low dose gabapentin and titrated to response or side effects. Follow up was available on 25 patients (15 female, 10 male). Partial or complete response to gabapentin was noted in 16 patients (65%). Some degree of vocal fold paresis/motion impairment (UVFP) was noted in 20 of the 25 patients. 15/16 (94%) of responders had UVFP compared to 5/9 (56%) of non-responders, (p<0.04, Fisher’s Exact). Pre-treatment Voice Handicap Index, Reflux Symptom Index and Modified Leicester Cough Questionnaire scores were not significantly different between responders and non-responders. Side effects limited gabapentin dose in 4/9 non-responders and 4/16 responders (p<0.66).

Conclusions: In patients with chronic cough suspected to be related to vagal neuropathy, UVFP is more likely to be seen in gabapentin responders compared to non-responders.
POSTERS

Using Laryngeal Ultrasound for the Identification of Pediatric Vocal Fold Nodules

Julina Ongkasuwan, MD; Brandon Tran, MD; Jeremy Jones, MD

Objective/Hypothesis: The term vocal fold nodules refers to bilateral thickening of the membranous folds with minimal impairment of the vibratory properties of the mucosa. They are thought to be related to repetitive mechanical stress, associated with voice use patterns. Diagnosis is typically made in the office via either rigid or flexible laryngeal stroboscopy. Depending on the individual child, obtaining an optimal view of the larynx can be difficult if not impossible. Recent advances in high-frequency ultrasonography allows for transcervical examination of laryngeal structures. The goal of this project is to determine if laryngeal ultrasound (LUS) can be used to identify vocal fold nodules in dysphonic children.

Study type: Case-control.

Design: This was a prospective case-control study in which the patient acted as his or her own control. Methods: Forty-six pediatric patients were recruited for participation in this study, mean age 4.8 years. Twenty-three did not have any vocal fold lesions and 23 had a diagnosis of vocal fold nodules on laryngeal stroboscopy. The recorded LUS were reviewed by 2 pediatric radiologists who were blinded to the nodule status.

Results: There was substantial interrater agreement ($\kappa= 0.70$, 95% CI: 0.50-0.89) between the 2 radiologists regarding the presence of nodules. There was also substantial agreement ($\kappa=0.87$ 95% CI: 0.72-1) between LUS and laryngeal stroboscopy. Sensitivity of LUS was 100% (95% CI: 85-100%) and specificity was 87% (95% CI: 66-97%).

Conclusion: LUS can be used to identify vocal fold nodules in children with substantial agreement with laryngeal stroboscopy.

Voice and Swallowing Outcomes of Unilateral Vocal Fold Paralysis

Juliana Bonilla-Velez, MD; J. Bonilla-Escobar, MD, MSc; Ozlem E. Tulunay-Ugur, MD

Objectives: Our aim was to assess voice and swallowing outcomes comparing young and older patients with unilateral vocal fold paralysis (UVFP).

Methods: Retrospective chart review of all patients presenting to a tertiary care center with UVFP was performed.

Results: A total of 567 charts were reviewed revealing 237 patients, 137 younger than 65 years-old, 100 older. Median time to evaluation by ENT was 112 days for younger, 182 days for older patients (more than 2 months delay). There was no difference from first ENT visit to initial treatment. 46 patients had idiopathic paralysis, 128 iatrogenic, 38 mass, 25 other etiology. Carotid endarterectomy was a common cause in older patients, anterior cervical fusion in younger. A larger group of the older patients underwent in-office procedures. At presentation, 7.2% of the patients required tube feeding; this was not different between older and younger patients. Pooling on laryngoscopy significantly correlated with tube feeding dependence. At initial visit, 28.57% young patients had an abnormal swallowing performance status scale (SPSS), 26% of the older patients did (p>0.05). Only 9.3% of the younger had an abnormal SPSS compared to 13.24% of older following initial treatment. Of the patients who had a pre and post-procedure voice handicap index score, pre-procedure average was 82, compared to 41.5 post-procedure in the older group. In the younger group these were 75, 39.5 respectively.

Conclusions: Carotid endarterectomy was a significant risk factor for dysphagia in older patients. Older patients do as well as younger patients and should be treated as aggressively.
POSTERS

Voice Profiles in 75 to 95-Year-Old Patients

David Macias, BS; Priya Krishna, MD, MA; Brianna K. Crawley, MD; Thomas Murry, PhD

Introduction: While vocal changes and pathologies in the elderly have historically been studied, the very elderly (75-95) have received little attention. This retrospective chart review investigates the characteristics and voice disorders in a very elderly population.

Methods: This study identified 105 consecutive patients from the ages of 75 to 95 years old presenting with voice as their chief complaint. Demographics, diagnosis, vocal history, medical and surgical history, and VHI-10 scores were obtained.

