TRANSACTIONS

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**Emeritus**

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**Associate**

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MINUTES OF THE EXECUTIVE SESSIONS

REPORT OF THE SECRETARY

The membership prior to the April 2011 election included 139 Active members, 68 Emeriti members, 49 Corresponding members, 5 Honorary members, and 5 Associate members, for a total membership of 259 Fellows.

Drs. James Burns, Dinesh Chhetri, Seth Dailey, Ramon Franco, Chrissine Gourin, Karen Kost, and Pierre Lavertu were elected to Active Fellowship; Dr. Akihiro Shiotani was elected to Corresponding Fellowship and Drs. Herbert Dedo and W. Frederick McGuirt were elected to Emeritus status.

After election of the nominees, the 2011 roster reflects 145 Active members, 64 Emeriti members, 47 Corresponding members, 6 Honorary members, and 4 Associate members, for a total membership of 267 Fellows. A new category for Corresponding Emeritus Fellows was created by the membership last year and Drs. Benjamin Bruce and Patrick J. Bradley were elevated to this category.

These totals also reflect we were notified that four members are deceased prior to this report.

Dr. Garrett reported that according to the By-Laws, there is a 150 limit for active fellows. Discussions have taken place to determine if the Council will recommend an increase to accommodate the number of excellent young laryngologists who are current Post-Graduate Members and once completing their TRIO thesis will be eligible for nomination as active fellows.

This year, six Post-Graduate Members were approved for membership. They are Drs. Swapna Chandran, Joanna D’Elia, Dale Ekmbom, Reene Gupta, Daniel Novakovic, and Sunil Verma.

Dr. Garrett also reported that in 2012, the Head and Neck Society will not meet during COSM in San Diego and that in 2013, ASPO will not hold its meeting in Orlando. However, there are plans to have a combined session with the ABEA and the European Laryngology Society (ELS). This will allow more of our European colleagues to participate in the meeting and provide an opportunity for collaboration. She stated that the COSM SLC have agreed to return to Las Vegas in 2014 where the 2010 meeting was deemed a success based on the increased number of attendees. ACS is working on finalizing contract negotiations with Caesar’s Palace which will be a more upscale venue.

Respectfully submitted,
C. Gaelyn Garrett, 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. Benninger reported that the finances of the Association have improved when compared to the dismal period of 2008-2010 when collectively, $185K was lost. Additional revenues from publicaitions, i.e., Laryngoscope, have increased by $7500. The major source of continuing income is members’ dues. Although the amount of outstanding delinquent dues is still high, there has been an improvement on remittances due in part to the efforts of our Administrator. Assets have improved due to a combination of controlling expenses, i.e., as eliminating the formal President’s banquet and opting for a more intimate event that provides opportunity for socializing and excellent choices in food, beverage, and entertainment selections.

The Council reduced expenses by scheduling the Winter Council Meeting during the TRIO Sectional meetings.

Although finances are stable, the greatest need still exists for additional funding resources. Dr., Benninger reported that the Association is still very highly market dependent. He reported that Prodigy has performed well with investments. He reminded the Association that in 2009, Dr. Crumley created a Sustainers’ Fund for donors to make a contribution to the ALA. Last year, only $3200 was received. Dr. Ossoff will be distributing some key details on this fund and how fellows and friends of the ALA may participate. He reiterated that donations are vital to the Association’s operations and encouraged everyone to get involved with the Sustainers Fund.

Respectfully submitted,
Michael S. Benninger, MD
Treasurer
REPORT OF THE EDITOR

Transactions
Dr. Courey reported that the 2010 Transactions have been 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. There were more than 54K visits to the site and multiple search engines were used. The majority of visits were from the United States with others from Asia, South America, and the UK.

Publication
Dr. Courey reported there was a 65% rate of manuscripts submitted from the 2010 annual meeting in 2010 that 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.

He 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. Courey 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.

Respectfully submitted,
Mark S. Courey, MD
Editor

REPORT OF THE HISTORIAN

Dr. Ossoff reported on the passing of four Emeriti fellows since the 2010 annual meeting. After presenting a brief obituary for each deceased fellow. Dr. Ossoff requested the observation of a moment of silence on memory of Dr. John Frazer, Dr. Haskin Kashima, Dr. Frank Ritter, and Dr. Joyce Schilds.

Respectfully submitted,
Robert H. Ossoff, DMD, MD, CHC
Historian
RECIPIENTS OF THE DE ROALDES AWARD

1928 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

RECIPIENTS OF THE CASSELBERRY AWARD

1923 George Fetterolf
and Herbert Fox

1928 Ralph A. Fenton
and O. Larsell

1929 Richard A. Kern
and Harry P. Schenck

1929 Edward H. Campbell
and Harry P. Schenck

1930 Arthur W. Proetz

1934 Anderson C. Hilding

1936 Francis E. LeJeune
and Joel J. Pressman

1939 H. Marshall Taylor
and Brien T. King

1940 French K. Hansel

1941 Noa 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 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 Ira Sanders

1995 Hugh F. Biller
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 Trevor J. I. McGill
2001 Donald B. Hawkins
2002 James S. Reilly
2003 Ellen M. Friedman
2004 C. Martin Bailey
2005 William P. Potsic
2006 Amelia F. Drake
2007 Colin Barber
2008 Seth Pransky

2009 William Crysdale
2010 Charles M Myer, III
2011 Mark Richardson

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

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

2007 Idranil Debnath
2008 Tara Shipchander
2009 David O. Francis
2010 David O. Francis
2011 Jeffreey Houlton
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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**

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**BENEFACTORS**

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Welcome fellow members and guests to the American Laryngological Association’s 132nd annual meeting. I am humbled for your trust of me for the leadership of the ALA, and for having given me such a wonderful year. I would also like to recognize my son Peter and his wife, Erika and thank them for being here with me.

I hope this will be an exciting and educational experience for all of you. You will see that the program includes many contributions and a panel from our postgraduate members. For in fact, they are the future of laryngology. I also have included 2 “State of the Art” lectures to share with you cutting edge material. Dr. Steven Zeitels will share with us the current state of Laser laryngeal surgery, and Dr. Kristina Simonyan will explain the current understanding of neural control of laryngeal function based on functional MRIs.

I hope our program will also show you how far we have come in the past 200 years.

The origins of endoscopic laryngeal surgery started with Bozzini who has become the father of minimally invasive surgery. He developed the “Lichtleiter that used a speculum, candle light and mirrors for illumination and cannulae to fit the orifice (throat, rectum, urethra). However, his device was condemned by the medical community in Vienna.

This was followed by Benjamin Guy Babington’s glottoscope (1829) mirror and tongue depressor, and John Avery’s laryngoscope with head mirror illumination (1844). Manuel Garcia in 1854 a vocal pedagogist, observed his own larynx using a dental mirror and sunlight. He reported this to the Royal Society of London in 1855 “Observations on the human voice”. This resulted in the widespread use of mirror laryngoscopy.

Ludwig Turck further explored the mirror exam with sunlight, but failed due to mostly cloudy days in Vienna. Johann Czermak, in Pest, perfected it’s use with artificial light and a curved mirror. Morrell Mackenzie said “Czermak freed laryngoscopy from the clock and barometer”. Czermak also began training other physicians including a number of Americans. He is also credited on being the first to take a photograph of the larynx. Brunings developed a direct laryngoscope for “autolaryngoscopy” that could be used in the office. It applied pressure to laryngeal
framework to better expose the anterior commissure.

Several Americans went to learn the mirror examination from Czermak. Among them was Horace Green who practiced in New York City became the first specialist in the US for throat and respiratory diseases. He has been credited by Louis Elsberg, the first President of the ALA, as the father of American Laryngology. He used mirror lighting and direct visualization for surgery and application of caustic agents for infectious diseases of the throat and was called a “quack” by many other physicians.

Elsberg in 1860 published the first formal American article in laryngology and shortly thereafter received the AMA gold medal for his publication “Laryngoscopic Surgery: Illustrated in the Treatment of Morbid Growths within the Larynx”. His boyhood friend, Jacob Da Silva Solis-Cohen, a Civil War Surgeon was influenced by Elsberg and became the first formal surgically trained surgeon to become a laryngologist. He introduced rigorous surgical training for laryngology, and was probably the first surgeon to cure a cancer using a laryngofissure and hemilaryngectomy, in 1867. Elsberg and Solis-Cohen founded the ALA in 1878. Elsberg’s first two presidential addresses for the ALA were “Laryngology in America” and “Laryngological Instruction”.

In October 1873, Clinton Wagner, who had studied laryngology in Europe, helped found the NY Laryngological Society (the first laryngology society in the world), which met on a regular basis in members homes. A most notable meeting as in October of 1882, when the guest of honor was Morrell Mackenzie, who later founded the British Laryngological Association. Wagner also helped found the Metropolitan Throat Hospital (the 1st of it’s kind in the US). This was in part because laryngologists were barred from hospitals being called dishonest and unreliable practitioners.

A distinguished surgeon, Samuel D. Gross of Philadelphia, once introduced Jacob Solis-Cohen as a man who “devoted most of his time to a cubic inch of the human anatomy. Someday I suppose, we will have specialists confining themselves to diseases of the navel”. George Lefferts, Louis Elsberg and Jacob Solis-Cohen founded the Archives of Laryngology in NYC in 1880. The journal and society were a mechanism to share knowledge and stimulate research.

Killian by 1897 added suspension laryngoscopy and rigid bronchoscopy to the laryngeal surgical practice. Brunings added many instruments at the turn of the last century. A big change occurred when general anesthesia and the operating microscope where added in the 1960’s. Professor Harold Hopkins added telescopic rods for better visualization. Otto Kleinsasser refined laryngeal microsurgery. Dr. Isshiki reintroduced and refined laryngeal framework surgery.

Johann Mikulicz in 1881 is credited with doing the first successful esophagoscopy, using the galvanized wire light and the knowledge from Kussmaul’s observations of sword swallowers. Mikulicz also added removable optical devices to magnify the images and in 1881 by developing an instrument that could be angled to 30 degrees to navigate curves in body parts. Clearly, the greatest clinical contributions to endoscopic techniques for the upper aerodigestive tracks were from Chevalier Jackson.

Basil Hirschowitz, a South African, developed a flexible fiber-optic endoscope, but it was slowly adopted because it had optical distortion and poor illumination. Stroboscopy was developed to better understand vocal fold motions for sound
production. Ortel first introduced this technology to slow down motion and better understand the physiology of voice production in 1878. Hans von Leden later improved the equipment and art of stroboscopy and its value in understanding performers and laryngeal dysfunction. Hirano further refined the technique to what it is today.

In 1873, Billroth performed the first laryngectomy for cancer. Alonso and Clerf redefined these procedures in the 1940’s. Max Som, Joseph Ogura, John Kirchner popularized partial laryngectomies and supraglottic resections- 1958-60. Bruce Pearson described the sub-total laryngectomy in 1981. Wolfgang Steiner popularized the endoscopic partial laryngectomy in the 1990’s.

The first laser were conceived by Charles Hard Townes in 1957 while he was at Columbia University. Theodore Maiman, at the Hughes Institute, constructed the first working laser in 1960. The first human surgery was of the eye, and Dr. Steven Trokel at Columbia used the excimer laser for corneal surgery.

1970’s Polanyi and Jako worked with Strong and Vaughn to add a CO2 laser to laryngeal surgery for accurate cutting and ablation with decreased bleeding in laryngeal surgery. The first human laryngeal transplant was performed 12 years ago by our guest of Honor- Marshall Strome.

These are difficult economic times, but I feel the future of our specialty is bright. We will see We will see the use of stem cells and growth factors to regenerate replacement parts, nerves, and epithelium.

Laser with wave lengths used for each indication will be available, Targeted toxins, viral vectors and growth promotors will be easily applied to change biological behavior. Electrical and magnetic fields will be used to enhance biological systems, promote healing, or change function.

All of this will happen, but the sharing of knowledge and the continuation of the ALA will take money and effort. We need you to attend and participate in our meetings, help support the science and development of our new technology, help support and teach our post-graduate members, and Help fund the ALA initiatives

Thank you.
Dr. Ford, originally from NYC, he received his medical degree from the University of Louisville and completed his residency training at the Henry Ford Hospital in Detroit. He served a chief of Otolaryngology at the Randolph Air Force Base, San Antonio, Texas. He then went to the University of Wisconsin where he served on the faculty, becoming the Professor and Chairman of the Department of Otolaryngology for many years. He is presently Professor and Chairman Emeritus of the Department. He is the recipient of many awards and named lectureships around the world, including the Newcomb Award, a Presidential citation and the Baker lecturer of the ALA and the Broyles-Maloney award of the ABEA. He has been President of the ABEA and the SUO. He is a master laryngeal surgeon, and has devoted most of his career to protecting the vocal cords with minimally invasive techniques. His research program evolved through promotion of objective voice evaluation and videostroboscopy in clinical practice. He was one of the first people to do in office injection laryngoplasties and augmentation using collagen, and continued the development of bioimplants. He devised new equipment to allow for these procedures to be done efficiently. He also devoted much of his research and career to understanding vocal fold scarring and trying to reverse the scar process to allow for normal mucosal vibratory function for voicing. Chuck has taught all of us so much over the years, and deserves to be recognized for it. He is my friend and has taught me many important principles over the years. Chuck would have been here but is a guest of honor at a meeting in Italy, so we will honor him in absentia.
Presidential Citations

MARVIN P. FRIED, MD
Bronx, NY

Dr. Marvin Fried is a graduate of the City College of New York and received his medical degree from Tufts University. He trained in Otolaryngology at Washington University in St. Louis with Dr. Ogura, followed by a 3-year fellowship at the NIH. He then became the chief of Otolaryngology of the Public Health Service at Norfolk, VA. He began his academic career at the Boston Univ/Tufts Program in Boston. Shortly thereafter, he joined the Harvard Med School faculty as an Otolaryngologist at the Beth Israel/Brigham and Woman’s Hospital in Boston, where he had a distinguished career until he returned to NYC as chair of the Department of Otolaryngology of the Albert Einstein/Montifiore Program. He is the recipient of numerous awards including the Fowler Award for his thesis from the Triological Society; the Mark Award from the American Society for Laser Medicine and Surgery; and the Newcomb Award from the ALA.

Marvin’s interests are diverse, but much of his research work was involved with laser surgery in combination with robotics, and his continued development of surgical training with simulators. Marvin serves on 9 editorial boards and is a reviewer for another dozen journals. The amazing thing about Marvin is his productivity and willingness to work for all of our societies. He is a member of scores of medical societies and has been an officer of many including Board of Directors of the Academy; Chair Elect, Specialty Advisory Council of the Academy; President, American Society for Laser Medicine and Surgery; President, SYO; Councilor, Secretary and President of the ALA; President, American Rhinologic Society; and President, NY Laryngological Society. In recognition of his tireless work on our behalf and specifically for all the guidance he has given me during this President’s year, and for his friendship I award him with this citation.
Dr. Hillel, originally from New York City, received his undergraduate and medical degrees from Stanford University. He trained in Otolaryngology at Stanford followed by a fellowship in Head and Neck Surgery also at Stanford. He then began his academic career at the University of Washington (UW) in Seattle, where he has been ever since. He is a Professor of Otolaryngology and also an Adjunct Professor of Rehabilitation Medicine. He was the chief of the VA service until 2002 and is the Director of the Neuromuscular Clinic for Swallowing and Speech Disorders and the Director of the Voice Clinic, both at the UW. Al is the recipient of many awards including the Fowler Award for his Triologic thesis.

Al’s research has been mostly related to neurological disorders affecting speech and swallowing. His electromyographic studies of the larynx are the gold standard for all of the rest of us who use this testing. Al has presented his work at many international meetings. He has been the director of a Laryngology Fellowship Program which has turned out several wonderful laryngologists in our ranks.

Al is a remarkable clinician and scientist who always thinks out of the box and has led us to a better understanding of laryngeal movement disorders. Most of all, Al is a friend.
Presidential Citations

GAYLE E. WOODSON, MD
Springfield, IL

Dr. Gayle Woodson was born in Texas and received her undergraduate degree from Rice University. She then received her medical degree from Baylor College of Medicine followed by surgical training at Johns Hopkins and Otolaryngology at Baylor. She then did 2 fellowships in laryngology, one at Baylor followed by one at the Institute of Laryngology & Otology in London. Gayle’s academic career then proceeded with a return to Baylor, then a move to the University of California – San Diego, the University of Tennessee, University of Florida, and now as Chair of the Department of Otolaryngology at the Southern Illinois University School of Medicine.

She has received numerous honors for her contributions including: the Newcomb Award, special presidential citation, and guest of honor from the ALA; the Chevalier Jackson Award of the ABEA; a member of the Collegium; presidential citation from the Academy; and Olga Jonasson Distinguished Member Award, Association of Women Surgeons. Aside from all of the amazing surgical and scientific contributions, Gayle has set a standard for all women in Otolaryngology and has blazed trails because of her excellence.

Gayle has served on numerous review committees for the NIH, FDA, Resident Review Committee and the American Board of Otolaryngology. She has served on numerous national societies including President of the ALA, Board of Directors of the AAO-HNS, President of SUO, Board of Directors of the American College of Surgeons, President of the Memphis Chapter of the American Medical Women’s Association, and the Council of AADO.

Gayle’s careful and thoughtful scientific research landed her numerous VA, NIH and University grants. She has been a master at understanding laryngeal reflexes, laryngeal motion and disordered motion. She has been a pioneer of surgical procedures for vocal fold paralysis, electromyography, botulinum toxin therapy, sleep apnea, and vocal fold scarring. She has taught courses and given lectures in all corners of the world, representing the best that American Otolaryngology has to offer. Gayle is a real master, teacher, investigator, and a friend.
Dr. Yanagisawa received his undergraduate and medical degrees from Nihon University in Tokyo, Japan. He then did his surgical internship at the US Tokyo Army Hospital followed by a residency in Otolaryngology at the Yale-New Haven Medical Center where he has remained for his entire career. He is a clinical Professor of Otolaryngology at the Yale Medical School and an Attending Otolaryngologist at Yale and St. Rafael’s Medical Centers. He is a humble gentleman who is indeed a giant. He has been President of several Otolaryngology Societies; honorary member of Otolaryngology societies of several countries; and has been a guest lecturer around the world. Though Eiji is a multifaceted Otolaryngologist with great talent, his major interest has been in photography, videography and visual documentation.

He has been the chairman of several world medical film festivals and an award winner for his contributions. He has also received major awards from the ALA, ABEA, the American Otological Society, the Triological Society, and the AAO-HNS for his contributions.

He has published 341 original articles; 79 book chapters, 4 books, 233 presentations and has created 77 videotapes or movies. Eiji Yanagisawa is a giant in our field, has always shared his knowledge with me and is a friend.
Dr. Zeitels originally from New York, went to Boston and received his undergraduate and medical degrees from Boston University. He then trained in Otolaryngology at the combined BU/Tufts program. It was during these years that he developed skill and knowledge in lasers for surgery from Stuart Strong, Charles Vaughn and Geza Jako. After his residency he stayed and did a year fellowship in Head and Neck Oncology and then joined the BU academic department where he remained until 1990 when he moved to the Harvard Medical School. He is currently the Eugene B. Casey Chair of Laryngeal Surgery, in the Department of Surgery and a Visiting Surgeon in the Division of Thoracic Surgery. Steve is the Director of the Center for Laryngeal Surgery and Voice Rehabilitation - Massachusetts General Hospital and the Director of a Laryngology Fellowship Program at the Mass General Hospital.

He is a member of 21 Medical Societies and has held many offices including President of the ABEA and Vice President for the History of Otolaryngology Society. He has scores of honors and named lectureships bestowed upon him including the Casselberry Award from the ALA; the Chevalier Jackson Lecturer and the Broyles-Maloney A, both from the ABEA. He has lectured on various laryngeal surgical topics worldwide. He is a avid student of the history of our society with partners from other disciplines such as cancer research, engineering, computers, craft, and angogenesis research, he surrounds himself so that he can learn from others to make his work the best.