Results: Of the 105 patients, 54 (51%) were female and 51 (49%) were male. When subdivided by age, 86 (82%) were between 75 and 85 years old and 19 (18%) between 86 and 95. The most common diagnosis was vocal fold atrophy (VFA). In the 75 to 85-year-old group, males had a higher incidence of VFA than females, while the reverse was true in the 86 to 95-year-old group. In addition, 31 (30%) patients indicated difficulty swallowing. A history of smoking, dysphagia, and head and neck surgery were prominent findings in both groups. Few major diseases were found in this population. Significant VHI-10 scores (>11) were present in 59 (56%) patients.

Conclusion: This study, to our knowledge, is the first to investigate voice complaints and profiles of the very elderly. As the population gentrifies in this country, an increased understanding of the very elderly voice is essential to recognize vocal complaints and communication needs of this group as well as to find appropriate treatment protocols to maintain functional voice use.

Voicing and the Montgomery T Tube: A Hopkins experience

Vaninder Dhillon, MD; Alexander Hillel, MD; Simon Best, MD

Introduction: Montgomery T tube placement has been described in thoracic and surgical literature with regards to bypassing tracheal stenosis. However in the Otolaryngology literature there is little to describe the option of a t tube in lieu of a tracheostomy for laryngotracheal stenosis, with respect to airway management as well as voice.

Objective: To describe our method for placement of a Montgomery t tube using an endoscopic approach in patients with isolated laryngotracheal stenosis, and the outcomes of airway, voice and swallow for patients before and after placement using objective criteria

Methods: Retrospective chart review of 10 patients who underwent t tube placement for laryngotracheal stenosis, and their overall airway, voice and swallow outcomes

Results: Diagramatic and intraoperative photographic evidence of how we measure and place a Montgomery T tube. Statistically significant improvement in VQRL, RSI, EAT-10 scores, as well as CCQ scores pre and post placement for all patients.

Conclusion: Montgomery t tubes are optimal for managing patients with laryngotracheal stenosis, provide a safe airway and create an ability for patients to maintain voicing capabilities. For the Otolaryngology field, and specifically laryngologists, we are able to find a feasible way for placing this tubes without difficulty in the operating room using simple endoscopic techniques.
The Association was notified of the passing of Dr. Samuel (Sammy) R. Fisher, who passed away on Wednesday, November 25, 2015 with his loving family by his side at the age of 65 years old. Inducted into the ALA in 1995, Dr. Fisher remained an active Fellow for more than 20 years until his untimely passing. He served as a Professor of Surgery in the Division of Head and Neck Surgery & Communication Sciences at Duke University Health System where his career expanded for more than 40 years.

A native of Winston-Salem, NC, Dr. Fisher received his B.S. degree from Davidson College in 1972 and earned his medical degree from Duke University School of Medicine in 1975. He completed his surgical residency at Duke Hospital in general surgery, and selected Otolaryngology Head and Neck Surgery as his specialized training.

In addition to being an ALA Fellow, Dr. Fisher was a member of the American Academy of Otolaryngology - Head and Neck Surgery, the American Rhinologic Association, and board certified by the American Board of Otolaryngology. Internationally renowned for his expertise in head and neck surgical oncology, he also had broad expertise in many aspects of Otolaryngology. He was recognized as an expert in the diagnosis and treatment of melanoma of the head and neck. Dr. Fisher published significant research in his areas of interest, which included biochemical action of the membranes in chronic sinusitis and polyposis and the molecular genetic makeup of cancers of the head and neck.

For those who knew him, Sammy was a Southern gentleman, a true character with a gift for humor. He had a love for life and lived it to the fullest. Sammy was a proud dad and granddad, loyal son and brother. He especially enjoyed the game of golf among his other many interests that also included cooking, hunting, fishing and gardening. Sammy was also a member of the Iron Dukes, and truly bled Duke blue.

Left to mourn his passing but cherishing his memory, Dr. Fisher is survived by his mother Marjorie Rankin Fisher; four children, Samuel Rankin (Carolyn) Fisher, Jr., Lee Reesman Fisher, Marjorie Randall Fisher, and Robert Watson Fisher; two brothers, Dr. William (Lynn) Sloan Fisher III "Romey" and Evans Watkins Fisher; and his three month old grandson, Samuel Rankin Fisher III.

A memorial service was held on Wednesday, December 2, 2015 in the Goodson Chapel at the Duke Divinity School.
On November 1, 2015, one of our Emeritus Fellow, Geza J. Jako, M.D., passed away at the age of 85 years old, in Melrose, Massachusetts. Dr. Jako was nominated for Active Fellowship by Drs. M. Stuart Strong and Albert Andrews and was inducted in 1983. After retiring from practicing medicine in 2008, Dr. Jako requested elevation to Emeritus that became effective at the Annual Meeting in 2009.

Born in Budapest, Hungary in 1930, Dr. Jako graduated Summa Cum Laude from Semmelweis Medical University in 1954. His interest in the field of Ear, Nose, and Throat (ENT) Surgery may be attributed to his material grandfather, Dr. Geza Krepuska, who was the first chairman of Otolaryngology at the University. He also had interest in physics and engineering while a medical student which led to his building one of the first electronystagmography in the world as well as hearing measuring instruments. Because of his involvement during the 1956 Hungarian Revolution, he helped organize the ambulance and medical emergency services; however, he was forced to escape because of the Communist backlash. Péterfy Sándor Street Hospital, his former hospital, is now recognized as the "Hospital of the 1956 Revolution" and there are two historic commemorative plaques attesting to his contributions during the revolution. He was recognized with a Hungarian Knighthood in 2000.

As a refugee, Dr. Jako arrived in Boston in 1957 by crossing the Atlanta Ocean aboard a Navy Military troop transporter. In Boston, he completed his specialty training in ENT at Harvard Medical School where he would later join the faculty. Beginning in 1962, Dr. Jako received recognition as being the first to implant two electrodes into a patient’s cochlear and is considered for the development of cochlear implants. This was also the year he developed the first microsurgical instruments for surgical treatment of vocal cords and throat cancer.

Dr. Jako’s career included being recognized as a world famous surgeon, physician scientist, professor, inventor, educator, and presidential appointee. He was the inventor of soft tissue microsurgery, laser surgery, and modern techniques of minimally invasive surgery. While at Boston University School of Medicine, he used the first surgical carbon dioxide (CO2) laser that was developed by him and his physicist colleague, Dr. Thomas Polanyi. In 1971, the first successful human use of the laser in surgery, other than that of the eye, occurred and is highly regarded as a safe mechanism to treat patients.

He served as a White House Advisor for Cancer to Presidents Reagan and Bush (George H.W.) in addition to being a Founding Member, Past President, and Honorary Member of the American Society for Laser Medicine and Surgery. Additionally, he was an honorary and emeritus member of numerous international and domestic medical societies, and received several international and domestic awards for advancing his medical specialty and pioneering laser and microsurgery. In 2009, Dr. Jako was presented a Presidential Citation by ALA’s President Marvin Fried. Of note, he received the prestigious "Hektoen Gold" award from the American Medical Association in 1972 for inventing Laser Surgery. There are so many awards and accolades that were bestowed upon Dr. Jako. A widely read author, Dr. Jako published more than 150 textbook chapters and seven US patents relating to Minimally Invasive, Micro and Laser Surgery. His patents were licensed to several companies of which he became an advisor. In addition, more than 120 surgical instruments several leading medical device companies bear his name. Of special note are the endoscopic instruments that he designed, developed, and first applied the use of high intensity fiber-optic light cables and source in surgery for microsurgical
techniques of the larynx. Dr. Jako was indeed the "Father of Laser Surgery."

He was an early supporter and member to the Hungarian Society of Massachusetts with his close friend and former classmate Professor Dr. Károly Balogh. Dr. Jako was elected to the Hungarian Academy of Sciences in 2001. His work, entitled "Hungarian Born Scientists who made the 20th Century", is exhibited in the Hall of the Hungarian National Museum in Budapest. There he is among two dozen other scientists such as Eotvos†, Szentgyorgyi†, Teller†, von Bekessy†, and other Nobel Prize Laureates.

Dr. Jako was also an avid philanthropist where he donated medical instruments and assisted in renovating operating suites outside the US. In his spare time, he enthusiastically loved the theater, the arts, and enjoyed playing tennis, swimming, skiing, and vacationing with his family. In addition to his loving wife of 50 years, Maria (Gal) von Jako, he will be remembered by his three children, siblings, grandchildren and a host of friends and colleagues.
MEMORIALS

ROBERT ALAN SOFFERMAN, MD
(November 18, 1941 - October 14, 2015)

The ALA Council and its members were informed that Dr. Robert Alan Sofferman, an Emeritus Fellow, passed away on October 14, 2015, at his home surrounded by his loving family, at the age of 73. Dr. Sofferman, known to many as Dr. Bob, was inducted as an Active Fellow in 1995 and was elevated to emeritus status in 2012.

One of Bob’s life-long passions, golf, was discovered while he attended Milburn High School in Milburn, New Jersey. In 1963, he graduated from Lehigh University as a member of Omicron Delta Kappa and Alpha Epsilon Delta. He was a magna cum laude graduate of the University Of Maryland School Of Medicine in 1967. His surgical internship was performed at the University of Colorado in 1968, where he met and married his wife of 47 years, Barbara (McCann) Sofferman.

Drafted into the U.S. Army in 1968, Bob was a Vietnam-era Veteran serving three years as a major at the U.S. Army 279th Station Hospital in Berlin, Germany. Moving to Needham, MA, Bob completed his residency in otolaryngology at Massachusetts Eye and Ear Infirmary.

In 1975 the family moved to Colchester, VT, where Bob took what he thought would be a temporary appointment in the Department of Otolaryngology and Assistant Professor of Surgery at the University of Vermont College of Medicine. Two years later, he became Chairman of the Department at Fletcher Allen Health Care and Professor of Surgery in 1993. As chairman, the department grew from three to ten surgeons and many other support staff.