He is honest and diligent about his work. His current research includes the use of 532 lasers for vascular lesions and premalignant lesions; use of avastin for papillomas and premalignant lesions; biomaterials for the regeneration of vocal folds; and optical coherent tomography. Steve is really the true renaissance scholar --he is historically well versed; develops new ideas, learns from others, collaborates for the betterment of the specialty, teaches, publishes, and always shares knowledge. He is indeed my great friend.
INTRODUCTION OF THE GUEST OF HONOR
Marshall Strome, MD, MS

New York, NY

Andrew Blitzer, MD, DDS

Dr. Marshall Strome received his undergraduate and medical education at the University of Michigan, followed by a rotating internship at the Philadelphia General Hospital, a residency year in general surgery at the Harper Hospital in Detroit and an Otolaryngology residency at the University of Michigan. His early academic career started at the Beth Israel Hospital of Boston and Harvard Medical School. Marshall’s success there was rewarded by his eventually being a senior surgeon and Chief of Otolaryngology at the Brigham and Woman’s Hospital of Boston as well as the Chief of Otolaryngology at the Beth Israel Hospital. He then left to become the Chairman of Otolaryngology at the Cleveland Clinic. He is currently a member of the Head and Neck Surgical Group of New York and an invaluable part of the faculty for our Laryngology Fellowship Program of the NY Center for Voice and Swallowing Disorders.

Marshall’s teaching and surgical career has been remarkable. He has changed the lives of countless patients with his thoughtful medical decisions and his skilled surgical procedures. He has taught many of the finest otolaryngologists in the country. Uniquely he in 1998 - Performed first total human laryngeal transplantation;
2004 - Developed new endoscopic approach for laryngeal cancer
2006 - Performed first robotic laser surgery for laryngeal malignancy, and
2006 - Developed new surgical procedure for aspiration
His list of awards are too numerous to recite, but include:
--Medallion of Honor - Society of Facial Plastic & Reconstructive Surgery
-- Sword of Saudi Arabia
-- Pioneers in Organ Transplantation® - The Discovery Channel

He has been on the Council and President of many Otolaryngology Societies including:
The Cartesian Society, SUO, and the ALA. He has served on 13 editorial Boards of medical journals. He is currently a member of the prestigious NIH panel to review all of the Human Transplantation Grants.

His major research interests include: -- Cryotherapy and Laser Excision for Early Stage CA of the Larynx; -- the Effect of Surgical Hypothyroidism on Survival in Patients with
Guest of Honor

Over the past 40 years, Marshall has lectured to medical groups around the world, with many named lectureships and keynote speeches. He has published more than 200 papers, 60 chapters or invited papers, and 4 books. Marshall has served as a leader and an inspiration to many of us. Most of all he is my partner and dear friend.
PRESENTATION OF
THE AMERICAN LARYNGOLOGICAL ASSOCIATION
AWARD
to
LAWRENCE W. DeSANTO, MD
Scottsdale, AZ

Richard Hayden, MD

It is a great personal pleasure for me to make the presentation of the ALA Award to Dr. Larry DeSanto, an esteem colleague and good friend. It is an easy award to make to a true pioneer.

Contrary to popular belief, Larry did not start life as a pilot; he received his Bachelor and Medical degrees at the University of Minnesota. Six months after beginning his residency, Uncle Sam "came" calling. He served as an Air Force squadron flight surgeon in Thailand, Laos, Turkey, Saudi Arabia and New Mexico.

Returning from service, Dr. DeSanto returned to Mayo to complete his residency where he trained more than 150 residents. Larry began practicing otology but it gradually morphed into Laryngology and Head and Neck Surgery. He continued at Mayo in what became a stellar career in Laryngology and Head and Neck Surgery.

Larry migration to Arizona was a significant role where he was a founding member of the Mayo Clinic in Arizona and the first chair of its ENT Department and Professor in the Mayo College of Medicine. This was extremely momentous for me as Larry provided me with such mentoring as he continues to do today, along with his wisdom and experience to residents in the “dessert.” Thank you, Larry and Lora lee for your continuing support and enrichment to the Oto family.

The reason for the award is for the work in microsurgery this man did that was pioneering work in the 1960’s. It is very important to realize that, and many of the young people in the audience will not remember, that in the 1960’s, most manipulations done in larynx were performed under local anesthetic using techniques considered archaic in the larynx. With the mentorship of Ken Devine, Joseph Ogura, and Mike Hinni, Larry was studying the effects of doing a laryngoscopy under general anesthetic. After obtaining the first laser at the Mayo Clinic, Dr. DeSanto practiced, with much criticism, the concept of transoral laser surgery for early laryngeal cancer. He opened many doors to plastic suspension that in turn opened doors: 1) since the patient was under general anesthetic, he could use the now obscure suspension laryngoscope and 2) by using the
binocular view provided by the suspension laryngoscope, he was an advocate of microscope, when wider tubular laryngoscopes had not yet been invented.

Larry’s paper in 1970 on this actual issue of suspension opened many doors. He stated to pry open the door of surgical cynicism in the area of micro-invasive adventures in the upper aerodigestive tract. During the period of the entry of the laser, he closely collaborated with Joe Ogura and Stuart Strong and others in the Boston crowd on doing conservation laryngeal surgery work. Larry’s paper in 1973 on early glottic cancer treatment using micro-invasive techniques made him a headliner in Toronto. When I showed up there, they were still a twitter over the inaugural laryngeal conference Doug Brice has put on in 1974.

That was really when this puppy got inspired about head and neck cancer. If you look at the work that was being done by micro-laryngoscopic and what it brought, you will have to admit, it was an important addition. It branched out the multidisciplinary multi-center database that we use today with TLM that Larry put together. Again he was way ahead of his time, with the first quality of life study for laryngeal cancer patients back in the 70’s before the thought had crossed most minds.

The legacy of what this gentleman has produced for our discipline is pretty evident today and even this week’s meeting. If you look at the rising enthusiasm that you see not only in this room but the room next door regarding micro-invasive techniques for dealing with a multitude of cancers of the upper aerodigestive tract. The result has been astounding.

For the outstanding and valuable contributions Larry has made to our laryngology, we, as a specialty, should be widely grateful. I personally find that his mentorship of stars such as Bruce Pearson, Kerry Olsen, and Mike Hinni have allowed people who came from a more jaded past of more aggressive therapy to really see the light in the millennium.

We are grateful Larry, and it is with a lot of enthusiasm that I welcome you to the ranks of a very esteem group of recipients of this well-earned Award. I thank you and congratulate you.
PRESENTATION OF THE GABRIEL F. TUCKER AWARD

to

Mark Richardson, MD, MScB, MBA

Portland, Oregon

Ellen Friedman, Houston, Texas

It is really a pleasure to be here and I know that John is disappointed that he will be unable to present this award because he does take a great deal of pride in his family’s history and contributions. And he himself received a presidential citation this year with the ABEA and his family continues to be productive in contributing

As it mentions, the Gabriel F. Tucker Award was established in 1987 and it is given to an individual who has made significant contributions to the field of pediatric laryngology or the ALA or both. So it is truly an honor to give this to my close friend and colleague, Dr. Mark Richardson. On this slide, you get to see a photo of Gabriel F. Tucker Sr. and Gabriel F. Tucker, Jr. both of whom were accomplished otolaryngologists. This is an example of the Tucker Award and one of the things that John usually talks about is the incredible detail of this beautiful memorial paperweight or medal. It has a lot of detail and it is quite beautiful and it something that we hope Mark will enjoy and display prominently in his office.

This year’s winner of this Award is Mark Richardson who is a pediatric otolaryngologist as a beginning but he is just so much more. I’d like to tell you a little about him. He completed his residency at the Medical University of South Carolina, a surgical internship at the University of South Florida and returned to MUSC for an otolaryngology residency. Mark completed fellowship training in pediatric laryngology under the leadership of Robin Cotton in Cincinnati and they maintain a close and important relationship to this day. Following his fellowship, he joined the University of Washington faculty in Seattle and he was the University of Washington’s first pediatric otolaryngologist beginning a group which now has grown substantially and is of considerably significance in the academic world. Following his 15 year tenure at UW with Charles Cummings, he followed Charlie to John Hopkins where he spent a considerable amount of time and subsequently becoming the Vice Chairman and the Bordley Professor of Otolaryngology in the Department of Otolaryngology at Hopkins. Dr. Richardson also studied beyond otolaryngology and received a
Master of Science in Business in 1998 and his MBA in 2000 – both from John Hopkins University. This definitely was a great move for him because in 2007, Mark was appointed Dean of the School of Medicine at Oregon Health and Sciences University in Portland, Oregon following a year of services as interim dean.

Dr. Richardson is a member of numerous national organizations including the AAO-HNS, ABEA and ASPO. He has been the recipient of several teaching awards and society presentations.

This gives me great pride because there are very few or a scant number of medical school deans of medical schools around the country who are otolaryngologists and specifically pediatric otolaryngology.

It is truly with great pride, admiration and pleasure that I am able to introduce Dr. Mark Richardson, the 2011 Gabriel F. Tucker Award winner.
Dr. Simonyan received her medical degree from Yerevan State Medical University in Armenia. She then did a residency in Otolaryngology, at the Georg-August University in Göttingen, Germany followed by a PhD degree in Neurophysiology from the University of Hannover, Germany as well as a second Doctor of Medicine degree from Univ of Gottingen.

She then became a visiting fellow at several Universities including Neuroimaging at the Massachusetts General Hospital and at the University of Pittsburgh. Kristina spent five years in the Laryngeal and Speech section at the National Institute of Health.

She currently holds appointments in the Neurology and Otolaryngology departments at Mt. Sinai Medical School in NYC. She has won numerous awards for her work. She is uniquely trained and is a world expert in neuroimaging and neural control of the larynx. She will now explain all of this to us.
In my talk, I want first to introduce you to what we knew before the advent of neuroimaging about the neural control of the larynx, mostly based on electrical stimulation and tract tracing studies. Then, I will talk about current research with the use of different neuroimaging techniques, and finally, I will conclude with some open questions for future research.

As we know, the laryngeal functions are numerous and some of them are vital, such as breathing and swallowing. All laryngeal functions can be divided into three groups, including breathing, respiration, and phonation. Some of these functions, such as breathing, coughing, swallowing, laughing, are innate behaviors that can also be produced on demand. Some of them, for example, speech and song, are only voluntary behaviors, while others, such as sneezing, are only innate behaviors.

The main question I want to focus in my talk today is how the brain controlling voice production.

It appears that central nervous control of voice production is organized in an hierarchical manner that is different brain levels control vocalizations of different complexity. The lowest level within this hierarchical control is represented by the phonatory sensory and motor nuclei and reticular formation of the brainstem (subsystem I). These structures are responsible for the coordination of laryngeal, articulatory and respiratory activities for production of innate vocalizations. An example can be a cry of newborn at birth. This type of vocalization is an innate behavior that does not require prior learning. Even anencephalic infants, who lack the entire forebrain but have an intact brainstem, are able to produce these types of vocalizations. As child growth, these vocalizations become under voluntary control. For example, a child can cry without obvious painful stimulus and suppress crying at the presence of painful stimulus. For this type of vocal control, the brainstem structures need an input from higher subcortical regions, such as periaqueductal gray of the midbrain (PAG). The PAG is positioned to couple external stimuli with internal motivational vocal reactions. It also receives heavy input from the limbic structures, such as hypothalamus, amygdala, red nucleus, to shape the emotional character of vocalizations. The PAG receives input from the anterior cingulate cortex (ACC), which is involved in the voluntary control of emotional vocalizations. When this
region is lesioned in stroke patients, they are able to speak and vocalize but lack emotional intonations of vocalizations. The PAG and ACC together with the limbic input structures form the subsystem II. Finally, the highest level of voice control is represented in the laryngeal/orofacial motor cortex and its input and output projections (subsystem III). This level is involved in the control of such highly skilled and learned vocal behaviors as speaking and singing. When the laryngeal motor cortex (LMC) is lesioned bilaterally in neurological patients, these patients are not able to speak or sing but they are still able to produce some other types of vocalizations, such as grunting, crying, laughing. This indicates the parallel organization of voice production control by the ACC-PAG and by the LMC.

For the remainder of my talk, I want to focus your attention on understanding the neural control of the larynx by the LMC.

Methods to understand neural basis of human behaviors and cognition are based, among others, on brain lesioning studies and neuropsychology; electrophysiology and neuroanatomy; pharmacological and genetic studies; and neuroimaging.

Electrical stimulation measures function of a neuron or a neural network by using excitation of cell membrane with an electric current. It can be direct with penetrating or surface electrodes and indirect with the use of transcranial magnetic stimulation (TMS). Electrical stimulation studies can be conducted in both humans and animals. Neuroanatomical tract tracing assesses connectivity between brain regions by using dyes that are transported along the axons. This transport can be anterograde from the cell body to synapse or retrograde from synapse to the cell body. Because of the invasiveness and toxicity, neuroanatomical tract tracing can be used only in animals and postmortem human brain tissue.

Our first knowledge about the central control of laryngeal movements based on direct electrical stimulation studies comes from mid 1930s. In 1936, German neurologist Oscar Foester was first to report on bilateral movement of the vocal folds with electrical stimulation of the motor cortex. A year later, in 1937, Wilder Penfield and colleagues described vocalization representation in the motor cortex of a man. In 1950s and 1960s, Woolsey and others observe similar larynx representation in the motor cortex of the monkey, while Hast and others were not able to confirm the motor cortical larynx representation in the dog and cat.

Hast and colleagues were further able to map the representation of separate laryngeal muscles in the motor cortex of the rhesus and squirrel monkeys by using direct electrical stimulation with simultaneous laryngeal EMG. They reported, however, the laryngeal muscle representations in the premotor cortex (area 6) with the TA and CT response times ranging between 20 and 40 ms. Almost 30 years later, with the use of TMS, two studies were able to identify the TA and CT representation in human motor cortex. In contrast to the monkey, they reported the muscle representations in the primary motor cortex (area 4) with faster TA and CT response times, ranging between 7.3 and 11.3 ms.

While most of neuroanatomical studies have been conducted in non-human primates with only 2 studies in human postmortem tissue, it has been hypothesized that humans and non-human primates share similar laryngeal motor cortical networks, except the direct projection between the LMC and nucleus ambiguus of the brainstem, where the laryngeal motoneurons reside.

In summary, the larynx representation within the primary motor cortex and its direct connection with the nucleus ambiguus may have enabled faster neuronal transmission for
the direct control of vocal gestures for speech and song production.

In contrast, the larynx representation within the premotor cortex and its indirect connections with the nucleus ambiguus in non-human primates may explain their limited ability to learn and control their vocalizations voluntarily.

Our knowledge about the neural control of the larynx would have probably stopped here if not for the advent of neuroimaging. Neuroimaging is unique: while most of the other techniques permit examination of only one neural entity at a time, brain imaging allows the study of the whole brain at once. Neuroimaging is based on hemodynamic-metabolic methods, such as functional MRI (fMRI) and positron emission tomography (PET); neuroanatomical methods, such as high-resolution MRI and diffusion tensor imaging (DTI); electromagnetic methods, such as electroencephalography (EEG) and magnetoencephalography (MEG).

PET measures brain function, metabolism, neurotransmission, and other neurochemical pathways by using positron emitter decay resulting into 2 gamma rays. It has low temporal resolution (about 30-60 sec) with spatial resolution of 5-10 mm. FMRI measures brain function by using magnetic properties of oxygen: deoxygenated hemoglobin is paramagnetic, while oxygenated hemoglobin is diamagnetic. FMRI has also low temporal resolution of about 5 sec with spatial resolution of a few mm.

High-resolution MRI measures brain structure, such as gray matter volume, cortical thickness, etc., by using radio waves to interrogate protons in water molecules. It can have a very high spatial resolution. DTI measures the organization of white matter by using water molecule displacement along the axons. It also can be of very high resolution.

These neuroimaging methods can safely be used in both humans and animals.

Almost half a century after the seminal work by Penfield and others, neuroimaging studies starting from early 2000s looked into mapping of the laryngeal representation in humans to confirm the results of TMS studies. A series of studies by different groups have been conducted with the use of different laryngeal tasks, such as speech, singing, coughing, sniffing, production of syllables and glottal stops, whisper, whimper, in order to map the larynx in the human motor cortex. These studies were able to identify a more discrete region within the human primary motor cortex (area 4p) for the larynx representation as an organ compared to a much wider region for vocalization representation as a behavior mapped by Penfield and colleagues.

Compared to the rhesus monkey, the human larynx representation appears more dorsally from the Sylvian fissure in the primary motor cortex.

Let’s look now into the functional and structural organization of this region in humans by considering two major laryngeal functions, breathing and speaking.

In an fMRI study of syllable and breathing production in healthy human subjects, we see that both these tasks activate similar brain regions and this activation is fairly bilaterally distributed over both hemispheres. However, compared to breathing, voice production elicits larger brain activation in the auditory cortex, while the PAG is active during voice production only.

To understand how the functional networks of the LMC are organized during production of syllables and breathing, we used functional connectivity analysis (psycho-physiological interactions analysis). We found that despite the bilateral brain activation during both syllable and breathing production, the functional LMC networks controlling syllable
production are left lateralized, while functional LMC networks controlling breathing have bilateral distribution without hemispheric lateralization.

In contrast to this, structural LMC networks (assessed using DTI and tractography) controlling both syllable and breathing production are bilaterally distributed without hemispheric lateralization.

These findings suggest that functional networks controlling different laryngeal functions are built upon a common bilateral structural network of the LMC. Bilateral organization of functional networks controlling breathing supports its indispensable role in all types of laryngeal behaviors, whereas significant left-hemispheric lateralization of functional networks controlling simple but highly learned syllable production suggests their role in production of speech.

While, through all these studies, we start to understand better how neural control of the larynx is organized in humans, we still don’t know much about the neurochemical underpinnings of speech control. Our only knowledge comes from the studies in songbirds and neurological patients. The LMC receives a number of excitatory (glutamatergic), inhibitory (GABAergic) and modulatory (dopaminergic) inputs. In a study in healthy human subjects, we started exploring the dopaminergic control of speech production.

We asked the subjects to first rest in the PET scanner for some time and then produce short English sentences. We examined their dopamine levels during resting and speaking with the use of [11C]raclopride, a D2/D3 receptor antagonist, which is being replaced by newly released dopamine during task production. We found that speaking was associated with increased dopamine release in the bilateral dorsal caudate nucleus, left posterior caudate nucleus and left dorsal and posterior putamen. We further found that dopamine release in the left dorsal putamen is significantly correlated with the brain activation in the same region during speech production. This suggests left lateralized coupling between dopamine release and striatal activation during normal speech production, which may underlie the left lateralization of brain networks during speech and syllable production.

In summary, compared to non-human primates, the human larynx is represented in the primary motor cortex (area 4) more dorsally from the Sylvian fissure. Functional but not structural networks of the human LMC show left hemispheric lateralization during production of learned syllables but not innate breathing. Dopamine release during speech production is lateralized to the left striatum and is coupled with striatal activation.

Finally, there are several unknowns regarding the central control of the larynx. Some of them include:
- Representation of the larynx in the primary somatosensory cortex;
- Characterization of subcomponents of the laryngeal motor cortical networks in non-human primates, healthy humans and patients with neurological voice and speech disorders;
- Organization of functional laryngeal motor cortical networks during different laryngeal behaviors;
- Interactions between laryngeal motor cortical and limbic pathways of voice control;
- The temporal characteristics of the LMC activity;
- The role of neurotransmitters (GABA, dopamine, glutamate) in voice and speech control.
INTRODUCTION OF THE STATE OF THE ART LECTURER

STEVEN M. ZEITELS, MD, FACS

ANDREW BLITZER, MD, DDS

Dr. Zeitels is originally a New Yorker who went to Boston where he received his undergraduate and medical degrees from Boston University. He then trained in Otolaryngology at the combined BU/Tufts program. It was during these years that he developed skill and knowledge in lasers for surgery from Stuart Strong, Charles Vaughn and Geza Jako. After his residency he stayed and did a year fellowship in Head and Neck Oncology and then joined the BU academic department where he remained until 1990 when he moved to the Harvard Medical School.