Dr. Sofferman viewed the most fulfilling aspect of his career that allowed him to train many residents and medical students, many of whom became like family. In addition to his being an ALA Fellow, he was a member of the Vermont State Medical Society, American Academy of Otolaryngology, American Board of Otolaryngology, American Head and Neck Society, the Triological Society and other local, state and national associations. Bob received many honors and awards including the H. Gordon Page Surgical Clinician Award from the UVM Department of Surgery; the Triological Society’s Harris P. Mosher Award numerous presidential citations for his dedication to the specialty.

"Dr. Bob” was a consummate teacher, and was extremely committed to giving back to his profession. He wrote and edited many articles in professional journals, presentations and served as a guest lecturer or visiting professor at symposia around the world. He was a pioneer in many aspects of his profession, including the implantation of cochlear implants in the 1980s and promoting and teaching the use of ultrasound in the practice of otolaryngology. He was a strong advocate for the development of an accreditation program for otolaryngology instruction in ultrasound.

His love of golf is well known and although he enjoyed the competition, it was the many enduring friendships he made through the game that meant the most. Bob loved to travel for work, golf, or pleasure. His most treasured memories were his trips to Africa with his wife and several of their closest friends. He often considered himself one of "the luckiest people in the world." When not caring for his patients, he was an avid outdoorsman and nature appreciator, enjoying cross-country skiing, fly fishing, snow-shoeing, and kayaking as well as an excellent photographer. He indeed had multiple interest outside of medicine but none were more important to him than is family. Incredibly proud of his children and five
granddaughters, who were the absolute joy of his life, Dr. Bob never missed an opportunity to express it. All those who knew Bob were touched by his compassion, his enthusiasm for new things, his dedication, his infectious sense of humor, and his brilliant and perpetual smile that absolutely lit up a room. He could hardly go anywhere without being recognized and thanked by people whose lives he had touched and changed for the better. He lived life on his own terms, doing things his way. He dedicated his life to helping others, not just in his capacity as a physician, but anyone he came across. He was a perfectionist, a lifelong scholar, an artist, a loving father, husband, brother, son, and grandfather.

Bob is survived by his wife, Barbara; his daughter, Rebecca Sofferman; his son, Brooke (Corrina) Sofferman; five granddaughters, Autumn, Ayla, Zoe, Skylar, and Kyleigh; his mother Helen Sofferman; his sister, Lynn (Rob) Donner; several nephews, nieces, and cousins.
MEMORIALS

JOHN ANWYL TUCKER, MD
February 20, 1930 – April 12, 2016

One of our esteemed Fellows, John Anwyl Tucker, MD, passed away on Tuesday, April 12, 2016 in Avalon, New Jersey at 86 years of age. Dr. Tucker was an Active Fellow for 43 years before being elevated to Emeritus status in 2015. He was a devoted Fellow having served in numerous capacities and as President in 1997. A devoted supporter of the ALA, Dr. Tucker regarded it an honor to carry on the Gabriel Tucker MD Award legacy that was established in 1987 by the Tucker Family and friends honoring his late father and brother, Dr. Gabriel Tucker Sr. and Dr. Gabriel Tucker Jr., respectively.

Born in Bryn Mawr, Pennsylvania, Dr. Tucker held lifelong love and ties to the Philadelphia area, graduating from the University of Pennsylvania in 1953, where he played with great pride on the sprint football team. After completing medical school at Johns Hopkins School of Medicine in 1957, Dr. Tucker began his work in otorhinolaryngology as a resident at Penn in 1958. He also served in the U.S. Army, as Chief of Section, Otolaryngology at Valley Forge General Hospital from 1961-1963, which he fondly recalled reporting for duty by picking up his uniform in Center City and driving out the expressway.

Professionally, Dr. Tucker was an internationally renowned leader as a surgeon and academic in the field of pediatric otorhinolaryngology. Dr. Tucker was recognized for his medical expertise, his compassion and ability to connect with adolescent patients, and the collegial relationships he fostered with colleagues. Following in the footsteps of his father and older brother, Dr. Tucker was an innovator in developing laryngological instruments that became essential tools in the field but is also remembered for the numerous contributions of unique scope to Penn and the many other Philadelphia-area medical institutions such as Hahnemann University, Temple University, Drexel University, Veteran's Hospital of Philadelphia, St. Christopher's Hospital for Children, Children's Hospital of Philadelphia to name a few. Instead of accepting his professional accomplishments, Dr. Tucker’s graciously referred to how fortunately he was to be able to help children through his work.

Among the many distinguished awards he received and the memberships he held, Dr. Tucker was most proud of receiving the award named in honor of his father and brother “For Excellence and Distinguished Contribution to Pediatric Laryngology” in 1991. In 1997, he was elected President of the ALA and would also serve as the presidents of the American Broncho-Esophagological Association, the Philadelphia Laryngological Society, and the Philadelphia College of Physicians Section on Otolaryngology, and The American Society of Pediatric Otolaryngology.