He is currently the Eugene B. Casey Chair of Laryngeal Surgery, in the Department of Surgery and a Visiting Surgeon in the Division of Thoracic Surgery. Steve is the Director: Center for Laryngeal Surgery and Voice Rehabilitation - Massachusetts General Hospital and the Director of a Laryngology Fellowship Program at the Mass General Hospital. He is a member of 21 Medical Societies and has held many offices including President of the ABEA and Vice President for the History of Otolaryngology Society. He has scores of honors and named lectureships bestowed upon him including the Casselberry Award from the ALA; the Chevalier Jackson Lecturer for the ABEA; and the Broyles-Maloney award from the ABEA.

Steven has lectured on various laryngeal surgical topics worldwide. He is a avid student of the history of our craft, he surrounds himself with partners from other disciplines such as cancer research, engineering, computers, and angiogenesis research, so that he can learn from others to make his work the best. He is honest and diligent about his work.

Dr. Zeitels’ current research includes the use of 532 lasers for vascular lesions and premalignant lesions; use of avastin for papillomas and premalignant lesions; biomaterials for the regeneration of vocal folds; and optical coherent tomography. Steve is really the true renaissance scholar -- he is historically well versed; develops new ideas, learns from others, collaborates for the betterment of the specialty, teaches, publishes, and always shares knowledge. He is indeed my great friend.
STATE OF THE ART LECTURE

Current and Future Directions in Laser Surgery of the Larynx

Steven M. Zeitels, MD, FACS

Boston, Massachusetts

I would like to begin this presentation by expressing my appreciation to Dr. Blitzer and the council of the American Laryngological Association for providing me with the opportunity to share my perspectives on the current and future directions in laser surgery of the larynx. I have been remarkably fortunate to have been trained by those who pioneered laser surgery. I would like to thank Geza Jako, Stuart Strong, and Charles Vaughan for their mentorship and for reviewing the origins of laser surgery. They provided key material for this lecture so that I might provide you with their insights about this exciting period of innovation, which laid the foundation for many of our current approaches to endoscopic laryngeal surgery.

Since the introduction of lasers to medicine in the 1960s, there has been an inextricable linkage between lasers in medicine and their use in Laryngeal Surgery. Consequently, laser development has provided a catalyst for substantial innovation in laryngeal surgery over the past 50 years. In 1966, Geza Jako [1, 2] partnered with Thomas Polanyi [3] to initiate mammalian investigations with a carbon dioxide (CO\textsubscript{2}) laser. Jako, who had previously introduced microlaryngeal surgery [4], was an intrepid innovator. He had the foresight to realize the importance of the technical advantages lasers provided for soft-tissue dissection, as well as the heuristic value to train surgeons in microlaryngeal surgery who were having difficulties with the new art due to the need for controlling microlaryngeal hand-instruments with their non-dominant hand under high magnification. The research team was completed [5] when Stuart Strong [6, 7] and Charles Vaughan [8, 9] joined Jako and Polanyi. The three pioneering surgeons were well aware that minimally-invasive surgery had its origins in Laryngology [10] and that over time more procedures would be done employing advances in laser technology. Furthermore, they espoused the philosophy of Jacob Solis Cohen [11] (America’s first head and neck surgeon and 2\textsuperscript{nd} president of the ALA) who made clear in the 19\textsuperscript{th} century that to optimally manage laryngeal disease, an individual must be equally skilled in transoral and transcervical surgical techniques.

The initial application for the CO\textsubscript{2} laser was to ablate or resect epithelial diseases (dysplasia [12], papillomatosis [13], cancer [7-9, 14]) and these disorders still comprise the majority of cases best suited for laser use today. Benign phonatory mucosal lesions (nodules, polyps, cysts) are generally better removed with cold
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instruments as a subepithelial resection approach. [15-17] The CO$_2$ laser results in unavoidable heating of the underlying pliable delicate superficial lamina propria [18] and the overlying normal epithelium. This precluded an optimal subepithelial resection predisposing to deleterious effects on phonatory mucosal wave propagation and voice production. In the latter 20th century, academic camps created synthetic conflict suggesting unidimensional support of cold instruments versus CO$_2$ laser when performing phonomicrosurgery. In fact, Jako had initiated both approaches to be synergistic and complementary not competitive.

Over the past 15 years, angiolytic lasers (532 nm Potassium Titanyl Phosphate (KTP) laser and 532 nm Pulsed-Dye laser (PDL)) have facilitated great advancements in laryngeal surgery. These lasers were designed based on Rox Anderson’s seminal theory of selective photothermolysis [19-21] a concept that he developed to enhance the treatment of vascular malformations in infants’ skin. Accordingly, as we initiated intensive collaboration with Anderson, he noted the similarity of the therapeutic goal in treating an infant’s dermis and a human vocal fold, ‘maintaining pliability’. Bower et al [22] and McMillan et al [23] reported early experience with the yellow-light 585 nm PDL for treating recurrent respiratory papillomatosis (RRP). We subsequently reported a substantially larger experience [24] and broadened the application by treating dysplasia [25], cancer [26], ectasias, and varices. [27] The fiber-based delivery systems of the angiolytic lasers allowed for initiation of office-based laryngeal laser surgery with local anesthesia, which was a key innovation in laryngeal surgery. [28, 29] Office-based laryngeal laser surgery had been previously conceived by Blitzer et al [30] with the CO$_2$ laser but the effort was not continued due to difficulties with the technology.

We abandoned use of the CO$_2$ laser when the Thulium laser [31] was introduced, which offered soft-tissue treatment characteristics of the CO$_2$ laser but employed a .3mm -.6mm fiber. About the same time, a retrofitted wave-guide was introduced for the CO$_2$ laser [32] which many surgeon use today for endolaryngeal cancer surgery.

Because of key advantages of the 532 nm KTP laser, we have not used 585 nm PDL since 2005. These advantages of the KTP laser are well delineated in the literature [33-35] but are highlighted by the: 1. ability to greatly vary pulse-width even to continuous wave, 2. ability to use substantially smaller fibers (.3mm versus .6mm), 3. reliability (solid-state technology). These advantages result in greater precision and facility, which is invaluable in the challenging scenario of awake office-based laryngeal surgery. These advantages can be easily seen and taught by using the chick chorioallantoic membrane [36, 37], which is an effective economic live perfusing model that simulates the microcirculation of human vocal folds.

Moreover, the KTP laser has become our most commonly-used instrument in transoral laryngeal surgery. We reported our one-year utilization in 2009, which revealed that of the 324 microlaryngoscopic procedures and 386 office-based procedures, 50% were done with the KTP laser. [38] The KTP laser has proven to be remarkably versatile since its settings can be adjusted to effectively involute ectasias and varices of singers while also being very effective for treating extensive carcinoma.

KTP laser treatment of glottic cancer has allowed us to maintain cure rates of ~95% for T$_1$ disease and >85% for T$_2$ lesions, while achieving our best voice results to date. This has been accomplished by treating bilateral disease in a staged
fashion taking care to preserve anterior-commissure architecture and employing ultra-narrow margins. [26] This is done by observing the difference in combustion of angiogenic malignant tissue as compared with normal soft tissue of the vocal fold. We believe that vocal folds (early disease) are a privileged site due to an extremely low incidence of regional and distant metastasis as compared with other sites of the upper aerodigestive tract cancer. This biological difference allows for two-staged treatment, which provides a key advantage for achieving a better vocal outcome. Since curing early glottic is not difficult with any adequate treatment, voice outcome and preservation of future treatment options (e.g. radiation) are the key metrics for success. To date, we have treated over 150 patients with KTP laser treatment and the majority have greater than three-year follow up.

The near-term and mid-term horizon for employing laser technologies to further enhance laryngeal surgery is promising. Integrating fiber-based laser technologies should soon improve the growing advancements in transoral robotic surgery. [39] Laser technologies will also likely provide subepithelial softening of scarred vocal folds, which will allow for injectable implants to restore vocal-fold mucosal pliability, the primary mechanical deficit responsible for the majority of unresolved hoarseness. [40, 41] Finally, it is likely that there will be further integration of antiangiogenesis pharmacological agents with angiolytic lasers, which will lead to more effective treatment of epithelial diseases of the larynx. [42]

References


State of the Art Lecture


INTRODUCTION OF THE THIRTY-SEVENTH DANIEL C. BAKER, JR. MEMORIAL LECTURER CLARENCE T. SASAKI, MD

ANDREW BLITZER, MD, DDS

The Daniel C. Baker, Jr. Lectureship was established in 1975 by the Baker Family, and Dr Baker’s friends, patients and colleagues, in his memory and in appreciation for his dedication to the field of Laryngology. Dr Baker was President of the ALA in 1974 and a recipient of the Newcomb Award in 1971.

Dr. Sasaki, born in Honolulu, was a Phi Beta Kappa graduate of Pomona College in California, and a prize winning graduate of Yale University Medical School. His surgical training was at UCSF and Dartmouth Med Ctr. He also served as a military surgeon including a tour of war duty in Vietnam. He then trained in Otolaryngology under John Kirchner at the Yale-New Haven Medical Center where he has been since that time, now Professor and Chief of the Section of Otolaryngology. He also did 3 fellowships under the tutelage of Ettore Bocca, Hugo Fisch, and Mr. Dai Davies in London.

He has received many awards for his careful and dedicated teaching and research, including The Edmund Prince Fowler Award for his Triological thesis in 1979; The Casselberry Award from American Laryngological Association; The Broyles-Maloney Award from the ABEA; Guest of Honor of the ALA in 2008; and the Chevalier Jackson Lecturer of the ABEA in 2009. He serves on 11 editorial boards of medical journals. He has been the recipient of numerous NIH and other research grants and has served on a number of study sections for grant reviews. Dr. Sasaki was taught about the airway and airway physiology and disease by his mentor John Kirchner, but then took this knowledge to a whole new level. He has investigated in a meticulous fashion and taught all of us how the larynx and airway work, and how to attempt to fix it when it is not functioning well. He has published 218 original articles; 13 case reports; 70 book chapters; and 8 textbooks. Clarence is the consummate surgeon, scientist, teacher, compassionate physician, and most of all a friend.
First of all, I never dreamed that I’d be up here someday delivering such an important address. As I sat at home thinking about the importance of it all, I asked myself “What would Daniel Baker have to say if he were here in twenty eleven?” Well, here is my version of what he might have done.

As you may know, Dr. Baker served as Chair of Otolaryngology at Columbia Presbyterian for 10 years in the 1970’s………..And by the way, I am indebted to both Lanny Close and Jon Aviv for furnishing me his portrait and bio sketch.

As you may also know, the mystery of the vagus nerve has been a central focus of my professional career for many years......and you may very well have heard my discussion of it in some form before. I am hopeful however that the contained message might be consistent with the thoughts of Dr. Daniel Baker had he the opportunity to complete his ALA Presidency, cut short by his untimely death in 1974.

In that regard, I have chosen to explore the vagus nerve and its evolving relationship to the animal spirits. I will start with a little history of animal spirit-dom, give you a few concrete examples and conclude with a message governing our continued relationship with those very spirits.

And so as our story unfolds, before the dawn of civilization, ancient man recognized, among other things, that certain cervical injuries, including high double vagotomy, invariably produced a lethal effect. Then, it was not uncommon for primitive man to invoke supernatural forces to account for events in the world he experienced. Natural events, such as storms with their lightning and thunder, deadly attacks by wild animals, and the unpredictable and often turbulent behavior of man himself were powers anthropomorphized through the action of spirits, so characterizing all that was either ambiguous or uncertain in the world surrounding.

So back to the vagus. Not surprisingly, history would tell us that Alexandrian physicians in the
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third century B.C. invoked a theory of animal spirits to explain the uncertain actions of nerves. According to theory, animal spirits were thought to be weightless, invisible entities that flowed through hollow nerves to globally mediate bodily functions, such as limb withdrawal, for example, when contacting heat of a flame or one’s changing heartbeat, sleep and awake states, including the lethal effects of bilateral vagal injury.

In the second century A.D. the animal spirits theory was further popularized by the Roman physician Claudius Galen, whose teachings would indelibly dominate our understanding of the nervous system for the next 1,500 years. So you see, Galen believed that nutrients were absorbed by the liver, which then produced “natural spirits”. Such spirits were transported to the heart which transformed them into “vital spirits” which were then carried to the brain to undergo further transformation into so called “animal spirits”. Such spirits were thought to reside in the cerebral ventricles until needed. Transporting animal spirits through the hollow nerves would force muscles into action…..or so the tale went.

For centuries Galen’s doctrine so dominated western culture as if the spirits themselves had taken on an indelible life of their own. When the Belgian anatomist Andreas Vesalius published De Humani Corporis Fabrica in 1543, daring to dispute fundamental Galenic theory, he was branded a heretic and forced to flee to Jerusalem. While even 100 years later, Rene Descartes nevertheless continued to embrace animal spirits in celebrating his new foundation for the biological study of behavior. He would explain that when one is awake animal spirits flowed into the brain causing it to distend while sleep had the opposite effect resulting in shrinkage as animal spirits flowed from it to enter nerves distally.

When did all of this fantasy end, you may ask?

It was not until Luigi Galvani, while sitting in his kitchen, watching his wife preparing frog leg soup, that he observed contractions of the leg muscles of the frog whenever nerves were contacted by his wife’s kitchen shears. He observed unequivocally that animal spirits originating in the brain were in fact not required for muscle contraction, since his wife by now had already deftly separated her frogs’ legs from their bodily attachments. Galvani’s conclusions shook the scientific world, but would his observations and later elegant experiments dispel the curse of Galen? Was the exorcism indeed complete?

Since then, we have been blessed by so many observational advances in our quest to better understand the behavior of nerves. During the last half of the 20th Century, two fundamental properties of nerves were established that changed our collective outlook forever: firstly, the ionic nature of the propagated action potential and secondly the process of axonal transport. By means of a transport mechanism, essential metabolic components synthesized in the nerve cell bodies could be carried through the relatively long length of nerve fibers to preserve and maintain the viability and function of ion channels and pumps.

Axonal flow, seen spilling out at the cut end of this nerve, also provided for the metabolic needs of specialized receptor terminals and the formation of neurotransmitters. These advances, not the fanciful animal spirits of Galen or Descartes, have come to represent the fundamental cornerstones for understanding modern neuroscience and for the rational interpretation of neuropathies and eventually their therapy.

So back to the vagus. This nerve, derived from the Latin to wander, is composed of
sensory and motor fibers exhibiting a more extensive anatomic course and distribution than any other cranial nerve as it wanders through the neck and thorax to the abdomen. Its branches project to the external ear, carotid body, laryngopharynx, esophagus, heart, lungs, stomach and other abdominal viscera. As you know, multiple cross interactions among somatic and visceral vagal functions are commonplace in states of both health and disease.

As we are a society of Laryngologists then, let me provide you a few examples of how systematically derived observations, based on a rich history of physiologic principles, have enhanced our understanding of the vagus nerve in health and ultimately modified our management of certain diseases, animal spirits, of course, notwithstanding. Within the constraints of time, I will present to you several interesting observations you may not fully know about, yet each of them dispelling common legend.

Firstly, a two-year-old boy presents to the emergency room with a barking cough, stridor, and fever. His concerned pediatrician directs the emergency department to place the boy into a cold mist tent to loosen mucus plugs that are responsible for increasing airway turbulence. The E.R. doc shrugs his shoulder in disbelief but complies. Within 20 minutes, work of breathing has eased and all are relieved. Did we loosen secretions or did we selectively stimulate the vagus to render a beneficial outcome?

If one stimulates the superior laryngeal nerve of the vagus by delivering a micro aerosol of water, particle size 6.5 micron, to the supraglottic larynx while measuring phasic bursts of inspiratory activity from the phrenic nerve, a couple of measures are notable. By comparing the upper pair of traces to the lower, the rate of breathing slows 38% from baseline. If we integrate the phrenic EMG signal (seen in the lower traces of each pair), upward slope of the inspiratory phase correlates with tracheal airflow and what do we find? Micro aerosol stimulation of the supraglottic vagus not only slows breathing rate but also decreases tracheal airflow by 47%, clearly benefiting our patient with airway obstruction due to turbulent airflow of croup.

This interesting response, however, is blocked if one topically anesthetizes the larynx with 2% tetracaine, the bottom pair of traces showing no measurable difference over baseline above. Selectively stimulating the tracheobronchial mucosa distal to the larynx, on the other hand, also produces no measurable change over baseline.

So, our ability to selectively stimulate vagally mediated supraglottic mucosal receptors with aerosolized water suggests that the larynx, at times itself, serves as a sensory organ in respiratory control. By the way, stimulating with water or saline micro aerosol produces identical results. The likely vagal receptors involved are therefore supraglottic mechanoreceptors rather than specialized mucosal chemoreceptors, dispelling, once and for all, the implausible legend of mucous plugs in viral croup.

Another example. An established surgeon, a veteran of many years’ experience, removes a laryngocoele but inadvertently injures the internal branch of the superior laryngeal nerve. Knowledge that this damaged branch of the vagus is purely sensory, reassures him that his patient will suffer no serious consequence.

Shortly thereafter, when his patient experiences multiple aspiration events, she is told that unilateral deafferentation may produce a small sensory field defect that will eventually rectify itself. Is our surgeon entirely correct? Is there any help around the corner?
By creating a model of unilateral superior laryngeal nerve section, we measured glottic closing force by dropping a pressure transducer between the cords as we electrically stimulated the superior laryngeal nerves. In a control intact model, the mean glottic closing force measures 276 mm Hg. After unilateral superior laryngeal section, glottic closing force unexpectedly drops to 149 mm Hg. Expressed as percentage reduction, if control closing force is represented as 100%, closing force after superior nerve section drops to as much as 54% of control. Clearly, creating a much weaker response.

The following explanation may be helpful. Each superior laryngeal projects to its ipsilateral and contralateral nucleus ambiguus through its ipsilateral solitary nucleus. This results in the combined simultaneous activation of motor neurons not only on the same side, but also on the other. In this organizational model, injury to one superior nerve, while preserving bilateral reflex cord adduction, takes out almost half of the combined adductor neurons. In other words, four motor neurons are reduced to two! The resultant 50% reduction in active neurons supports a calculable reduction in glottic closing force, perhaps the cause of repeated aspiration events in our patients.

But, is there help around the corner? We are also aware that medialization thyroplasty carries the capability of restoring up to 57% of glottic closing force and indeed such a procedure greatly reduces our patient’s aspiration events without altering voice quality.

In this, there is an unexpected lesson that could not have been predicted by Grey’s Anatomy alone. Dispelling another legend, unilateral sensory denervation contributes to aspiration by means other than simply creating a sensory field defect. Rather, superior laryngeal injury actually reduces the force of reflex glottic closure to 50% of control, a fact that can be remediated by, of all things, medialization thyroplasty.

Bear with me for another quick example. In the middle of the night, a 4-year-old is emergently evaluated for a foreign body and stridor. She is emergently tracheotomized by the hospital’s ENT resident, saving her life, while removing a foreign body lodged in the vallecula. Weeks later, unable to successfully decannulate the patient, her PCP questions whether collateral injury by the resident is responsible for the worrisome inspiratory stridor experienced by abrupt removal of the trach tube.

A series of observations concerning vagal modulation of phasic vocal cord abduction may shed light on a potentially thorny confrontation. In fact, much of our patient’s response to tracheotomy is governed by vagally mediated control of respiration. If we monitor the phasic EMG activity of posterior muscle in response to varying ventilatory load, we will likely derive the following relevant simple but notable observations.

During spontaneous nasal breathing when ventilatory resistance is judged to be maximal (within physiologic range) seen in the top pair of traces, spontaneous phasic posterior cricoarytenoid activity likewise appears to be maximal corresponding to a negative inspiratory pressure change of 15 mm of water. Approximately three minutes following a change to mouth-breathing (with a drop in ventilatory load), posterior activity decreases in the trace pair below corresponding to a decrease in intra-tracheal pressure change. When spontaneous breathing is shunted through a tracheotomy, abductor activity in the upper trace not only diminishes but completely ceases, as you see, resulting in complete electrical silence.
However, when the tracheotomy is partially occluded and ventilatory load partially re-established, posticus activity slowly recovers as seen in the lower trace. Now, approximately four weeks following tracheotomy, partial trach tube occlusion produces no measurable return of phasic posticus activity. In the lower trace, complete trach tube occlusion at this time induces severe laryngeal inspiratory stridor and cyanosis due to physiologic abductor failure. However, daily incremental reestablishment of ventilatory load successfully reestablishes phasic abductor activity and in this case favoring successful decannulation.

And so, back to the story of the resident and his patient. All are relieved and a potentially thorny misunderstanding successfully dispelled. The parents and PCP are again happy and satisfied and our ENT resident has learned a valuable lesson in vagal control of laryngeal respiratory function. In fact, he goes on to spend much of his career attempting to unravel the mysteries of the vagus nerve in Otolaryngology, even receiving the privilege of delivering today’s Baker Lecture.

I could go on with other tales of fascination with the vagus nerve, had I more time. But now allow me to return to the focus of this lecture.

These kinds of observations, arguably simple and rudimentary, don’t always come easily. First of all, they are observations of clinicians, like these, not basic scientists, and they are made by clinicians who generally reflect a fond appreciation for historical advances shaped by neurophysiologic principles of discovery.

Let me to leave you then with two messages. Firstly, it is true we (that is, our collective membership here) have been responsible for many such advances in understanding the vagal control of breathing, swallowing, and speaking. Further advances will ultimately rest upon continued discovery at the hands of clinicians like you. Why, you may ask? I can tell you from many years of NIH interaction, basic scientists working alone will never enter this field in significant strengths and for good reason. Research methods most effective in the discovery of experimental principles of vagally mediated functions are necessarily physiologic, not molecular and are therefore less attractive to current biological sciences.

But perhaps more importantly, basic scientists are understandably uniformed of clinical questions that arise from daily interaction with our patients. Major advances have therefore always been and will likely continue to be the product of super-clinicians like Sir Victor Negus, Sir Donald Harrison, Joe Ogura and John Kirchner to name a few from our past, each of them having done his part to dispel the curse of animal spirits. So you, my fellow clinicians, are the future of discovery. And, understanding the vagus is key to detection, prevention, and cure of throat disease.

And, now finally back to animal spirits. We all do recognize that systematic discovery is often a slow and caretaking process. Alternatively, it is so tempting for us, like primitive man, to invoke the spirit of neurophysiologic terms and principles to explain ambiguous or uncertain clinical events without adequately testing them, or more concerning, using them to justify therapeutic interventions based on untested beliefs.

What I am trying to say is that today we struggle with animal spirits of a very different shape and color. You have heard at meetings of this kind, terms loosely applied to the vagus such as, aberrant regeneration, synkinesis, paresis, inhibition, even words like sensory collision, all neurophysiologic terms that sound very,
very convincing but if poorly tested sound as much like Galen’s animal spirits to civilized man 2000 years ago.

Has the curse of today’s animal spirits been dispelled once and for all? Was the exorcism of the 1700’s truly complete? Only if we continue to reasonably apply those principles of inquiry defined by scientific process, testing and re-testing each hypothesis until we render them bulletproof. If we don’t, there of course will be no federal bailout. Laryngology is not exactly the City Group or AIG of American medicine. We are NOT too big to fail and there will be no NIH rescue.

As primitive man breathed life into animal spirits to explain the unknown and as our scientific forefathers revived those very spirits to raise the level of interest and credibility in the study of neural behavior, so do we occasionally retreat to embrace those animal spirits whenever confronted with the questionable behavior of the vagus nerve.

For all those residents and fellows joining us from the tops of their graduating classes, beware of today’s animal spirits, those fancy-sounding terms drawn from man’s primeval instincts and loosely applied to events not well understood. By virtue of our position in American Medicine, you are armed with the talent and tools to detect, neutralize, and dispel the curse of those spirits wherever it should appear.
The Effect of Temporary Vocal Fold Injection Medialization Laryngoplasty on the Rate of Permanent Medialization Laryngoplasty in Unilateral Vocal Fold Paralysis Patients

Katherine C. Yung, MD; Ilya Likhterov, MD; Mark S. Courey, MD

Initial treatments for unilateral vocal fold paralysis include observation, voice therapy, or temporary vocal fold injection medialization. If the vocal fold function and voice do not spontaneously improve, permanent medialization is often performed in a delayed manner. The aim of this retrospective chart-review was to determine the effect of temporary vocal fold injection medialization on the rate of permanent medialization laryngoplasty. Demographic information, etiology of paralysis, and treatment information was obtained on 51 eligible patients. Patients were divided into 2 groups based on their election for temporary injection. Demographic information and etiology were similar between the groups. Thirty-five percent (6/17) of patients, who underwent temporary injection, elected for subsequent delayed permanent medialization. In comparison, 61.8% (21/34) of patients treated with observation elected for delayed permanent medialization. This trend suggests that temporary injection medialization reduces the likelihood of patients electing for a permanent intervention. Further study is warranted and ongoing.

Activity Dependent Electrical Stimulation of a Denervated Laryngeal Muscle Can Prevent Synkinetic Reinnervation and Restores Function

David L. Zealear, PhD; Kenichiro Nomura, MD, PhD
Isamu Kunibe, MD, PhD; Akihiro Katada, MD, PhD
Yike Li, MD; Rajshri Mainthia, BS
Cheryl Billante, PhD

A clinical model of laryngeal paralysis was studied in the chronic canine where both laryngeal nerves were sectioned and ventilation compromised. The PCA muscles were implanted with electrodes leading to a pulse generator. Animals were randomly assigned to 3 groups to assess the effect of different stimulus paradigms on reinnervation quality and degree of functional recovery. Spontaneous vocal fold movement was measured endoscopically. Exercise tolerance was measured on a treadmill. EMG potentials were recorded from abductor muscles and adductor muscles during hypercapnic respiration to index reinnervation by inspiratory motoneurons, and during SLN stimulation to index reinnervation by adductor motoneurons. Nonstimulated controls and stimulated 40 pps animals showed paradoxical closure of the glottis during hypercapnea and decreased exercise tolerance due to faulty reinnervation. In contrast, stimulated 10 pps animals showed no paradoxical closure during hypercapnea and normal exercise tolerance. EMG findings demonstrated significantly less faulty reinnervation by foreign adductory motoneurons.
A Cost Analysis of True Vocal Fold Paralysis Secondary to Thyroidectomy

Philip Weissbrod, MD; Michael Pitman, MD

Objectives: To determine the cost to the national economy of the treatment of recurrent laryngeal nerve paralysis related to thyroidectomy. To provide a cost effective treatment algorithm that maximizes patient outcome and minimizes morbidity.

Methods: Cost analysis based on Medicare fees for the treatment of vocal fold paralysis related to thyroidectomy. Cost analysis of primary nerve repair with ANSA cervicalis, injection laryngoplasty, electromyography, type 1 laryngoplasty and lost worker productivity. When applicable, cost of office versus operating room procedures is incorporated.

Results: Traditional methods of management result in costs of $19,469.71 per person. When transection is recognized intraoperatively, optimal treatment costs $2,834.34. When paralysis is noted postoperatively, optimal treatment costs $11,389.78. When applied to a national scale, savings can be conservatively estimated at greater than $7.5 million.

Conclusion: Optimal treatment of vocal fold paralysis after recurrent laryngeal nerve injury minimizes healthcare expenditures, lost worker productivity time, and potential medicolegal claims while decreasing patient morbidity.

Qualitative and Quantitative Laryngeal Electromyography Predicts Motion Recovery in Acute Recurrent Laryngeal Neuropathy

Libby J. Smith, DO; Clark A. Rosen, MD
Christian Niyonkuru; Michael C. Munin, MD

Quantitative laryngeal electromyography (LEMG) adds objective information (turns analysis) regarding extent of neurologic injury. Retrospective review was performed of LEMG data (quantitative and qualitative) after recurrent laryngeal neuropathy (RLN) in patients with clinical vocal fold paralysis and varying degrees of motor unit recruitment. Prognosis was correlated with actual vocal fold motion recovery status (minimum of 6 months following onset) using positive and negative predictive values (NPV, PPV) in patients undergoing LEMG for prognosis analysis with acute vocal fold paralysis. 23 patients underwent LEMG for RLN, including evaluation of recruitment, motor unit configuration, detection of fibrillations, synkinesis testing, and turns analysis. All 4 patients with excellent LEMG prognosis recovered motion, while 17/19 patients with fair/poor LEMG prognosis were without motion, resulting in a 100% PPV and 89.5% NPV. Integrating both qualitative and quantitative LEMG data improves prognostic accuracy in vocal fold paralysis patients who demonstrate voluntary motor unit activity.
Scientific Sessions

Laryngeal Electromyography for Prognosis of Vocal Fold Palsy: A Meta-Analysis

Scott Rickert, MD; Lesley Childs, MD; Tom Murry, PhD; Lucian Sulica, MD

Purpose: Meta-analysis of Laryngeal electromyography (LEMG) for prognosis in cases of vocal fold palsy (VFP)

Procedures: Eight studies reporting LEMG results and clinical outcome in 473 cases of VFP were identified by literature search. Results: 283/473 patients (59.8%) had findings consistent with axonal injury, while 190/473 (40.2%) had voluntary motor unit potentials size and recruitment consistent with recovery. According to laryngoscopic examination, 258/283 of patients with axonal injury had poor recovery (PPV=91.2%) while 25/283 (9.8%) had good recovery. In patients with findings consistent with recovery, 98/190 (NPV=51.6%) noted good recovery while 92/190 (48.4%) noted poor recovery. Odds ratio was 10.993 with 95% confidence interval of 6.69-18.06.

Conclusions: LEMG is a good predictor of poor recovery in patients with VFP and is clinically useful in identifying candidates for early definitive intervention.

Total Resection of the Cricoid Cartilage with Thyrotracheal Anastomosis in the Treatment of Low-Grade Chondrosarcoma of the Larynx.

Andrea Gallo, MD, PhD; Marco de Vincentiis, MD; Antonio Greco, MD; Massimo Fusconi, MD; Giulio Pagliuca, MD, PhD; Salvatore Martellucci, MD, PhD

Objective: To describe a partial laryngeal surgical technique for the treatment of chondroma and low-grade chondrosarcoma of the larynx. These cartilaginous tumours arise within the endolaryngeal structures, primarily from the cricoid cartilage. These tumours are generally treated with total laryngectomies which may be considered an overtreatment since they are low-grade malignancy tumours. A preservative approach would therefore be preferable.

Methods: Three patients with low-grade chondrosarcoma of the larynx underwent total cricoidecтомy. A pexy was performed between the trachea and the residual larynx.

Results: No evidence of tumour recurrence was detected at 3 years of follow-up. One month after surgery all patients were able to tolerate a soft diet and to speak satisfactorily. One patient was ultimately decanulated whereas two patients still have a tracheostomy.

Conclusions: Total cricoidecтомy may obviate the need for total laryngectomy in low-grade chondrosarcoma of the larynx.
Scientific Sessions

CT-Scan Prediction of Thyroid Cartilage Invasion for Early Laryngeal Squamous Cell Carcinoma

Dana M. Hartl, MD, PhD; Guillaume Landry, MD
Francois Bidault, MD; Morbize Julieron, MD
Gérard Mamelle, MD; Francois Janot, MD
Daniel F. Brasnu, MD

Treatment for laryngeal cancer may be influenced by preoperative computed tomography scan (CTs) suspicion of thyroid cartilage invasion. Our aim was to determine its predictive value for tumors treated with open partial laryngectomy. Retrospective study of tumors treated with complete or partial resection of thyroid cartilage. CTs were compared to tumor stage, anterior commissure (AC) involvement, vocal fold (VF) mobility and histopathological thyroid cartilage invasion. Of 236 tumors cT1 (26 %) cT2 (55 %) cT3 (19 %), histopathological thyroid cartilage invasion was seen in 8%. CTs sensitivity was 10.5%, specificity 94%, positive predictive value 13%, negative predictive value 92%. In false-positive CTs, AC tumors were over-represented (61.5% versus 27%, p=.004). Tumors with decreased VF mobility were over-represented in false-negative CTs (41% versus 13%, p=.004). CTs was not effective in predicting thyroid cartilage invasion, overestimating cartilage invasion for AC lesions and underestimating invasion for lesions with decreased VF mobility.

Thyroid Cartilage Invasion in Early-Stage Squamous Cell Carcinoma Involving the Anterior Commissure

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Odile Casiraghi, MD; Patrick Marandas, MD
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Daniel F. Brasnu, MD

The anterior commissure (AC) poses a particular problem due to the proximity of the thyroid cartilage to the mucosa. Our objective was to evaluate incidence and the risk factors for thyroid cartilage invasion in laryngeal cancer involving the AC treated with open conservation surgery. Retrospective study of tumors involving the AC. Tumor stage, extensions, vocal fold (VF) mobility, and pathological cartilage status were recorded. 94 tumors staged cT1b (44%), cT2 (50%), cT3 (6%) were treated using vertical (31%) or supracricoid laryngectomy (69%). Overall, thyroid cartilage invasion was 8.5%. The incidence of cartilage invasion was higher if VF mobility was impaired (31% versus 5%, p=.002), but was not related to supraglottic or subglottic extension, uni- versus bi-cordal lesions, type of surgery or CT scan prediction (P>.05). VF mobility was the only significant factor related to thyroid cartilage invasion and should be taken into consideration when planning surgical resection of these tumors.
Salvage Surgery for Laryngeal Cancer after Failure of Different Organ Preservation Strategies

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Luca Oscar Redaelli De Zinis, MD; Piero Nicolai, MD

INTRODUCTION: Salvage surgery (SS) for persistent/recurrent cancer must act as parachutes after failures of surgical and non-surgical laryngeal preservation strategies.

MATERIAL AND METHODS: 302 persistent/recurrent laryngeal cancers were treated by SS between 1986 and 2007. They had been previously submitted to chemoradiotherapy (CRT/RT) or radiotherapy (Group A), transoral laser surgery (TLS) (Group B), and open neck partial laryngectomies (ONPL) (Group C). SS encompassed TLS, ONPL, and total laryngectomy (TL) with/without postoperative RT/CRT.

RESULTS: Five-year overall, determinate survivals, and organ preservation were 69.5%, 75.3%, and 55.5% for Group A, and 89.1%, 93.5%, and 83.8% for Group B+C (p=0.0001 for every comparison). Major postoperative complications were encountered in 29.3% of patients in Group A versus 7.1% in Group B+C (p=0.001).

CONCLUSIONS: SS can be accomplished using the same tools of primary treatment (TLS, ONPL, TL) even though survivals, complications, and organ preservation are significantly influenced by the previous treatment.

Optical Injector: A Novel Device for Improved Airway Injection

Sanjay Manohar Athavale, MD

Injections of the glottis, subglottis, and trachea are a common procedure used by laryngologists. Generally, airway injection requires two hands, one manipulating a flexible or rigid endoscope and the other manipulating an injection instrument. Due to the constraints of limited visibility, mobility, and time, airway injections can be cumbersome. Therefore, there is a need for a faster and more efficacious means of injecting the airway. A novel device has been created that allows for an injection device to be incorporated with an endoscope, thereby allowing for steady, consistent injections with a single hand. The device has been tested on surgeons of different experience levels and preliminary results show increased speed and efficacy of injections. Additionally, it allows the operator to have a free hand to manipulate a second instrument. With continued modifications and testing, we hope this device will be able to enhance and improve airway injection therapy.
Scientific Sessions

A Multi-Institutional Analysis of Tracheotomy Complications

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Nicole Maronian, MD; John Sinacori, MD
Michael Pitman, MD; Sid Khosla, MD
Dale Ekbom, MD; Albert Merati, MD

Objectives: This multi-institutional hospital-level study aimed to provide detailed information about the factors associated with tracheotomy intra-operative and post-operative complications.

Methods: Eight academic institutions contributed. Data was collected on consecutive tracheotomy procedures at each institution, with patient comorbidities, surgeon, technique, postoperative management, early complications (within first week), late complications (beyond first week), and outcomes recorded.

Results: Detailed information on over 1100 tracheotomy procedures was obtained from eight academic institutions. Otolaryngologists performed 68% of the tracheotomies. There were significant differences in preferred technique at different institutions. Early and late complication rates were 9% and 12%, respectively. Certain intraoperative and perioperative management factors were identified that were associated with increased complication rates.

Conclusion: This study identified specific hospital-level management factors associated with increased complications. Findings, in conjunction with national-level database information, will be important in establishing evidence-based guidelines.

Partial Posterior Cricoid Plate Removal for Wide Interarytenoid Distance

Nicolas Maragos, MD

The open posterior glottis may affect voice and swallow. Procedures used to improve posterior glottic closure include arytenoid adduction and arytenoid fixation (adduction arytenopexy). When the interarytenoid distance is great and other procedures fail, removal of a vertical strip of posterior cricoid plate may be beneficial. We identified nine patients between March, 2006 and August, 2010 with an abnormally wide interarytenoid distance. Etiologies included cricoarytenoid joint fixation, laryngeal/neck/head trauma, and congenital abnormality. Surgical approach includes tracheostomy, thyrotomy, removal of a vertical strip of posterior cricoid plate, bilateral disruption of the cricothyroid joints, and cricoid stabilization with an external titanium plate. All patients self-decannulated within 3-6 weeks post-op with voices stronger and easier to produce after healing. Partial posterior cricoid plate removal is offered for improving posterior glottic closure in patients’ recalcitrant to other surgical options.
Scientific Sessions

Voice Outcomes Following Adult Cricotracheal Resection

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Introduction: Cricotracheal resection (CTR) is an effective treatment for moderate-to-severe laryngotracheal stenosis (LTS) in adults. However, voice outcomes following this procedure have rarely been reported.

Methods: Acoustic, aerodynamic, stroboscopic, and Consensus Auditory-Perceptual Evaluation of Voice (CAPE-V) data were reviewed for consecutive adult patients following CTR between 2000-2010.

Results: Thirteen patients (median age 43 years, 85% female) underwent postoperative evaluation and had a mean overall CAPE-V score of 52/100, mean fundamental frequency (F0) of 156.7Hz, estimated subglottic pressure of 8.3kPa, and an average airflow of 213Liters/minute. Six patients underwent pre- and postoperative evaluations and had a significant reduction in F0 (205.3vs.157.7, p=0.03), but not in median intensity, range, pressure, or flow. Overall CAPE-V scores worsened, but did not reach statistical significance (14vs.59, p=0.25).

Conclusions: Although CTR is an effective treatment for adult LTS, the current study indicates that CTR has significant ramifications on voice outcome. Patients should be counseled about these potential voice alterations preoperatively.

Raised Intensity Phonation Compromises Vocal Fold Epithelial Barrier Integrity

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Nicholas Echemendia, BS; Mahalakshmi Sivasankar, PhD

We investigated the hypothesis that 30-minutes of raised intensity phonation alters transcript levels of vocal fold intercellular tight junction (TJ) proteins and disrupts the epithelial barrier. Eighteen New-Zealand-White rabbits were randomly assigned to receive 30-minutes of raised intensity phonation or vocal fold approximation without phonation. Quantitative polymerase chain reaction was used to investigate transcript levels of the TJ proteins, occludin and zonula occludin-1 (Z0-1), and the adherens junction proteins β-catenin and E-cadherin. Structural alterations to the epithelium were further examined by scanning electron microscopy (SEM) and transmission electron microscopy (TEM). Mann-Whitney U revealed significantly decreased occludin (P = .016) and β-catenin (P = .016) from rabbits undergoing raised intensity phonation, compared to control. There were no significant differences in ZO-1 and E-Cadherin (P >.025). SEM revealed significant obliteration, desquamation, and evidence of microhole formation in vocal folds exposed to raised intensity phonation, while TEM revealed dilated intercellular morphology between groups.
Scientific Sessions

Regeneration of Aged Vocal Folds with Basic Fibroblast Growth Factor: Results of Clinical Trial

Shigeru Hirano, MD; Ichiro Tateya, MD, PhD
Yo Kishimoto, MD; Satoshi Ohno, MD
Tsuyoshi Kojima, MD; Shin-ichi Kanemaru, MD

Objectives: Aged vocal fold is characterized by atrophy of the mucosa which causes glottal insufficiency. The present clinical trial examined regenerative effects of basic fibroblast growth factor (bFGF) on restoration of aged vocal folds.