When Dr. Tucker was not attending to his patients, Dr. Tucker enjoyed spending time at the Jersey Shore, where he and his loving wife, Mary Jane, were married in Avalon. As long-time members of the Yacht Club of Stone Harbor, they were known to close down the dance floor. An avid fan of all Philadelphia sports, he never missed an Eagles game until his health prevented him from doing so.

He is survived by his caring wife Mary Jane, children Laura (Alf) Cromwell; John Jr.; Paul; Bradford (Monica) Gallagher; Tiffany Gallagher (Gordon) Mathews; and Sean (Kara) Tucker. Also cherishing his memory are his six grandchildren: Lydia, Josh, and James Cromwell, Willa and Greta Mathews, and Ellen Tucker. John is remembered by friends and family for his generosity, great sense of humor, and quick smile.
## OFFICERS 1879 - 2015

### Presidents

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Secretaries and Treasurers

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Secretaries

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## Treasurers

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## Librarians

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## Librarian and Historian

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## Librarian, Historian and Editor

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## Historian

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DECEASED FELLOWS

Dates indicate original election to the Association

Honorary Fellows

1946 Alonso, Justo M., Montevideo, Uruguay
1941 Levy, Robert, Denver, CO
1992 Aschan, Gunnar K., Linköping, Sweden
1918 Lewis, Fielding O., Media, PA
1908 Barnhill, John F., Miami Beach, FL
1933 Lierle, Dean M., Iowa City, IA
1983 Birkett, Herbert S., Montreal, CN
1883 Mackenzie, John N., Baltimore, MD
1878 Bosworth, Francke H., New York, NY
1940 Broyles, Edwin N., Baltimore, MD
1910 Masser, Ferdinand, Naples, Italy
1917 Coates, George M., Philadelphia, PA
1904 Mosher, Harris P., Marblehead, MA
1925 Clerf, Louis H., St Petersburg, FL
1910 Moure, J. J. E., Bordeaux, France
1957 Conley, John J., New York, NY
1937 Nager, F. R., Zurich, Switzerland
1960 Daly, John F., Fort Lee, NJ
1930 Negus, Sir Victor E., London, ENG
1818 Dean, Lee Wallace, St Louis, MO
1918 Oliver, H. K., Boston, MA
1881 Delavan, D. Bryson, New York, NY
1957 Ono, Jo, Tokyo, Japan
1891 De La Sota y Lastra, Ramon, Seville, Spain
1906 Pierce, Norval Harvey, San Diego, CA
1893 de Roulades, Arthur W., New Orleans, LA
1937 Portmann, Georges, Bordeaux, France
1923 Fenton, Ralph A., Portland, OR
1924 Proetz, Arthur C., St Louis, MO
1879 French, Thomas R., Brooklyn, NY
1957 Ruedi, Luzius, Zurich, Switzerland
1936 Galloway, Thomas C., Evanston, IL
1932 Schall, LeRoy A., Boston, MA
1880 Garcia, Manuel, London, ENG
1909 Semon, Sir Felix, Great Missenden, England
1986 Gould, Wilbur J., New York, NY
1878 Solis-Cohen, J., Philadelphia, PA
1903 Harris, Thomas J., New York, NY
1973 Som, Max L., New York, NY
1971 Harrison, Sir Donald F. N., Surrey, England
1889 Swain, Henry L., New Haven, CT
1943 Hilding, Anderson C., Duluth, MN
1914 Thomson, Sir St Clair, London, ENG
1928 Hill, Frederick T., Waterville, ME
1903 Tilley, Herbert, London, ENG
1948 Holinger, Paul H., Chicago, IL
1914 Wagner, Clinton, New York, NY
1957 Huizinga, Eelco, Groningen, the Netherlands
1948 Williams, Henry L., Rochester, MN
1907 Jackson, Chevalier, Schenectady, PA
1951 Woodman, DeGraaf, New York, NY
1878 Johnston, Samuel, Baltimore, MD
1890 Wright, Jonathan, Pleasantville, NY
1878 Lefferts, George Morewood, Katonah, NY

Corresponding Fellows

1978 Arauz, Juan Carlos, Buenos Aires, Argentina
1902 Lermoyez, Marcel, Paris, France
1972 Arslan, Michele, Padua, Italy
1897 Lec., H., Paris, France
1942 Batson, Oscar V., Philadelphia, PA
1938 Blair, Vivray P., St Louis, MO
1896 MacDonald, Greville, Haslemere, England
1892 Browne, Lennox, London, England
1894 MacIntyre, John, Glasgow, Scotland
1903 McBride, P., York, England
1964 Clevos, Carlos, Bogota, Colombia
1920 McKenzie, Dan, London, England
1940 Colledge, Lionel, London, England
1919 McKerrow, James F., New Canaan, CT
1901 Collier, Mayo, Kearsney Abbey, Kent, England
1880 Meyer, Wilhelm, Copenhagen, Denmark
1893 Desvernine, Carlos M., Havana, Cuba
1896 Mygind, Holger, Copenhagen, Denmark
1986 Dohlman, Gista, East Bradford, FL
1950 Neil, James Hardie, Auckland, New Zealand
1943 Eggston, Andrew A., New York, NY
1919 Paterson, Donald Rose, Cardiff, Wales
1930 Emerson, Francis P., Franklin, MA
1941 Patterson, Norman, Herts, England
1961 Faaborg-Anderson, Kund, Nykobing, Denmark
1971 Rethi, Aurelius, Budapest, Hungary
1936 Fraser, John S., Edinburgh, UK
1919 Rogers, John, Jr, New York, NY
1887 Gougenheim, A., Paris, France
1894 Sajous, C. E. DeM., Philadelphia, PA
1901 Grant, Sir James Dundas, London, England
1924 Schaefer, J. Parson, Philadelphia, PA
1984 Huguenin, Carlos, Montevideo, Uruguay
1912 Schmiegelow, Ernst, Copenhagen, Denmark
1970 Hutcheon, Jack R., Brisbane, Australia
1946 Segura, Eliseo, Buenos Aires, Argentina
1985 Inouye, Tetsuzo, Saitama, Japan
1940 Soto, E. Fernandez, Havana, Cuba
1919 Kelly, Adam Brown, Helensburgh, Scotland
1881 Thornton, Pugin, London, England
1978 Kleinsasser, Oskar, Marburg, Germany
1913 Turner, A. Logan, Edinburgh, UK
1981 Labus, Carlo, Milan, Italy
1936 Vialle, W., Prague, Prague, Czechoslovakia
1950 Larsell, Olof, Portland, OR
1980 Whistler, W. McNeil, Edinburgh, UK
1926 Law, Frederick M., New York
1894 Wolfenden, R. Norric, Kent, England
1921 LeMaitre, Ferdinand, Paris