Methods: Ten patients (6 men and 4 women, mean age of 70.1 years) were recruited in the trial. Ten microgram of bFGF was injected into one vocal fold. Injection was performed unilaterally or bilaterally accordingly, and repeated if necessary up to 7 times. The patients were followed up at least for 6 months. The effects were assessed by acoustic and aerodynamic measurements.

Results: All patients showed improvement of voice. Maximum phonation time, mean flow rate, jitter, and noise-to-harmonic ratio indicated significant improvement up to 1 year, although shimmer did not reach to significant improvement point.

Conclusion: The clinical trial demonstrated that bFGF has a significant role in regenerative effects for aged vocal folds.

Glucocorticoids and the Vocal Fold Mucosa

Ryan C. Branski, PhD; Hang Zhou, MD, MS
Mahalakshmi Sivasankar, PhD; Milan Amin, MD; Dennis H. Kraus, MD

Introduction-Office-based procedures are increasingly common. The utility and efficacy of glucocorticoid (GC) injections have been reported for a variety of conditions. We seek to provide mechanistic insight into GC activity in the vocal folds.

Procedures- The presence/density of the GC receptor in the rat vocal fold was determined immunohistochemically. Human vocal fold fibroblasts were also treated with dexamethasone (DM), with emphasis on ECM metabolism.

Results- The GC receptor is densely distributed in the vocal fold epithelium and capillary walls, with diffuse staining in the lamina propria. Fibroblast expression of the GC receptor decreased as function of increased DM. DM decreased fibroblast proliferation and collagen synthesis. DM also appears to modulate collagen metabolism via regulation of MMP and TIMP secretion.

Conclusions-These data provide preliminary mechanistic insight into this evolving treatment modality, suggesting that steroids have significant matrix-based effects, beyond the expected anti-inflammatory actions.
Western Blot Confirmation of the H+/K+-Atpase Proton Pump in the Human Larynx and Submandibular Gland

Kenneth W. Altman, MD, PhD
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David Burstein, MD; James A. Radosevich, PhD

Purpose: We previously demonstrated the H+/K+-ATPase (proton pump) in human larynx and lung glands via immunohistochemistry (IHC). The present hypothesis is that the proton pump exists in other seromucinous glands, and confirms IHC findings with western blot analysis.

Methods: Fresh human tissue comprised 3 submandibular glands, 4 larynges, and 3 normal stomach controls. Submandibular gland was immunostained with two monoclonal antibodies selectively reactive with alpha or beta subunits. Western blot analysis was performed on all specimens.

Results: The submandibular gland revealed positive IHC for alpha and beta subunits. Western blot for the 100kDa alpha protein was present for all larynx and submandibular gland specimens. The 60-80 kDa glycosylated beta subunit protein, and the 52 kDa precursor were also present for all specimens.

Conclusion: This presence may play an important role in acid-base balance of tissue exposed to laryngopharyngeal reflux (LPR), and be a potential target for proton pump inhibitor pharmacotherapy.

Sendai Virus-Mediated Transgene Expression in the Larynx

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Mamoru Hasegawa, PhD; Akihiro Shoitani, MD
Koji Araki, MD, PhD

Introduction: The potential for gene therapy to be an effective treatment for laryngeal impairments has been hampered by the genotoxic potential of current viral vectors. Sendai virus (SeV) vector is expected to be safer than DNA viral vectors like adenovirus, because SeV is an RNA virus, of which the transfected genome is located exclusively in the cytoplasm and does not go through a DNA phase. In addition, the high gene expressions have been noticed in many tissues including the airway epithelial, muscle, inner ear and neural tissues.

Methods: GFP expression was evaluated after direct aerosolized administration of the recombinant SeV vector expressing GFP into the rat larynx.

Results: Efficient GFP expression was observed not only in vocal cord epithelium but also in Reinke's space.

Conclusions: SeV is a useful and convenient vector which has potentials to be a promising strategy for gene therapy for laryngeal impairment
Bioengineered Prosthesis with Fibroblasts for Cricoid Regeneration

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Mituyoshi Imaizumi, MD; Akiko Tani, MD
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Introduction: Our group reported an artificial prosthesis for airway reconstruction. This prosthesis was applied to human cases, and postoperative courses were almost satisfactory except that it took two months for the prosthesis to be covered by epithelium. Our group reported that a bioengineered prosthesis with fibroblasts was effective in rapid regeneration of trachea in rat and rabbit model. The purpose of this study is to evaluate effects of the bioengineered prosthesis on regeneration of larynx.

Procedures: Collagenous solution with rat dermal fibroblasts was infiltrated into the piece of the prosthesis and gelatinized. The piece of bioengineered prosthesis was implanted into cricoid defects of rats.

Results: After reconstruction, epithelial and subepithelial regeneration of cricoid defects with bioengineered prosthesis were more rapid than that with artificial prosthesis only.

Conclusions: It was suggested that bioengineered prosthesis with fibroblasts was effective in rapid regeneration of larynx.

Cervical Variation of the Phrenic Nerve

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Elena Stark, MD, PhD; Gerald S. Berke, MD
Jonathan J. Wisco, PhD; Abie Mendelsohn, MD

Objectives: Reinnervation of the posterior cricoarytenoid muscle with a phrenic nerve (PN) root has been shown to restore physiologic motion in animal models. Translation to humans is limited by the knowledge of PN anatomy.

Methods: Dissection of 112 cadaveric necks (89 embalmed and 23 fresh).

Results: Length of fresh cadaver C3, C4, and C5 nerve roots was 3.9 +/- 2.4, 3.6 +/- 2.6, 0.5 +/- 0.8 cm, respectively. Embalmed cadavers had shorter C3 and C4 PN root lengths than unembalmed cadavers (p = 0.02 and p = 0.03, respectively). Nine PN root patterns were identified. The most common pattern was single C3/C4 contributions with an immeasurable C5, present in 30/112 (27%). 25/112 (22%) demonstrated single C3/C4/C5 contributions.

Conclusions: There is wide variability within the anatomy of the PN. Additional study is required to identify predictive factors for viable donor nerves in cases of bilateral vocal cord paralysis and laryngeal transplantation.
High-Speed Videoendoscopic Analysis of Relationships between Cepstral-Based Acoustic Measures and Voice Production Mechanisms in Patients Undergoing Phonosurgery

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Dimitar D. Deliyski, PhD; Robert E. Hillman, PhD; Susan Thibeault, PhD

There is increased interest in using cepstral-based acoustic measures for objective clinical voice assessment because of apparent advantages over more time-honored methods, but there is a paucity of information about how these newer measures relate to underlying phonatory mechanisms. Relationships between the cepstral peak prominence (CPP) and high-speed videoendoscopy (HSV)–based measures of vocal fold phonatory function were investigated in 20 subjects who underwent phonosurgery for vocal fold lesions. Results based on changes in measures between pre-surgical and post-surgical assessments showed that CPP correlated significantly with an HSV-based measure combining fundamental frequency deviation and speed quotient (r = –0.70, p < 0.001) and that variation in CPP could also be attributed to trading relationships between HSV-based measures of vibratory phase asymmetry and glottal closure. These initial results demonstrate that the clinical utility of cepstral-based measures can be enhanced by a better understanding of how these measures relate to underlying phonatory mechanisms.

Genetic Characterization of Pre-Malignant and Malignant Vocal Fold Lesions

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Malignant transformation of laryngeal keratosis has been reported in 1-40% of patients (1-2), yet reliable criteria for predicting patients most at risk have yet to be determined. Diagnoses are traditionally made clinically and with histopathology, and errors in biopsy sampling and interpretation are common. In an effort to elucidate genetic markers distinguishing premalignancy from malignancy, we used qPCR to compare expression of 84 cancer pathway genes of patients histologically diagnosed with nondysplastic epithelium with keratosis (ND=7), keratotic dysplasia (DY=3), and invasive carcinoma (CA=7). All patients had a clinical diagnosis of leukoplakia and/or erythroplakia, and biopsies were obtained from true vocal fold tissue. Expression of matrix metalloproteinases (MMP1, MMP2, MMP9) were found to statistically differentiate the groups (p<.01), suggestive of a critical pathway for extracellular matrix degradation in laryngeal oncogenesis. These preliminary data represent genetic expression markers with the potential to stratify patients into prognostic categories, and ultimately guide treatment. REFERENCES 1. Bouquot JE, Gnepp DR. Laryngeal precancer: a review of the literature, commentary, and comparison with oral leukoplakia. Head Neck. 1991; 13(6):488-97. 2. Silamniku B, Bauer W, Painter C, Sessions D. The Transformation of laryngeal keratosis into invasive carcinoma. Am J Otolaryngol. 1989; 10(1):42-54
Laryngeal Dysplasia: Role of Human Papillomavirus in Nonsmokers

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Anna Marta Degener, PhD; Alessandra Pierangeli, PhD
Salvatore Martellucci, MD; Marco de Vincentiis, MD

Objective: A synergistic effect between smoking and alcohol intake is the major cause of premalignant and malignant lesions of the larynx but the risk factors and pathogenesis of the neoplastic transformation in nonsmokers remain poorly defined. The aim of this retrospective study is to establish the relationship between smoking habits and HPV infection in laryngeal dysplasia.

Methods: HPV DNA was amplified from 30 paraffin-embedded laryngeal dysplasia tissue specimens by the polymerase chain reaction (PCR) using two groups of different consensus primers. 15 samples were taken from smokers and 15 from nonsmokers.

Results: The present investigation failed to demonstrate HPV genome in all samples of laryngeal precancerous lesions.

Conclusions: The absence of viral genomes in laryngeal dysplasia specimens of smokers as well as nonsmokers suggests that other factors play a more important role than HPV infection in the carcinogenesis of these lesions, being that laryngopharyngeal reflux is the most implicated risk factor.

Extra-Esophageal Reflux & Surgical Fundoplication: What Parameters Predict Symptomatic Improvement?

David O. Francis, MD; Marion Goutte, BS
James C. Slaughter, PhD; C. Gaelyn Garrett, MD
Michael Holzman, MD; Michael F. Vaezi, MD, PhD

Introduction: The role of surgical fundoplication in patients with refractory extra-esophageal reflux (EER) symptoms is controversial. This study investigates the importance of baseline patient demographic and physiologic parameters in response to surgery.

Methods: Of 350 patients with EER symptoms refractory to medical therapy who had esophageal function testing, 27 patients with objective gastroesophageal reflux disease underwent fundoplication surgery. Logistic regression determined which parameters predicted improvement of presenting symptom.

Results: Symptomatic improvement occurred in 59% of patients’ 1-year post-operatively. Predictors of improvement were concomitant heartburn +/- regurgitation (OR 6.6, 95% CI 0.97 – 44.9, p=0.05) and pH<4 greater than 12% (OR 10.5, 95% CI 1.36 – 81.1, p=0.02). Probability of improvement was 90.6% if both conditions were present. On PPI therapy, impedance parameter did not predict response to therapy.

Conclusion: Baseline concomitant heartburn +/- regurgitation and esophageal pH<4 greater than 12% are predictors of post-operative improvement of presenting EER symptoms, not impedance measures.
Scientific Sessions

Efficacy of Large Diameter Dilatation in Cricopharyngeal Dysfunction

Matthew S. Clary, MD; Scott Keith, MD
Maurits Boon, MD; Joseph R. Spiegel, MD

A retrospective chart review was performed on 49 patients meeting the criteria for cricopharyngeal dysphagia from 2004-2008 presenting in the outpatient setting. Patients were treated with 60 French esophageal dilators. Outcomes were analyzed as a function of symptomatology, manometry, duration of benefit, and safety. Over the period reviewed, 63 dilatations were performed on 49 patients. With cricopharyngeal dysfunction, 9 patients had more than one dilation. The average starting Functional Outcome Swallowing Score (FOSS) was 1.86. 73.4% of patients experienced improvement in their FOSS with an average duration of 408.3 days. There were 5 minor complications and no major complications. In the largest series of esophageal dilatation for cricopharyngeal dysfunction in the literature, we found large bore bougienage to have significant utility due to its efficacy, ease of use, safety, and low cost when compared to other modalities such as botulinum injection, balloon dilatation, and cricopharyngeal myotomy.

A Histological Examination of the Quadrangular Membrane

Nwanmegha Young, MD; Clarence T. Sasaki, MD

Introduction: The banality of laryngeal cancer spread is due in part to connective tissue membranes. These membranes function as barriers to cancer and divide the larynx into subunits. The field of laryngeal conservation surgery is based on these concepts. The quadrangular membrane plays an important role hindering the lateral spread of cancer in the larynx. The composition of this membrane has not been well described in the literature. In this study we examined basic characteristics of the quadrangular membrane using histological techniques.

Methods: Whole-organ sections of the larynx were used. These sections were examined under the microscope with stains specific for collagen and elastin.

Results: Examination of the sections revealed the quadrangular membrane is made up of closely woven undulating collagen and elastic fibers.

Conclusion: The quadrangular membrane is a fibroelastic structure providing a barrier to cancer spread.
A New Method for Assuming Vocal Fold Shear Property with Surface Wave Analysis

Masaru Yamashita, MD, PhD; Hirohito Kobayashi, PhD

It is still difficult to analyze vocal fold mucosal property in vivo. A new non-invasive way to estimate shear property of vocal fold is proposed. In this method, the color image sets of vibrating vocal fold from high speed camera were enlarged with two dimensional mathematical interpolation and RGB saturation (equivalent to negative of black-white image) and layer of the color image was extracted from each image frame. In the extracted RGB saturation images, wave front of mucosal surface wave that arises in vibrating vocal fold and propagates away from the vocal fold free edge was observed, tracked, and traveling speed was assessed (mean value =1.413m/s). With introduction of the assumption of tissue homogeneity of vocal fold, the shear wave speed (1.342m/s) was estimated to be 95% of surface wave speed. From deduced shear wave speed, the shear modulus of healthy vocal mucosal surface was evaluated to be around 1800Pa.

Atypical Laryngeal Manifestations in Oral-Facial-Digital Syndrome, Type I

Robert W. Kopp II, BS; Anthony J. Mortelliti, MD
Joel E. Portnoy, MD

Oral-facial-digital (OFD) syndrome is a disease spectrum encompassing abnormalities of the oral cavity, face, digits and several other organ systems. Classically, OFD type I is not associated with laryngeal abnormalities, however, a 4 year-old girl with that clinical diagnosis presented with a history of recurrent aspiration pneumonias and abnormal laryngeal findings on bronchoscopy. Physical examination findings and brain magnetic resonance imaging were consistent with her diagnosis of OFD type I. A telescopic laryngoscopy and bronchoscopy were performed to better assess her larynx. A trifurcate epiglottis, bilateral vallecular pits with splitting of the pharyngoepiglottic folds and an absent left aryepiglottic fold were noted during that procedure as was normal distal tracheobronchial architecture. Included in this report are intraoperative pictures illustrating these anomalies as well as a discussion of the various types of Oral-Facial-Digital syndrome.
Awake Flexible Fiber CO\textsubscript{2} Laser Ablation of Tracheal and Subglottic Stenosis

Michael A. Zozzaro, MD; Erik Cohen, MD
Sanaz Harirchian, MD; Kim Murray, MD

Acquired subglottic and tracheal stenosis is often secondary to endotracheal intubation, tracheotomy, burns, or systemic inflammatory diseases. Treatment strategies include tracheotomy, endoscopic dilation or laser ablation, and open reconstruction including tracheal resection and primary anastomosis, tracheoplasty or laryngotracheal reconstruction. Traditionally, laser therapy utilized a microscope-mounted CO\textsubscript{2} laser in patients under general anesthesia via tracheostomy or with jet ventilation. With the development of a flexible fiber CO\textsubscript{2} laser delivery system, treatment via flexible fiberoptic bronchoscopy has become feasible. We present a retrospective case series of 2 patients with thin, grade II and III acquired subglottic and upper tracheal stenosis who were successfully treated with transnasal, flexible bronchoscopy with the Omniguide CO\textsubscript{2} laser fiber using topical anesthesia and without tracheostomy. This technique has not been previously described in the literature. This technique may be safe and effective without the need for tracheostomy in appropriately selected patients with acquired subglottic and tracheal stenosis.

Bilateral Vocal Cord Paresis related to Vagal Nerve Stimulation

Jonathan M Sherman, MD; Jacqueline P Corey, MD
Nadieska Caballero, MD; Daniel E Martin, PhD

Vagal nerve stimulators are increasingly used for the treatment of refractory major depressive disorder and epilepsy. Temporary, minor laryngeal side effects are common, but well tolerated and include voice alteration, coughing, pharyngitis, and dyspnea. Permanent unilateral vocal cord paresis on the implanted side affects 1\% of patients. We report a case of new stridor from bilateral vocal cord paresis two years after VNS implantation related to the stimulation levels of the device. Contralateral paresis was intermittent, worsening with increasing levels of stimulation and resolving completely when the device was turned off, while ipsilateral paresis only resolved after removal of the device. This is the first reported case of bilateral paresis related to VNS, and it represents a rare but important possible complication which should be considered in the setting of laryngeal dysfunction even years after VNS implantation.
Complete Laryngeal and Tongue Dysfunction in an Acute LVAD Patient: An Airway, Feeding, and Voice Dilemma

Yi-Hsuan Emmy Wu, MD; Thomas Carroll, MD

We present a challenging case of airway, feeding and voice management in a left ventricular assist device (LVAD) patient. A 43 year old male demonstrated aphonia after LVAD placement. Exam revealed motor tongue dysfunction and flexible laryngoscopy revealed an insensate larynx and bilateral vocal fold immobility in the abducted position. An inability to swallow and persistent aspiration obligated nasogastric tube (NGT) placement, and tracheostomy was performed for pulmonary toilet. Aspiration persisted. It was felt the NGT acted as a conduit around which laryngopharyngeal reflux was occurring. Resistance from the cardiothoracic surgery team was met regarding replacement of the NGT with a Jejunostomy (J) tube due to concerns of potential LVAD infection and removal from the transplant list. Bilateral vocal fold augmentation was subsequently performed for voice improvement. Recurrent aspiration pneumonias became antibiotic resistant obligating NGT removal and J tube placement. The patient’s tongue symptoms and aspiration subsequently improved dramatically.

Co-Prevalence of Tremor in Patients with Spasmodic Dysphonia: A Case-Control Study

Laura White, BS; H.A. Jinnah, MD, PhD
John Hanfelt, PhD; Michael M. Johns II, MD

Although there is no cure for essential vocal and body tremor, pharmacologic therapy and botulinum toxin injections yield significant improvement. The goal of this study is to define the co-prevalence of essential tremor with spasmodic dysphonia (SD). A single institution case-control study was performed from May to July 2010. Consecutive patients with SD and benign voice disorders were enrolled prospectively. Each participant underwent a brief neurological exam. 146 benign voice disorder controls and 128 patients with SD were enrolled. Patients with SD were 2.8 times more likely to have essential tremor than the control group (OR = 2.81; 95% CI, 1.55 to 5.08) and only 35% of patients with SD had been seen by a neurologist for the evaluation of SD. It is important for each patient diagnosed with SD to undergo a complete neurological evaluation for body tremor, this is especially important in patients diagnosed with vocal tremor.
Scientific Sessions

Diagnosis of Chronic Cough Due to Bordatella Pertussis in the Adult Population

Jonathan M. Bock, MD; Michael O. Frank, MD

Introduction: Incidence of Bordatella pertussis infection among adults has risen significantly throughout the United States, but pertussis is not often considered in the differential diagnosis of chronic cough in adults. IgG testing can establish diagnosis of a recent infection late in presentation when cultures are no longer useful.

Methods: 8 adults with chronic cough with positive serology for B. pertussis over 15 months are presented, and institutional B. pertussis IgG tests were reviewed since 2006.

Results: 24 total patients were tested for B. pertussis IgG level since 2006, and 7 of 9 positive IgG tests occurred during the last 15 months. Many patients with positive serology had post-tussive emesis and syncope.

Conclusions: B. pertussis IgG testing and patient history can help establish diagnosis of pertussis in the adult patient with chronic cough late in presentation. This data also supports the inclusion of pertussis in the differential diagnosis of adults with chronic cough.

Differential Expression of TGF-ß Isoforms 1 and 3 Following Vocal Fold Mucosal Injury

Zhen Chang, PhD; Ayesha Hasan, BS
Yo Kishimoto, MD; Ayami Kishimoto, MD
Nathan V. Welham, PhD

Transforming growth factor beta (TGF-ß) isoforms differ in abundance and regional localization in various tissues and play crucial and distinct roles during wound healing. Specifically, TGF- β1 has been associated with fibrotic healing whereas a high ratio of TGF-β3/β1 has been associated with regenerative healing. The mechanisms underlying these differences are unknown. The purpose of this study was to characterize the expression and localization of TGF-β1 and β3 in naive and injured vocal fold mucosa, compared with oral mucosa and skin. Immunohistochemistry revealed differential localization of TGF-β1 and β3 by tissue type. Quantitative real time polymerase chain reaction (qRT-PCR) revealed a dramatic increase in TGF-β1 transcription post-injury, compared with a moderate increase in TGF-β3. The differential TGF-ß isoform localization/expression patterns identified here may play a role in the severity of scar formation; if so, manipulating the relative abundance of TGF-ß3/ ß1 during the acute post-injury phase may improve injury outcomes.
Efficacy of Laryngeal Botulinum Toxin Injection: Comparison of Two Techniques

Susan L. Fulmer, MD; Albert L. Merati, MD
Joel H. Blumin, MD

Objectives: It is hypothesized that there is no difference in the effectiveness of botulinum toxin (BTX) injection between electromyography (EMG) guided and non-EMG guided ‘point-touch’ techniques in treatment of adductor spasmodic dysphonia (AdSD). Study Design: Retrospective chart review.

Methods: Patients selected for evaluation underwent sequential treatment by both of the senior authors utilizing two different injection techniques with similar BTX dilution & preparation. Data gathered included dose injected, injection effect, presence and duration of breathiness and dysphagia after injection. Statistical analysis was performed used a generalized estimating equations model.

Results: Four hundred seventeen injections in sixty-four patients were analyzed. There was no difference in the rate of successful injections between the EMG guidance group and the non-EMG guidance group (94.4% and 93.2%, respectively; p = 0.7).

Conclusions: This unique study demonstrates that efficacy of BTX does not depend on the method of injection utilized. Excellent clinical results can be achieved with either EMG or non-EMG guided injection techniques.

Endoscopic Lysis with Keel Placement for Anterior Glottic Webs

Randal C. Paniello, MD; Sid M. Khosla, MD

Purpose: to review and describe our clinical experience with this novel approach to a difficult clinical problem.

Methods: retrospective case series (chart review)

Results: 14 patients were identified for inclusion, ranging in age from 24 to 62. The surgical procedure involves laryngoscopy with complete lysis of the anterior glottic web by laser or sharp technique, followed by placement of a square of silastic that is sutured in place using the Lichtenberger needle holder, and left in place for 4-6 weeks. The procedure was well tolerated, and successfully corrected the web in all but one case. The procedure does not require a tracheotomy, and the patients can swallow a normal diet and have a surprisingly good voice while the keel is in place.

Conclusion: This approach to treating anterior glottic webs offers several advantages over traditional open thyrotomy with keel placement, and should be considered in patients with symptomatic anterior glottic webs.
**Evaluation of Dysphonic Patients by General Otolaryngologists**

Seth M. Cohen, MD, MPH; Michael Pitman, MD
J. Pieter Noordzij, MD; Mark S. Courey, MD

Objective: To investigate instruments used by general otolaryngologists to visualize the larynx, assess their perception of the instruments’ capabilities, and understand their comfort diagnosing specific etiologies of dysphonia.

Methods: 1000 randomly chosen AAOHNS general otolaryngologists were mailed a survey.

Results: The response rate was 27.8%. Mean years in practice were 19.5. Mirror and fiberoptic laryngoscopy were most commonly used. 84.1% obtained stroboscopy. 33.7% reported laryngoscopy could assess vibration. 82.4% believed laryngoscopy could assess mucosal detail while 68.1% thought stroboscopy could. Respondents were more comfortable diagnosing conditions with obvious laryngeal anatomic abnormalities compared to those without, such as central neurologic disorders (p ≤ 0.001). 46.5% were concerned about over-diagnosing laryngopharyngeal reflux.

Conclusions: Though 84.1% of general otolaryngologists use stroboscopy, one third may not appreciate differences between stroboscopy and laryngoscopy. General otolaryngologists are less comfortable diagnosing voice disorders without obvious laryngeal anatomic abnormalities, and nearly 50% are concerned they over-diagnose reflux.

**Explant Culture of Fibroblasts Obtained from Chronically Scarred Rat Vocal Folds**

Yo Kishimoto, MD; Ayami Kishimoto, MD
Diane M. Bless, PhD; Nathan V. Welham, PhD

Vocal fold fibroblasts are widely used in vocal fold biology research and are considered a therapeutic target in vocal fold scarring; however, the majority of published vocal fold fibroblast work has involved cells harvested from normal tissues. Scar fibroblasts may exhibit a different phenotype than their normal counterparts, and if so represent an important area of investigation. The purpose of this study, therefore, was to characterize differences between scar and normal vocal fold fibroblasts in culture. We performed explant culture using rat vocal fold tissue harvested two months post-injury, and age/sex-matched non-injury controls. We examined cell growth and proliferation rates, transcription and translation of major extracellular matrix constituents, and gel contraction capacity. Scar fibroblasts appeared phenotypically different than controls, but these differences became less apparent with subsequent culture passages. Ongoing work with scarred vocal fold fibroblasts may be helpful in the advancement of new strategies for treating vocal fold scar.
**Globus Sensation is Associated with Abnormal Esophageal Bolus Transit**

Catherine J. Rees, MD; Kristin K. Marcum, MD
Nicholas Musisca, MS; Susan G. Butler, PhD

Introduction: Globus sensation is feeling of a lump or foreign body in the throat sometimes associated with dysphagia. High resolution impedance manometry (HRIM) allows for assessment of esophageal function and bolus transit and can be a useful tool in evaluating globus sensation.

Methods: 180 esophageal HRIM studies were reviewed, excluding achalasia and scleroderma. The Reflux Symptom Index items were correlated with the bolus transit findings, including the item pertaining to globus (scored 0-5).

Results: Globus scores 2-5 were significantly associated with abnormal bolus transit for liquids and viscous, compared to globus score 1 (p=0.019 and p=0.029, respectively). Throat clearing and excessive throat mucus were not associated with abnormal bolus transit. The odds ratio for abnormal liquid bolus transit with a globus score greater than 1 ranged from 3.5 to 8.

Conclusion: Globus sensation is strongly associated with abnormal bolus transit in the esophagus in this tertiary care population.

**Histopathologic Investigations of the Unphonated Human Vocal Fold Mucosa for a Decade**

Kiminori Sato, MD, PhD; Hirohito Umeno, MD
Takeharu Ono, MD; Tadashi Nakashima, MD

Vocal fold stellate cells (VFSCs) in the human maculae flavae (MFe) are inferred to be involved in the metabolism of extracellular matrices (EMs) essential for the viscoelasticity of the human vocal fold mucosa. We hypothesized that the tension caused by phonation (vocal fold vibration) stimulates VFSCs to maintain the EMs. Vocal fold mucosa unphonated for 11 years and 2 months of a 64-year-old male with cerebral hemorrhage was investigated by light and electron microscopy. The vocal fold mucosae (including MFe) were atrophic. The vocal fold mucosa did not have a vocal ligament, Reinke’s space or a layered structure. The lamina propria appeared as a uniform structure. Morphologically, the VFSCs synthesized fewer EMs, such as fibrous protein and glycosaminoglycan. And VFSCs appeared to decrease their level of activity. Vocal fold vibration is an important factor in the maintenance of EMs of the human vocal fold mucosa as a vibrating tissue.
**Imaging Mass Spectrometry for the Analysis of Vocal Folds**

Ichiro Tateya, MD, PhD; Yoshinori Takizawa, MD
Seiji Ishikawa, MD; Morimasa Kitamura, MD
Mitsutoshi Setou, MD, PhD; Juichi Ito, MD, PhD

Extracellular matrix components, such as hyaluronic acid, collagen, and elastin, are known to be present in the vocal fold lamina propria and contribute to maintain the property of the lamina propria. However, little is known about what other molecules are present in the lamina propria. Imaging mass spectrometry (IMS) is the next generation tool for research in the post-genomics era which visualizes the distribution of thousands of known/unknown molecules, such as phospholipids, proteins, and glycolipids, on a tissue section. This study is the first to analyze the vocal fold by IMS. Canine vocal folds were crio-sectioned and the sections were used for the analysis. In the preliminary study, IMS identified lysophosphatidylcholine molecules which are specifically expressed in the lamina propria and phosphatidylcholine molecules which are expressed in the macula flava. IMS is a powerful tool to perform in situ proteomics and will lead to understand vocal fold structure and vibration.

**Impact of Acute Oxidative Stress on Barrier Properties of Vocal Fold Epithelia**

Rebecca Alper, MD; Elizabeth Erickson-Levendoski, MS
Sherleen Fu, BS; Wei Zheng, PhD
Mahalakshmi Sivasankar, MD

Vocal fold epithelium is exposed to oxidative stress via cigarette smoke, vehicle, and industrial pollution. Oxidative agents are respiratory irritants, and may compromise barrier properties of intestinal epithelia. The purpose of this study was to quantify the adverse effects of acute oxidative stress on the barrier properties of vocal fold epithelia. This is an important area of investigation as a compromised epithelial barrier may increase vulnerability of the underlying vocal fold connective tissue to inflammation and injury. Electrophysiology, immunoblotting, and light microscopy were used to investigate the structural and functional impact of oxidative stress on vocal fold epithelial barrier. Freshly harvested porcine vocal fold epithelia were exposed to hydrogen peroxide for two hours to model acute oxidative stress. Acute oxidative stress did not reduce barrier protein concentration or epithelial resistance. These data provide the groundwork for future investigations on the effects of various environmental pollutants on vocal fold physiology.
Incidence of Distinct Benign Mid-Membranous Vocal Fold Lesions as Classified with a Novel Paradigm System

Clark A. Rosen, MD; Jackie Gartner-Schmidt, PhD
Robert T. Sataloff, MD, DMA; Greg Postma, MD
C. Blake Simpson, MD; Mark S. Courey, MD

Imprecision with nomenclature for benign vocal fold lesions (BVFL), results in miscommunication and impedes outcomes research. Our purpose was to develop and test the efficacy of a BVFL nomenclature paradigm. Clinical consensus conferences were held to create a multi-dimensional BVFL nomenclature system based on still light morphology, stroboscopic findings, response to voice therapy and intra-operative findings. Video analysis was performed to validate the stroboscopy component of the schema. A retrospective review of 45 BVFL patients was performed to assess the incidence of different types of BVFL. The nomenclature paradigm resulted in nine distinct vocal fold lesions: nodules, polyp, pseudocyst, cyst (subepithelial/ligament), fibrous mass (subepithelial/ligament), non-specific VF lesion and reactive lesion. Video analysis demonstrated validity to the stroboscopy aspect of the paradigm. The two most common lesions were vocal nodules and non-specific VF lesions. This novel nomenclature paradigm permits consistent classification of BVFL and may facilitate outcomes research for specific lesions and treatment modalities.

Intubation Granuloma of the Membranous Vocal Fold

Scott Rickert, MD; Vikash Modi, MD
Robert Ward, MD; Lucian Sulica, MD

Objectives: To describe the clinical features of granuloma of the membranous vocal fold secondary to traumatic intubation, an uncommon entity.

Methods: Retrospective review of 5 cases from one tertiary institution.

Results: 5 patients were identified with post-intubation granuloma of the membranous vocal fold. 3 patients were adults (age 49-80, mean 65) and 2 patients were children (age 9 days and 14 days). None noted hoarseness prior to intubation and all noted significant hoarseness post-operatively. Intubation time ranged from 4 hours to 3 weeks. Conservative treatment of proton pump inhibitors and voice rest was initially implemented with all adult patients. 2 of 3 (66.7%) failed conservative treatment. All patients undergoing surgical intervention noted excellent post-operative results.

Conclusion: Intubation granuloma of the membranous vocal fold is an uncommon event that presents early in the post-operative period. Surgical treatment should be advocated for those failing initial conservative treatment.
**Klebsiella Pneumoniae Descending Cervical Necrotizing Fasciitis Originating as a Paraglottic Abscess**

Justin S. Golub, MD; Sandy Mong, MD  
Philip A. Weissbrod, MD; Thomas K. Varghese, MD  
Tanya K. Meyer, MD

**Introduction:** Cervical necrotizing fasciitis (CNF) caused by monomicrobial Klebsiella infection is a rare entity. We present the first known case report of Klebsiella CNF in the United States and evaluate the literature for changing microbial patterns and sites of origin.

**Methods:** Case report and literature review

**Results:** A 30 year-old male presented with a paraglottic abscess and newly diagnosed diabetes. Transoral drainage yielded pansensitive Klebsiella pneumoniae. The patient’s clinical course deteriorated despite culture directed antibiotics. Repeat imaging showed inflammation of cervical and mediastinal tissue planes. Wide cervical incision, sternotomy, and multiple debridements were required. The patient was discharged on day 40. Literature documenting CNF describes predominantly polymicrobial or gram positive organisms, most commonly with a dental origin, and reports of monomicrobial Klebsiella necrotizing fasciitis are largely isolated to Asia.

**Conclusions:** The microbiology of CNF is varied and evolving. Clinicians must be aware of changing patterns for early diagnosis and treatment.

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**Laryngeal Hematoma after Strangulation Injury**

Jeffrey Cheng, MD; Benjamin D. Malkin, MD  
Nancy Jiang, MD

**Objective:** To describe an unusual case of a progressive laryngeal hematoma after a strangulation injury resulting in respiratory compromise.

**Methods:** Case review and review of the related English literature.

**Results/case report:** Our patient developed a supraglottic hematoma and cricoid fracture after a strangulation injury. The patient required an emergent, awake tracheostomy several hours after presentation for impending airway collapse and underwent delayed repair of the cricoid cartilage fracture. The hematoma fully resolved on day 9. The patient was decannulated and discharged home with normal vocal cord mobility and no postoperative complications.

**Conclusion:** Strangulation injuries necessitate careful and vigilant clinical evaluation and may in rare cases progress to life threatening airway compromise or collapse. Clinical suspicion should be raised in those patients who are symptomatic and have positive physical exam findings and abnormal flexible fiberoptic laryngoscopic examinations. Establishment of a secure airway should be of utmost importance, with tracheostomy being a life-saving measure in some cases.
Lysis of Interarytenoid Synechia (Type I Posterior Glottic Stenosis): Vocal Fold Mobility and Airway Results

Tanya K. Meyer, MD; Jeffrey Wolf, MD

Background: The Type I Posterior Glottic Stenosis (TI-PGS) is a well described entity but there is little known about the outcome of surgical treatment.

Methods: Retrospective case series.

Results: Thirteen cases met inclusion criteria. All but one patient had a tracheotomy at the time of initial evaluation. At the post-operative visit, seven patients (54%) had completely normal vocal fold motion. Of the verbal patients, six (50%) had normal vocal function as reported by both the patient/caregiver and the physician, and ten (83%) patients were successfully decannulated.

Conclusions: Patients with an isolated interarytenoid synechiae have an excellent prognosis with regard to decannulation. Although many patients regain normal vocal fold motion and a return to their pre-intubation vocal function, a significant proportion can have persistent deficits in vocal fold mobility and some level of dysphonia.

National Perspective on Tracheotomy Outcomes and Complications Presents Opportunities for Targeted Improvements

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Lina Lander, ScD; Albert Merati, MD
David W. Roberson, MD

Introduction: To determine national rates of tracheotomy frequency, outcomes and complications.

Methods: Analysis of public national database (NIS) from 2006.

Results: 117,998 tracheotomies were performed (58.1% male, average age 58.8); 12.2% had complications and 7.8% died. Patients with complications were on average younger (52.3, p<.0001) and those who died older (63.5, p<.0001). Tracheotomies were performed mostly in urban settings (96.4%). Predictors of higher complication rates were rural setting (3.5%, p<.0001), non-teaching hospital (32.3%, p<.0001), admission from long term care facility (2.7%, p<.0001) and Medicaid insurance (15.9%, p<.0001). Predictors of higher mortality rates were the same: rural setting (3.5%, p<.0001), non-teaching hospital (32.3%, p<.0001), admission from long term care facility (2.7%, p<.0001) and Medicaid (15.9%, p<.0001).

Conclusions: Tracheotomy is a common operation with substantial public health impact. Both complications and death are common after tracheotomy. Identification of risk factors for increased complication and mortality rates may allow targeted improvement interventions.
Neurofibroma of the Vocal Fold in a HIV Patient Not Associated with Neurofibromatosis Type 1

Heather J. Gomes, MD, MPH; Thomas Carroll, MD

Neurofibroma of the larynx is rare. We present a case of a true vocal fold (TVF) neurofibroma and review the pertinent literature regarding the presentation, diagnosis and management of laryngeal neurofibroma. To the best of our knowledge, this is the first report in the English literature of a neurofibroma isolated to the TVF.

A 39 year old HIV positive male with hoarseness, who does not carry a diagnosis of neurofibromatosis type 1 (NF-1), was found to have a TVF neurofibroma. Most reported cases of neurofibroma of the larynx are associated with NF-1. Diagnosis of laryngeal neurofibroma can only be confirmed on histology. Complete surgical excision is the treatment of choice for localized small lesions. Long term follow up is necessary secondary to the possibility of malignant transformation and recurrence. Neurofibroma of the larynx is rare but should be considered in the differential diagnosis of a subepithelial TVF lesion.

New Hoarseness in Patients with a History of Laryngeal Radiation

Scott Rickert, MD; Dan Novakovic, MD
Lucian Sulica, MD

Purpose: To examine causes, presentation and treatment of hoarseness in patients with a history of laryngeal radiation

Methods: All adults presenting to university laryngology service between 2007 and 2010 with new complaint of dysphonia and history of radiation were identified. Patients presenting within 5 years of radiation were excluded. Demographics, details of treatment, including stroboscopy and outcome were reviewed.

Results: Seven patients (6M/1F, mean age 60.4) were identified. Patients presented a mean of 18.4 years after radiotherapy. Hemorrhagic polyps (six unilateral, one bilateral) were identified in every case, as well as aberrant neovascularisation and variable stroboscopic abnormalities. Five patients underwent surgery, with confirmation of diagnosis. Although voice improved in all cases, recovery was prolonged and stroboscopic abnormalities persisted.

Conclusion: Hemorrhagic polyps appear to be the predominant cause of dysphonia in patients with a remote history of laryngeal radiation. We hypothesize that post-radiation neovascularization predisposes to hemorrhagic phonotraumatic injury and impaired postsurgical healing.
Objective Measurement of the Vocal Effort during Medialisation Thyroplasty: A Feasibility Study

Marc Remacle, MD, PhD; Vincent Bachy, MD
Georges Lawson, MD; Vinciane Lejoly-Devuyst, MSc SLP
Antoine Giovanni, MD, PhD; Thierry Legou, PhD
Nayla Matar, MD

Rationale: Objective measurement of the subglottic pressure could contribute to the choice of the implant’s size (IS) in metllization thyroplasty (MT).