110
Deceased Fellows

Emeritus Fellows

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Active Fellows

1878 Adams, George L., Excelsior, MN 1893 Hourn, George E., St Louis, MO
1958 Allen, Harrison, Philadelphia, PA 1925 Hyatt, Frank, Washington, DC
1880 Andrews, Albert H., Jr, Chicago, IL 1878 Iglauer, Samuel, Cincinnati, OH
1869 Arrowsmith, Hubert, Brooklyn, NY 1882 Ingals, E. Fletcher, Chicago, IL
1917 Asch, Morris J., New York, NY 1938 Ives, Frank L., New York, NY
1879 Ashley, Rae E., San Francisco, CA 1880 Jackson, Chevalier L., Philadelphia, PA
1892 Atkins, Joseph P., Philadelphia, PA 1878 Jarvis, William C., New York, NY
1958 Babbitt, James A., Philadelphia, PA 1897 Johnson, Hosmer A., Chicago, IL
1923 Bellenger, William L., Chicago, IL 1960 Johnson, Wooley, New York, NY
1906 Bean, C. E., St Paul, MN 1961 Johnston, Kenneth C., Chicago, IL
1880 Beck, August L., New Rochelle, NY 1944 Jones, Edley H., Vicksburg, MS
1949 Berens, T. Passmore, New York, NY 1979 Jones, Marvin F., New York, NY
1904 Bigelow, Nolton, Providence, RI 1964 Kealhofer, R. H., St Louis, MO
1924 Blassingame, Charles D., Memphis, TN 1954 Keim, W. Franklin, Montclair, NJ
1938 Bliss, Arthur Ames, Philadelphia, PA 1942 King, Edward D., North Hollywood, CA
1983 Boyden, Guy L., Portland, OR 1901 King, Gordon, New Orleans, LA
1951 Boylan, J. E., Cincinnati, OH 1878 Knight, Frederick Irving, Boston, MA
1895 Brown, John Mackenzie, Los Angeles, CA 1965 Knight, John S., Kansas City, MO
1932 Brown, Moreau R., Chicago, IL 1993 Komisar, Arnold, New York, NY
1892 Buckley, Robert E., New York, NY 1880 Kyle, D. Braden, Philadelphia, PA
1933 Canfield, R. Bishop, Ann Arbor, MI 1980 Langmaid, Samuel W., Boston, MA
1934 Carmody, Thomas E., Denver, CO 1953 Lederer, Francis L., Chicago, IL
1924 Casselberry, William E., Chicago, IL 1878 Lincoln, Rufus P., New Orleans, LA
1889 Chamberlain, C. W., Hartford, CT 1913 Lockard, Lorenzo B., Denver, CO
1983 Chamberlin, William B., Cleveland, OH 1897 Logan, James E., Kansas City, MO
1917 Chapman, S. Hartwell, New Haven, CT 1935 Looper, Edward A., Baltimore, MD
1882 Chappell, W. F., New York, NY 1888 Lowman, John H., Cleveland, OH
1896 Coakley, Cornelius G., New York, NY 1901 Lynah, Henry L., New York, NY
1902 Coffin, Rockwell C., Boston, MA 1952 Lynch, Mercer G., New Orleans, LA
1913 Cox, Gerald H., New York, NY 1915 Lynch, Robert Clyde, New Orleans, LA
1918 Cushing, E. W., Boston, MA 1914 Mackey, John E., New York, NY
1880 Cutter, Ephem, West Falmouth, MA 1881 Major, G. W., Montreal, Canada
1878 Daly, W. H., Pittsburgh, PA 1898 Makuen, G. Hudson, Philadelphia, PA
1880 Davis, F. H., Chicago, IL 1985 Mathog, Robert, Southfield, MI
1878 Davis, Warren B., Philadelphia, PA 1948 Maxwell, James H., Ann Arbor, MI
1941 Dennis, Frank Lownes, Colorado Springs, CO 1879 McBurney, Charles, New York, NY
1926 Dickerman, E. T., Chicago, IL 1927 McCinnis, Edwin, Chicago, IL
1901 Dickinson, John T., Pittsburgh, PA 1936 McGregor, Gregor, Toronto, Canada
1935 Equen, Murdock S., Atlanta, GA 1945 McLaurin, John G., Dallas, TX
1919 Eves, Curtis C., Philadelphia, PA 1885 McSherry, Clinton IL, Baltimore, MD
1914 Faulkner, W. Ross, New York, NY 1954 Meltzer, Philip E., Boston, MA
1901 Fetterolf, George, Philadelphia, PA 1958 Montreuil, Fernand, Montreal, Canada
1897 Friedberg, Stanton A., Chicago, IL 1940 Morrison, William W., New York, NY
1940 Frothingham, Richard, New York, NY 1886 Mulhall, J. C., St Louis, MO
1909 Fuchs, Valentine H., New Orleans, LA 1925 Mullin, William V., Cleveland, OH
1907 Getchell, Albert C., Worcester, MA 1914 Munger, Carl E., Waterbury, CT
1940 Gibb, Joseph S., Philadelphia, PA 1892 Murray, T. Morris, Washington, DC
1878 Gill, William D., San Antonio, TX 1881 Mynter, H., Buffalo, NY
1913 Glasgow, William Carr, St Louis, MO 1893 Newcomb, James E., New York, NY
1905 Goldstein, Max A., St Louis, MO 1895 Nichols, J. E. H., New York, NY
2001 Gray, Steven D., Salt Lake City, UT 1961 Ogura, Joseph H., St Louis, MO
1945 Grove, William E., Milwaukee, WI 1894 Park, William H., New York, NY
1988 Grossack, Gerald S., Atlantic, GA 1892 Porcher, W. Peyre, Charleston, SC
1983 Hanson, David G., Chicago, IL 1927 Porter, Charles T., Boston, MA
1957 Harkness, Gordon F., Davenport, IA 1954 Pressman, Joel J., Los Angeles, LA
1878 Harrill, James A., Winston-Salem, NC 1908 Randall, B. Alexander, Philadelphia, PA
1945 Hartman, J. H., Baltimore, MD 1882 Rankin, D. N., Allegheny, PA
1879 Hickey, Harold L., Denver, CO 1939 Richards, Lyman G., Wellesley Hills, MA
1907 Holden, Edgar, Newark, NJ 1902 Richardson, Charles W., Washington, DC
1882 Holmes, Christian R., Cincinnati, OH 1930 Ridpath, Robert E., Philadelphia, PA
1993 Hooper, Franklin H., Boston, MA 1945 Robb, James M., Detroit, MI
1938 Hope, George B., New York, NY 1953 Roberts, Sam E., Kansas City, MO
1981 Robertson, J. M., Detroit, MI

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<td>Wood, V. Visscher</td>
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## Roster of Fellows – 2016

*Date indicates year admitted to active fellowship.*

### Active Fellows - 135

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<th>Year Elected</th>
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<tr>
<td>2012</td>
<td>Abaza, Mona M., M.D., University of Colorado-Denver, Dept. of Otolaryngology, 12635 E. 17th Ave., AO-1 Rm. 3103, Aurora CO 80045</td>
</tr>
<tr>
<td>1994</td>
<td>Abemayor, Elliot, M.D., Univ of California, L.A. Rm. 62-132 CHS, 10833 Le Conte Ave., Los Angeles CA 90095-1624</td>
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<tr>
<td>1974</td>
<td>Alford, Bobby R., M.D., Baylor College of Medicine, One Baylor Plaza, #NA 102, Houston TX 77030</td>
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<td>2006</td>
<td>Altman, Kenneth W., M.D., Ph.D., Dept of Otolaryngology, Baylor College of Medicine, One Baylor Plaze, #NA-102, Houston, TX 77030</td>
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<tr>
<td>2001</td>
<td>Aviv, Jonathan, M.D., ENT and Allergy Associates, 210 East 86th St., 9th Floor, New York NY 10028</td>
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<td>2010</td>
<td>Baredes, Soly, M.D., Univ of Medicine and Dentistry of New Jersey, Dept. of Otolaryngology, 90 Bergen St., Ste. 7200, Newark, NJ 07103</td>
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<tr>
<td>2013</td>
<td>Belafsky, Peter C., M.D., Ph.D., Univ. of CA – Davis Medical Center, Dept. of Otolaryngology, 2521 Stockton Blvd., Suite 7200, Sacramento, CA 95817</td>
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<tr>
<td>1999</td>
<td>Benninger, Michael S., M.D., The Cleveland Clinic Foundation, Head &amp; Neck Institute, 9500 Euclid Ave., A-71, Cleveland, OH 44139</td>
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<tr>
<td>1993</td>
<td>Berke, Gerald S., M.D., Div. of Otolaryngology - Head &amp; Neck Surgery, UCLA School of Med., 10833 Le Conte, Los Angeles CA 90095-0001</td>
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<tr>
<td>2007</td>
<td>Bielanowicz, Steven, M.D., Dept. of Otolaryngology, Washington University Hospital, 2150 Pennsylvania Ave. NE., Suite 6-301, Washington, DC 20037</td>
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<td>1987</td>
<td>Blitzer, Andrew, M.D., D.D.S., 425 W. 59th St., 10th Fl., New York NY 10019</td>
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<td>Blumin, Joel H., M.D., Medical College of Wisconsin, Dept. of Otolaryngology, 9200 W. Wisconsin Ave., Milwaukee WI 53226</td>
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<td>2012</td>
<td>Bradford, Carol R., M.D., Univ. of Michigan – Ann Arbor, Dept. of Otolaryngology – HNS, 1500 E. Medical Center Dr., 1904 Taubman Center, Ann Arbor, MI 48103-5312</td>
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<tr>
<td>2011</td>
<td>Burns, James A., M.D., Harvard Medical School MA General Hospital, Dept. of Otolaryngology, One Bowdoin Square, 11th Floor, Boston, MA 02114</td>
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<tr>
<td>1994</td>
<td>Caldarelli, David D., M.D., Dept. of Otolaryngology, Rush Presbyterian St. Luke’s Medical Center, 1653 West Congress Parkway, Chicago IL 60612</td>
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<tr>
<td>2006</td>
<td>Carrau, Richard L., M.D., The Ohio State Univ. Medical Center, Dept. of Otolaryngology, 320 W. 10th Ave., Starling Living Hall, Room B-221, Columbus, OH 43210</td>
</tr>
<tr>
<td>1994</td>
<td>Cassisi, Nicholas J., D.D.S., M.D., Health Sciences Center, P.O. Box 100264, Gainesville FL 32610-0264</td>
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<tr>
<td>2016</td>
<td>Castellanos, Paul F. M.D., Univ. of Alabama – Birmingham, Dept. of Otolaryngology, 1530 3rd Ave., S., BDD 563, Birmingham, AL 35294</td>
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<tr>
<td>2011</td>
<td>Chhetri, Dinesh M., UCLA School of Med., Div. of Otolaryngology – Head &amp; Neck Surgery, 10833 Le Conte Los Angeles CA 90095-0001</td>
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<tr>
<td>1993</td>
<td>Close, Lanny G., M.D., Dept. of Otolaryngology, Columbia University, 622 W 168th Street, New York NY 10032-3702</td>
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<tr>
<td>2014</td>
<td>Cohen, Seth M., M.D., MPH, Duke University Medical Center, Dept. of Otolaryngology, Box 3805, Durham, NC 27710</td>
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<tr>
<td>1992</td>
<td>Cotton, Robin T., M.D., Dept. of Pediatric Oto and Maxillofacial Surgery, Children’s Hospital Med. Ctr. ASB-3, 3333 Burnet Ave., Cincinnati OH 45229-2899</td>
</tr>
<tr>
<td>2002</td>
<td>Courey, Mark S., M.D., Mt. Sinai School of Medicine, Dept. of Otolaryngology, One Gustave Levy Place, Box 1189, New York, NY 10029</td>
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<tr>
<td>1984</td>
<td>Crumley, Roger L., M.D., M.B.A., Head &amp; Neck Surgery, UC Irvine Medical Center, 101 City Dr. S., Bldg. 25, Orange CA 92868</td>
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<td>Dailey, Seth M.D.</td>
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<td>Damrose, Edward J. M.D.</td>
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<td>1990</td>
<td>Johnson, Jonas T. M.D.</td>
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<td>2012 (1983)</td>
<td>Johns, Michael E., M.D.</td>
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<td>1991 (1975)</td>
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<td>2014 (1987)</td>
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<td>2015 (1979)</td>
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<td>1988 (2006)</td>
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<td>2015 (1987)</td>
<td>Schuller, David E., M.D.</td>
<td>10th Ave., Ste. 519, Columbus OH 43210</td>
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<td>1990 (1979)</td>
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<td>2016 (1979)</td>
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<td>1990 (1975)</td>
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<td>2015 (1991)</td>
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<td>2016 (1994)</td>
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Emeritus Corresponding Fellows- (5)

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<th>Year (Start)</th>
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<tr>
<td>1980</td>
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<td>1984</td>
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<tr>
<td>Year</td>
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<td>2015</td>
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