Material and Methods: Patients with glottal insufficiency were enrolled in this prospective study. They had a MT using a Montgomery implant® (Boston medical, Boston, USA). The direct subglottic pressure (DSGP) was measured intraoperatively using a catheter inserted in the cricothyroid membrane. The implant’s choice was based on acoustic results, patient’s perception, fiberoptic examination and results of DSGP measured prior and after placement of the implant.

Results: 5 patients were included in the study. The DSGP could be measured in all the patients without increasing the surgical time or patients’ discomfort. The mean DSGP before and after the placement of the implant was 15.9 and 11.2 cm H2O, respectively.

Conclusion: Perioperative measurement of DSGP is easy, feasible and might allow a more objective choice of the IS in MT.

Onset and Offset Phonation Threshold Pressure and Flow in Excised Human Larynges

Ted Mau, MD, PhD; Joseph Muhlestein, BS
Sean Callahan, MD; Kent T. Weinheimer, BS
Roger W. Chan, PhD

Objectives: 1. To determine the minimum subglottal pressure and transglottal air flow required to initiate or sustain phonation. 2. To determine the effect of posterior glottic gap size on phonation threshold pressure (PTP) and flow (PTF).

Study Design: Induced phonation of excised human larynges.

Methods: Nine human larynges were harvested within 24 hours post-mortem. The subglottal pressure and flow at phonation onset and offset were measured on a bench apparatus. PTP and PTF were determined at graded separation distances between the vocal processes.

Results: Large inter-subject variation was observed in PTP and PTF values. One-way ANOVA showed no significant dependence of PTP and PTF on posterior glottic gap size.

Conclusions: This is the first reported series of onset and offset PTP and PTF in fresh excised human larynges. The insensitivity of PTP and PTF to posterior glottic gap size may be partially attributed to the bowed contour of the vocal folds in excised human larynges.
Optimal Concentration of Hepatocyte Growth Factor for Treatment of the Aged Rat Vocal Fold

Atsushi Suehiro, MD, PhD; Harry Wright, MD; Laurence James, MD; Bernard Rousseau, PhD, CCC-SLP

Introduction: Hepatocyte Growth Factor (HGF) demonstrates beneficial properties in restoring hyaluronan (HA) in the aged rat vocal fold. However, the optimal concentration of HGF remains unknown. The purpose of the present study was to investigate the optimal concentration of HGF for restoring HA in the aged rat vocal fold.

Description: Seventy-five 18 month old rats received serial injections of HGF in 10µl of phosphate-buffered saline (PBS) at the following concentrations: 10ng/10µl, 50ng/10µl, 100ng/10µl, 200ng/10µl, or control (PBS only). Larynges were subsequently harvested for histology and quantitative PCR.

Results: Alcian Blue staining revealed significantly increased HA deposition in the 100ng/10µl group, compared to control. These results were supported by qPCR, which revealed upregulated HA synthase gene expression.

Conclusion: In the current study, increased HA gene transcript levels and deposition of HA were found in the 100ng/10µl group.

Oropharyngeal Symptoms Following Suspension Microlaryngoscopy with a Suspension Versus Fulcrum-Based Laryngoscope Holder

Taryn Davids, MD; Adam Klein, MD; Michael M. Johns II, MD

Introduction: Oropharyngeal symptoms post direct laryngoscopy have been well described, we aim to compare symptoms following the use of two different laryngoscope systems; The Universal Modular Glottiscope (UMG) with suspension gallows and the Ossoff-Pilling laryngoscope with fulcrum-based Lewy arm stabilizer.

Methods: A prospective evaluation of symptoms was performed via survey study at intervals pre- and post-operatively. Relevant peri-operative information was collected.

Results: Oropharyngeal symptoms following microlaryngoscopy include altered tongue mobility, altered taste, tongue paresthesia, and dysphagia. While there was no statistically significant difference in number of oropharyngeal complications between laryngoscope systems, there was a strong trend towards greater number and duration of symptoms in the UMG group versus the Ossoff-Pilling group.

Conclusion: We encourage the use of the system most comfortable to the operator that maximizes field of view with minimal post-operative symptoms. In the case of the UMG laryngoscope we encourage practitioners to counsel patients in the pre-operative setting with regards to expected post-operative symptoms.
Overcoming Nasal Discomfort - A Novel Method for Office Based Laser Surgery

Sunil P. Verma, MD; Seth H. Dailey, MD

Introduction: The passage of an esophagoscope or channeled laryngoscope for office-based laser laryngeal surgery can be limited by a patient’s nasal discomfort from septal deviation or turbinate hypertrophy. We describe a novel method for delivering the laser fiber and visualizing its effect in these situations.

Methods: A retrospective chart review was performed and procedural details were recorded.

Results - Technical description: A patient was seated in the examination chair and instructed to hold his/her own tongue. The surgeon held a rigid angled telescope for visualization of the larynx in his nondominant hand and a laser fiber threaded through an Abraham cannula in the opposite. Energy from the PDL, KTP and CO2 flexible laser fibers was delivered for management of papilloma and leukoplakia.

Conclusion: For patients who cannot tolerate passage of a flexible transnasal laryngoscope or esophagoscope during office-based laser laryngeal surgery, an attractive alternative to surgery under general anesthesia is the transoral technique.

Patient Tolerance of Awake, In-Office Laryngeal Procedures (AIOLP): A Multi-Institutional Perspective

VyVy N. Young, MD; Libby J. Smith, DO
Lucian Sulica, MD; Priya Krishna, MD
Clark A. Rosen, MD

An increasing number of laryngeal procedures are performed in the office. However, little is known about how well these procedures are tolerated and what factors determine success/failure. Prospectively collected patient and physician surveys from 6 surgeons at 3 institutions describe patient tolerance of AIOLP. There were 105 AIOLP performed, including vocal fold injection (68%), laser (18%), and TNE (7%). Average duration of procedures was 13+8 minutes. Procedure discomfort was “just as” or “better than” expected in 75%. Patients reported an average of 37/100 on a discomfort scale. 92% of patients would agree to undergo another AIOLP, and 95% would recommend AIOLP to other patients. Procedures were completed successfully in 97%. Most common surgeon-reported difficulties included uncontrolled gag reflex and copious secretions. This study encompasses multiple diagnoses, procedures, and methods of anesthesia. Awake, in-office laryngeal procedures are exceptionally well tolerated by patients, resulting in extremely high completion and satisfaction rates.
Post-Operative Herpetic Laryngitis: A Rare Entity

VyVy N. Young, MD*; Priya Krishna, MD
Clark A. Rosen, MD

Infectious complications following phonomicrosurgery are rare. Reports of herpetic laryngitis are in the literature, but none following microlaryngoscopy. We present a case of a 55-year-old female who underwent microsurgical excision of a left VF lesion and KTP ablation of bilateral vascular ectasias. Post-operative videolaryngostroboscopy demonstrated severe bilateral laryngeal edema, erythema and ulcerations, encompassing an area greater than the original surgical field. Initial management included voice rest, antibiotics, steroids, and aggressive reflux treatment. The patient experienced prolonged vocal fold edema and poor voice outcome, which ultimately resolved over 6 months. Clinical diagnosis of herpetic laryngitis was presumptively made after the patient revealed a history of relapsing oral herpes incited by stress with a recent episode prior to microlaryngoscopy. This case highlights the importance of thorough review of a patient’s medical history. A protocol for pre-operative (prophylactic) antiviral therapy and appropriate timing of surgery is presented for patients with history of herpes infection.

Preliminary, Prospective Investigation of the Utility of Nimodipine for Acute Vocal Fold Paralysis

Clark A. Rosen, MD; Libby O. Smith, DO
Priya Krishna, MD; VyVy N. Young, MD
Jackie Gartner-Schmidt, PhD
Michael C. Munin, MD

Nimodipine has been shown to be beneficial for the recovery of acute vocal fold paralysis (AVFP) in an animal model. A previous small clinical series using nimodipine showed promise. A prospective, open-label trial of patients with AVFP (onset <4 months) was performed using nimodipine (4 mo). Early LEMG was performed to determine severity of neural injury. Fourteen patients were treated with nimodipine. Two patients stopped treatment early, and 4 are too early for analysis; thus 8 patients (11 paralyzed VF’s) were analyzed. Six patients experienced recovery of purposeful motion (9/11 paralyzed VF’s). LEMG results showed good prognosis in 4 VF’s (4/4 recovered) and poor/fair prognosis in 6 VF’s (4/6 recovered). Historical control LEMG patients with poor/fair prognosis demonstrated 20% recovery, compared to 67% recovery in nimodipine-treated patients with the same initial LEMG findings. This pilot study demonstrates better than expected acute vocal fold paralysis recovery with the early administration of Nimodipine.
Proposed Classification System for Reporting KTP 532NM/PDL 585NM Laser Treatment Effects of Vocal Fold Lesions

Pavan S. Mallur, MD; Michael M. Johns II, MD
Milan R. Amin, MD; Clark A. Rosen, MD

Currently no standard exists for reporting treatment results for the KTP/PDL lasers. The goal of this study is to validate classification schema for reporting immediate tissue effects after laser treatment. A five-point classification system was developed by clinical consensus. Video recordings were made prospectively. Two for each effect were presented to 3 fellowship-trained laryngologists, who were asked to classify each video based on the classification descriptions and examples. The treatment effect classification includes non-contact angiolysis, epithelial blanching, epithelial disruption, contact epithelial ablation, and contact epithelial ablation with tissue removal. Intra-rater reliability, evaluated by repeating 2 of 10 clips, and inter-rater agreement was good. This study reveals that standardized reporting of effects of KTP/PDL laser is feasible. We believe that results of KTP/PDL treatment should be reported using this validated classification system of immediate effect, along with laser settings and output. This will allow for systematic evaluation of long-term treatment results.

Prospective Multi-Arm Evaluation of Surgical Treatments for Vocal Fold Scar and Pathologic Sulcus Vocalis

Nathan V. Welham, PhD; Seong Hee Choi, PhD
Seth H. Dailey, MD; Charles N. Ford, MD
Jack J. Jiang, MD, PhD
Diane M. Bless, PhD

The purpose of this study was to compare the effectiveness of common surgical treatments for vocal fold scar and pathologic sulcus vocalis. Patients with newly diagnosed vocal fold scar/sulcus were assigned to one of three treatment modalities: Type I thyroplasty (n = 9), injection laryngoplasty (n = 9) and graft implantation (n = 10); and followed for 18 months post-treatment. Thyroplasty and graft implantation led to reduced voice handicap with no improvement in auditory-perceptual, acoustic, aerodynamic or vocal fold physiologic performance. Injection laryngoplasty resulted in no improvement on any vocal function index. Patients who underwent graft implantation exhibited the slowest improvement trajectory. Overall, it appears that no single treatment modality is successful for the majority of patients, and there is no evidence-based decision algorithm for matching a given treatment to a given patient. Progress therefore requires the identification of predictive clinical features that can drive evidence-based treatment assignment.
Scientific Sessions

Recurrent Non-Granulomatous Supraglottitis: Managing a Difficult and Rare Disease

Levi Ledgerwood, MD; Peter Belafsky, MD, PhD

Objectives: 1) Discuss a case of non-granulomatous supraglottitis. 2) Discuss the diagnosis and management of this rare disease entity.

Methods: Single case report for non-granulomatous supraglottitis.

Results: The patient is a 40 year old woman with an unremarkable medical history who 15 years ago developed the sudden onset of supraglottic edema and difficulty breathing following a throat infection. She was intubated for five days, and subsequently extubated with good recovery until five years later when the episode recurred. She has since developed supraglottic edema without antecedent infection 6-7 times. An extensive work-up has yet to reveal a cause of these episodes and recent biopsies to rule out granulomatous disease were also negative.

Conclusions: Non-granulomatous supraglottitis is a rare entity and remains a diagnosis of exclusion. We discuss a potential algorithm for work-up of these patients and discuss management strategies for their recurrent episodes of supraglottic edema.

Reducing Injury During Video-assisted Endotracheal Intubation: The "Smart Stylet" Concept

Philip Weissbrod, MD; Albert L. Merati, MD

Introduction: The GlideScope™ and related products have gained wide use in anesthesiology when difficult intubation is anticipated. Even when excellent visualization of the larynx is achieved, successful intubation can be difficult and/or traumatic due to awkward angles and rigid stylets.

Methods: Technical description of procedure and outcomes from intubation in a series of laryngeal surgical patients.

Results: For difficult intubations, a GlideScope™ is used in combination with a flexible bronchoscope acting as a manipulable “smart” stylet. The bronchoscope is not used for its light or fiberoptic capacity, but only as a manipulable guide while using the Glidescope™ as a video-assisted laryngoscope. Our experience with a large series of patients is presented in this technical paper along with illustrative videos.

Conclusion: The “smart stylet” concept allows for successful and safe endotracheal intubation when used with the Glidescope™.
Spasmodic Dysphonia Triggers: A Combined Clinical Experience of Over 300 Patients

Lesley Childs, MD; Scott Rickert, MD
Thomas Murry, PhD; Andrew Blitzer, MD, DDS
Lucian Sulica, MD

Purpose: Spasmodic dysphonia (SD) is a rare voice disorder that is generally considered idiopathic. Nevertheless, many patients associate onset with specific events or factors. This study intends to examine these patient perceptions, typically dismissed as irrelevant given our current medical understanding.

Procedures: Retrospective chart review.

Results: A total of 350 patients with SD were identified. Of these, 169 had specific memories of the onset of their disorder and 45% were described as “sudden”. Triggers in the sudden onset group were identified 79% of the time and only 1% of the time in those who reported gradual onset. Of the triggers identified, stress (42%), upper respiratory infection (33%) and postpartum (10%) were most common.

Conclusions: The large proportion of patients who perceive SD to be sudden in onset puts current understanding in question. Further study on associated triggers will help us to better understand the etiology and eventually lead to a hopeful cure.

The Effect of Intraoperative Injection Laryngoplasty with Radiesse vs. Medialization Thyroplasty with Silastic in Patients with Unilateral Vocal Fold Immobility

James Ruda, MD; Michael S. Benninger, MD
Tom Abelson, MD; Douglas Hicks, MD; Claudio Milstein, PhD

Objective: Unilateral vocal fold immobility (UVFI) is a condition typically treated with vocal fold injection vs. laryngeal framework surgery. This study sought to review the effectiveness of intraoperatively performed injection laryngoplasty (IL) vs. medialization thyroplasty (MT) in patients with UVFI.

Methods: From 2007-2010, UVFI pts were prospectively treated at our institution with MT utilizing silastic implantation or IL with Radiesse Voice (ILRV) or Voice Gel (ILRVG). Maximum phonation times, voice handicap index scores, were recorded for all pts, both pre-/postoperatively.

Results: 52/96 pts were treated with IL vs. 46/98 patients treated with MT. Average VHI scores in ILLRV vs. ML pts decreased 49% vs. 55.6% at 4-6 weeks postoperatively and 73.8% vs. 81.9% at 24 weeks postoperatively, respectively. Average 4 week MPTs increased from 8 to 24.3, 20.5, 20.2 seconds among pts treated with MT, ILRV, ILLRVG, respectively. Average MPTs of MT pts did not decline after 9 months.

Conclusions: Intraoperative IL or MT provided improved pt phonation and subjective vocal impairment. Use of MT provided the greatest prolonged phonatory benefit to our patients.
The Incidence of Dysphagia in the Elderly with Unilateral Vocal Fold Paralysis (UVFP)

Angela Cogburn Paddack, MD; Alissa Collins, BS
Ozlem E. Tulunay-Ugur, MD

Although the impact of UVFP on voice has been studied extensively, its effects on swallowing have received less attention, especially in the elderly. Aim: We hypothesized that elder patients with UVFP experience increased dysphagia and related complications. Methods: A retrospective review of patients younger and older than 65 years old with UVFP was performed, comparing symptoms, complications and treatment outcomes. Results: 8 of the 20 patients older than 65 years old were PEG dependent, and 5 had a history of aspiration pneumonia. Fourteen patients showed penetration and 12 aspirations, mostly with liquids. In the younger group, 6 of the 22 were PEG dependent and 3 had pneumonia. All PEG dependent patients in this group had other cranial nerve involvement or high vagal resections. Conclusions: Elder patients had more severe dysphagia requiring a PEG tube, and were less likely to resume oral intake after surgical intervention than the younger population.

The Role of NIM Nerve Monitoring System in Thyroidectomy

Sharon Hughes, BS; Naren Venkatesan, MD
Michael P. Underbrink, MD, MBA

Thyroidectomies are a standard procedure in Otolaryngology and are increasing in frequency. The crucial step in thyroidectomies is identification of the Recurrent Laryngeal Nerve. Damage to this nerve is the most significant complication of the procedure, resulting in hoarseness and difficulty breathing. While anatomical knowledge is the mainstay of preventing an injury to the nerve, the NIM nerve monitoring system helps provide confirmation. Therefore, it has become an integral and often standard part of thyroidectomies. However, it also begs the question if the NIM system is worthwhile as it increases cost and may only add minimal information after a surgeon has already anatomically identified the nerve. To evaluate the NIM system, a retrospective study of all patients undergoing a thyroidectomy at UTMB-Galveston from 1990-2010 was performed. The results of the study show that the difference between cases with and without the NIM system is minimal.
The Utility of Trial Vocal Fold Augmentation Using Saline

Lesley Childs, MD; Scott Rickert, MD
Daniel Novakovic, MPH, MBBS, BSc; Andrew Blitzer, MD, DDS

Purpose: To describe certain clinical settings in which trial vocal fold augmentation using saline has proven useful, serving as a guide for further intervention.

Procedures: Retrospective chart review.

Results: Five patients have undergone trial vocal fold augmentation using saline. Two patients with presbyphonia and tremor reported an increase in volume and were notably less hyperfunctional. A third patient with unilateral vocal fold immobility and decreased sensation from a CVA experienced improved swallowing capability. The fourth patient, an athlete, did not complain of any difficulty breathing upon exertion. Each of these four patients ultimately underwent successful formal injection laryngoplasty. The fifth patient with immobility and vocal fold scar had separation of the non-scarred tissues prior to treatment of the scar using a 532-nm laser, with plans for formal injection laryngoplasty in the future.

Conclusions: In certain individuals, trial vocal fold augmentation using saline represents an effective means of guiding future therapy for glottic insufficiency.

Toward Improved Understanding of Common Causes and Consequences of Dysphonia in the General Population

Seth M. Cohen, MD, MPH
Jaewhan Kim, PhD; Nelson Roy, PhD, CCC-SLP, ASHA-F
Carl Asche, PhD, MBA; Mark S. Courey, MD

Objective: To establish the etiologies of dysphonia diagnosed by primary care physicians (PCPs) and otolaryngologists and to determine differences in cited etiologies by these groups.

Methods: The Thomson Reuters MarketScan database contains commercial claims data from 100 employers, 12 health plans, and Medicare. Dysphonia-related ICD-9 codes were tallied by frequency and provider specialty from July 1, 2004 to June 30, 2008.

Results: Approximately 30 million individuals were in the database. Roughly 500,000 patients, ages 0 to > 65 years, sought medical care for dysphonia. Half saw a PCP and half an otolaryngologist. The three most prevalent ICD-9 codes overall were 464.00, 784.49, and 476.0; 464.00, 784.49, and 464.2 by PCPs; 784.49, 476.0, and 464.00 by otolaryngologists.

Conclusion: This study allows comparison of ICD-9 codes and associated costs between PCPs and otolaryngologists and provides an initial understanding of the practice patterns associated with the symptom of dysphonia in the general population.
Ultrasound Assessment of Vocal Folds: A Correlation Study with Flexible Fiberoptic Laryngoscopy

Jayme R. Dowdall, MD; Deepak Gupta, MD
Arvind Srirajaklidindi, MD; Randall Amis, MD
Adam Folbe, MD

Background: Perioperative examination of the vocal folds with flexible fiberoptic laryngoscopy is not always feasible. Prior studies suggest vocal fold ultrasound may be a useful screening tool, however, correlation to laryngoscopy findings necessary. The purpose of the study is to validate vocal fold ultrasound in the adult population and to correlate the ultrasound findings to the assessment provided by flexible fiberoptic laryngoscopy.

Materials and Methods: This IRB approved study has initially enrolled seventeen adult patients. Vocal fold ultrasound performed by the anesthesiologist is correlated with laryngoscopy performed by the otolaryngologist.

Results: Assessment of vocal fold motion was congruent in fourteen patients with normal vocal fold mobility; however, three patients undergoing vocal fold injections showed discordance between the findings.

Conclusion: Vocal fold ultrasound may be useful to rule out vocal fold motion abnormalities in the adult population. Abnormal findings on vocal fold ultrasound should be correlated with subsequent laryngoscopy.

Use of a Novel Instrument to Determine Oxygen Consumption and Hemoglobin Levels in Human Thyroarytenoid Muscle Pre and Post Exercise

Cari M. Tellis, PhD, CCC-SLP; Thomas L. Carroll, MD; Michael Fierro; James J. Sciote, DDS, PhD; Clark A. Rosen, MD

Visible light spectroscopy (VLS) is the concept behind the FDA approved TSTAT® device which monitors tissue oxygen and hemoglobin levels in many parts of the body. This instrument has never been used in the larynx. VLS may be an answer to non-invasively assess muscle function in individuals with movement-type voice disorders. Purpose: The purpose of this novel, pilot study was to determine if VLS, using the TSTAT® device, is a reliable and valid method of measuring oxygen and hemoglobin levels in the thyroarytenoid muscle of individuals without voice disorders to provide information about typical muscle function. Procedures: Measurements were taken in the thyroarytenoid muscle at baseline, after exercise, and after recovery using VLS through channel-port flexible laryngoscopy and hollow laryngeal electromyography needle. Results: Data were collected and analyzed. Conclusion: VLS can be used to measure changes in oxygen saturation and hemoglobin levels pre and post exercise in human thyroarytenoid muscle.
**Scientific Sessions**

**Ventilatory Technique for Central Airway Obstruction**

Michele P. Morrison, MD; Gregory N. Postma, MD

Objectives: To demonstrate various ventilatory techniques used in patients with CAO. Study Design: Retrospective review of illustrative operating room cases and review of the literature. Methods: A number of methods are available to ventilate individuals with CAO. These include the traditional ventilating bronchoscope, supraglottic/subglottic jet ventilation, high frequency jet ventilation, specialized jet ventilation tubes, and even cardiac bypass. Operating room cases involving patients with tracheal obstruction from tumors, airway stenosis, and various other conditions were looked at. These cases presented unique ventilatory challenges and are reviewed. Some of the ventilatory techniques employed include unilateral jet ventilation and coronary artery bypass.

Results: All subjects were successfully ventilated and the cause of CAO safely addressed.

Conclusions: Patients with CAO pose a unique ventilation difficulty. Knowledge of a variety of different airway techniques will aid in the management of these difficult patients.

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**Vocal Fold Granulomas: A Series of 114 Granulomas in a Tertiary Care Center**

Nadine V. Yammine, MD, MSc; Karen M. Kost, MD
Francoise P. Chagnon, MD; Daniel Kost-Stevenson

Objectives: To evaluate demographics, risk factors and treatment of patients with vocal process (VP) granulomas.

Methods: A chart review from 1997 to 2010 was completed. The following data were collected and analyzed: patient demographics, clinical presentation, risk factors, compliance, treatment and outcomes.

Results: 114 granulomas in 92 patients were identified. At least 2 risk factors were identified in 43 (47%) patients. Treatment included lifestyle and dietary modifications, speech therapy, proton pump inhibitors, H2 antagonists, corticosteroids, antibiotics, Botulinum Toxin A injection, vocal fold augmentation and surgery. Sixty five (71%) patients achieved resolution (Mean: 1.4 years). Five (5%) patients had a recurrence, 23 (25%) patients did not resolve and 9 (10%) were lost to follow-up. Fifty one patients (56%) were compliant with treatment.

Conclusion: Treatment of VP granulomas includes a combination of conservative, medical and surgical approaches. Patients reporting compliance with treatment had a higher rate of resolution.
Vocal Fold Vibratory Behavior Changes Following Surgical Treatment of Polyps
Investigated with High-Speed Video Endoscopy and Phonovibrography

Melda Kunduk, MD; Michael Döllinger, PhD
Joerg Lohscheller; Andrew J. McWhorter, MD

Vocal fold pathology and healing post-operatively can affect vibratory behaviors of the vocal folds and limit videostroboscopic evaluation. High-Speed Videoendoscopy (HSV) addresses this limitation while allowing the evaluation of periodic and aperiodic vocal fold vibration in an actual glottic cycle along the entire vocal fold length. The goal of the study is to objectively quantify the changes in vocal fold vibratory dynamics pre and post-surgery using HSV and the image analysis tool Phonovibrography (PVG). HSV data was collected from ten subjects diagnosed with unilateral vocal fold polyps, pre-operatively and post-operatively, at one week and one month. The objective PVG measures and further vocal fold vibratory features describing the vibratory behavior were collected and analyzed. Preliminary data revealed marked changes pre and post-operatively but little change following one week. The findings and their implication for clinical practice on voice rest following phonosurgery and the future research will be discussed.
MEMORIALS

HASKINS K. KASHIMA, MD

Dr. Haskins Kazunori "Chuck" Kashima, an Emeritus Fellow and a noted Baltimore otolaryngologist and a world leader in the treatment of laryngeal disease, passed away on November 11, 2010 in Lutherville, Maryland at the age of 78.

A memorial service was held on November 14, 2010 at the George Peabody Library, 17 E. Mount Vernon Place.

Dr. Kashima had an international reputation in laryngeal matters and surgery. He was also an expert on the human papilloma virus and its effect on the larynx," said Dr. Charles W. Cummings, former chairman of the Johns Hopkins University School of Medicine's department of otolaryngology — head and neck surgery.

Dr. Cummings, a longtime colleague, stated, "Chuck was much more than a relater of facts and statistics. He was a human being who developed relationships with patients that set him apart from most physicians. And he was always smiling and always downplayed his many accomplishments while talking about those of his colleagues."

He was a 1954 graduate of Stanford University and earned his medical degree from the Yale University School of Medicine in 1958. After completing an internship in surgery at Washington University's Barnes Hospital in St. Louis and a residency in otolaryngology, he joined the staff at the National Institute of Health for three years which was followed by his joining the faculty at Georgetown University Hospital in 1969. Dr. joined the Department of Otolaryngology faculty at John Hopkins in 1969 where he remained until his retirement in 2000.

He inducted into the American Laryngological Association as an Active Fellow where he would later received the Tucker Award in 1996 and the Newcomb Award in 1997 in recognition of his service to Laryngology and the Association. In 2001, he achieved Emeritus status.

Dr. Kashima lectured throughout the world, conducted significant research on recurrent respiratory papillomatosis and was instrumental in bringing the CO2 laser to Hopkins Hospital for use in the treatment of laryngeal disease.

Although he is known within academic medicine as a pioneer of clinical trials, Dr Kashima will be remembered most as a consummate clinician-teacher who encouraged his colleagues, residents and students with every interaction," Dr. Niparko said. He added: "Our department was blessed with his presence. His spirit lives on in our clinics and lecture halls."

Dr. Michael M.E. Johns, a former dean of the Hopkins medical school, commented that Dr. Kashima "was always looked to as a mentor, a strong shoulder, and for his good advice. He was also a person of great calmness, and when he walked into a room, you suddenly felt good. He was all about serenity and calmness and the wisdom that he carried with himself."

Dr. Kashima enjoyed traveling, playing tennis and fishing.

Dr. Kashima leaves as survivors, his wife of 49 years, the former Joyce Lynn French; sons, Dr. Matthew and Mark Haskins Kashima; a daughter, Lisa Poling; and eight grandchildren.
MEMORIALS

FRANK N. RITTER, MD, MS

It is with a heavy heart that I inform you of the passing of Frank Nicholas Ritter, B.S., M.D., M.S. on Tuesday, November 16, 2010, at age 82. He resided in Ann Arbor.

The Mass of the Resurrection was said at St. Thomas the Apostle Church in Ann Arbor on November 22, 2010.

Dr. Ritter’s decision to become a physician came at the age of 5 while observing the care his maternal grandfather gave to patients. Our resident teaching award is named in his honor.

Dr. Ritter received his M.S. degree from the University of Michigan in 1958. After interning at Mercy Hospital in Toledo, OH, he was accepted at the University of Michigan’s Ear, Nose and Throat Program which he completed in 1960. After completing his ENT residency in 1960, he entered private practice at St. Joseph Mercy Hospital in Ann Arbor and as Clinical Professor at the University of Michigan Medical Center where he was a popular teacher and received numerous awards.

Dr. Ritter was a veteran of the United States Air Force where he taught Flight Medicine at the School of Aviation Medicine and researched the effects of Space Travel in the ears of pilots and crew. After completing his E.N.T. residency in 1960, he entered private practice at St. Joseph Mercy Hospital, Ann Arbor, MI and was a Clinical Professor at the University of Michigan Medical Center. Dr. Ritter was a fine popular teacher and was given the "Shovel Award" and the Senior Award by the Medical Students.

Academically, he was the author of 70 scientific papers; published in medical literature, author of several books pertaining to the anatomy of the paranasal sinuses; and a collaborator of many chapters in E.N.T. textbooks. Recognized as an excellent speaker, both domestic and internationally, Dr. Ritter received numerous awards with the most notable one the title of “Knoght of the Equestrian Order of the Holy Sepulchre” presented by Pope John Paul II.

While medicine was his vocation, his avocation was the telling of jokes. He could tell stories on the spur of a moment about almost any subject. Whenever friends were going to give a presentation, they would ask him for an appropriate joke to tell.

In addition to being a fellow in the American Laryngological Association, Dr. Ritter was a member of numerous other professional and community organizations including the AAO-HNS, ABOto, ABEA, and the American Board of Emergency Medicine. He served as the chairman or president of many other local and regional associations.

He is survived by his wife of 53 years, Gertrude (Trudy) Frances Erlacher and their four daughters and four sons, their spouses, grandchildren and family and friends throughout the U.S. and abroad.
MEMORIALS

JOYCE A. SCHILD, M.D.

Dr. Joyce A. Schild, an Emeritus Fellow of the ALA, and a noted otolaryngologist whose career at the University of Illinois at Chicago Medical Center spanned four decades, died April 25, 2010 at her home in Albuquerque, New Mexico. She was 78.

Among the first women in the otolaryngology, she was a true pioneer both as a researcher and clinician, said Dr. J. Regan Thomas, professor and head of the University of Illinois at Chicago’s Otolaryngology department.

"Joyce Schild broke ground in so many ways," said Thomas. "As a researcher and clinician, she was rigorous in her detail and passionate about her work, advancing the field, caring for patients, and mentoring generations of students. And she was a tremendous role model – not just for women, whom she clearly inspired, but for all those with she worked and served."

Born in Chicago, Schild attended Chicago Public Schools and was a 1954 graduate of the old University of Illinois Navy Pier campus. Earning her medical degree in 1956 from the UIC College of Medicine, Schild joined the faculty of the department of otolaryngology head and neck surgery in 1958, serving until her retirement in 1996.

In 1984, Dr. Schild was inducted into the ALA as an Active Fellow. She was presented the Gabriel F. Tucker Jr. Award in 1994. In 2002, she was elevated to Emeritus status. She was also active with the Triological Society and the American Broncho-Esophagological Association where she served as President in 1979. As a member of the Chicago Laryngological and Otological Society, she was the president in 1984.

Dr. Schild was widely recognized for her work in the field of otolaryngology, publishing dozens of papers and articles.

Shortly after retirement, Schild and her husband, John Hegber, moved to New Mexico. Schild is survived by her husband. Private funeral services were held in New Mexico. A memorial service in Chicago will held in Chicago.
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1957 Harry P. Schenck
1958 Fred W. Dixon
1959 William J. McNally
1960 Edwin N. Broyles
1961 Dean M. Lierle
1962 Francis E. LeJeune
1963 Anderson C. Hilding
1964 Albert C. Furstenberg
1965 Paul A. Holinger
1966 Joel J. Pressman
1967 Lawrence R. Boies
1968 Francis W. Davison
1969 Alden H. Miller
1970 DeGraaf Woodman
1971 F. Johnson Putney
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1973 G. Slaughter Fitz-Hugh
1974 Daniel C. Baker, Jr
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1977 Charles F. Ferguson
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1995 Paul H. Ward
1996 Robert W. Cantrell
1997 John A. Tucker
1998 Lauren D. Holinger
1999 Gerald B. Healy
2000 Harold C. Pillsbury III
2001 Stanley M. Shapshay
2002 Gerald S. Berke
2003 W. Frederick McGuirt, Sr.
2004 Robert H. Ossoff
2005 Robert T. Sataloff
2006 Gayle E. Woodson
2007 Marshall Strome
2008 Roger L. Crumley
2009 Marvin P. Fried
2010 Andrew Blitzer
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Vice Presidents (First and Second)

1899–1900: Charles H. Porter, Gordon F. Harkness
1900–1901: Arthur W. Proetz, Henry B. Orton
1901–1902: Harold I. Lillie, Dean M. Lierle
1902–1903: John J. Shea, Thomas C. Galloway
1904–1905: John J. Shea, Frederick A. Figi
1905–1906: Henry B. Orton, Anderson C. Hilding
1906–1907: LeRoy A. Schall, Fletcher D. Woodward
1907–1908: W. Likely Simpson, Lyman, G. Richards
1908–1909: William J. McNally, Thomas C. Galloway
1910–1911: Claude C. Cody, Daniel S. cunning
1911–1912: James H. Maxwell, Clyde A. Heatly
1912–1913: Robert L. Goodale, Paul H. Holinger
1913–1914: Henry M. Goodyear, Robert E. Priest
1914–1915: Frances H. LeJeune, Pierre P. Viole
1915–1916: Charles Blassingame, Chevalier L. Jackson
1916–1917: James H. Maxwell, Oliver Van Alyea
1917–1918: Walter Theobald, Anderson C. Hilding
1918–1919: Julius W. McCall, P. E. Irland
1919–1920: Paul M. Moore, Jerome A. Hilger
1920–1921: Paul M. Holinger, Lester A. Brown
1921–1922: B. Slaughter Fitz-Hugh, Daniel C. Baker
1923–1924: Lawrence R. Boies, G. Edward Tremble
1924–1925: John F. Daly, Stanton A. Friedberg
1925–1926: DeGraaf Woodman, John Murtagh
Vice Presidents (First and Second)

1918  George E. Shambaugh, John R. Winslow 1970  Robert B. Lewy, Oliver W. Suehs
1920  Harmon Smith, W. B. Chamberlin 1972  Francis L. Weille, Sam H. Sanders
1922  George Fetterolf, Lorenzo B. Lockard 1974  Joseph H. Ogura, Douglas P. Bryce, John A. Kirchner
1923  Hubert Arrowsmith, Joseph B. Greene 1975  S. Lewis, Edwin W. Cocke, Jr.
1924  Ross H. Skillern, Gordon Berry 1976  Emanuel M. Skolnik, John T. Dickinson
1925  John E. Mackenty, Robert Levy 1977  J. Ryan Chandler, Herbert H. Dedo
1926  Lewis A. Coffin, William V. Mullin 1978  John E. Bordley, Lester A. Brown
1928  Robert Cole Lynch, Francis P. Emerson 1980  John Frazer, George A. Sisson

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1986  Blair Fearon 1997  Lauren D. Holinger 2008  Marvin Fried
1987  Seymour R. Cohen 19 1998  Gerald B. Healy 2009  Andrew Blitzer

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1879  G. M. Lefferts 1889  C. H. Knight 1900  P. E. Newcomb
1882  D. Bryson Delavan 1895  H. L. Swain 1911  Harmon Smith

Secretaries

1911  Harmon Smith 1942  Arthur W. Proetz 1977  William M. Trible
1918  D. Bryson Delavan 1947  Louis H. Clerf 1982  Eugene N. Myers
1919  J. M. Ingersoll 1952  Harry P. Schenck 1988  H. Bryan Neel III
1920  George M. Coates 1957  James H. Maxwell 1993  Gerald B. Healy
1935  James A. Babbitt 1968  Frank D. Lathrop 2003  Marvin P. Fried
1939  Charles J. Imperatori 1972  John F. Daly 2008  C. Gaelyn Garrett
### Treasurers

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### Librarians

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<tr>
<td>1879</td>
<td>F. H. Bosworth</td>
<td>1903</td>
<td>J. H. Bryan</td>
<td>1934</td>
<td>Burt R. Shurly</td>
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<td>1883</td>
<td>T. R. French</td>
<td>1930</td>
<td>John F. Barnhill</td>
<td>1935</td>
<td>George M. Coates</td>
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### Librarian and Historian

<table>
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<tr>
<th>Year</th>
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<td>1936</td>
<td>George M. Coates</td>
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<td>Louis H. Clerf</td>
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### Librarian, Historian and Editor

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<td>1964</td>
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<td>1994</td>
<td>Ernest A. Weymuller, Jr</td>
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### Historian

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<tr>
<td>2010</td>
<td>Robert H. Ossoff</td>
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DECEASED FELLOWS

Dates indicate original election to the Association

Honorary Fellows

1946 Alonso, Justo M., Montevideo, Uruguay 1914 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
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 Mourie, J. J. E., Bordeaux, France
1957 Conley, John J., New York, NY 1937 Nager, F. R., Zurich, Switzerland
1918 Dean, Lee Wallace, St Louis, MO 1818 Oliver, H. K., Boston, MA
1981 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
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, Schwensville, 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 Lac, H., Paris, France
1938 Blair, Vilray P., St Louis, MO 1986 MacDonald, Greville, Haslemere, England
1892 Browne, Lennox, London, England 1894 MacIntyre, John, Glasgow, Scotland
1964 Cleves, Carlos, Bogota, Colombia 1920 McKenzie, Dan, London, England
1940 Collledge, Lionel, London, England 1919 McKernon, 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
1950 Dohman, Gusta, East Bradenton, 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
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
1894 Holden, Edgar, New York, NY 1886 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
1978 Kleinsasser, Oskar, Marburg, Germany 1913 Turner, A. Logan, Edinburgh, UK
1881 Labus, Carlo, Milan, Italy 1936 Vialle, Jacques, Nice, France
1926 Law, Frederick M., New York 1901 Wingrave, Wyatt, Lyme Regis, England
1921 LeMaitre, Ferdinand, Paris
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<td>Halliday, Sir George C., Sydney, Australia</td>
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<td>Hansel, French K., St Louis, MO</td>
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<td>Hardie, Thomas Melville, Chicago, IL</td>
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1961  Pang, Lup Q., Honolulu, HI  2006  Sisson, George, Chicago, IL
1961  Pastore, Peter N., Richmond, VA  1987  Skolnik, Emanuel M., Chicago, IL
1948  Phelps, Kenneth A., Burlington, NC  1950  Smith, Austin T., Philadelphia, PA
1987  Porter, William, Ocean Springs, MA  1908  Smith, Harmon, New York, NY
1942  Potts, John B., Omaha, NE  2004  Soboroff, Burton, Chicago, IL
1951  Priest, Robert E., Edina, MN  1954  Sooy, Francis A., San Francisco, CA
2004  Putney, F. Johnson, Charleston, SC  1923  Spencer, Frank R., Boulder, CO
1963  Reed, George F., Syracuse, NY  1947  Theobald, Walter H., Chicago, IL
1903  Rennert, W. Scott, Buffalo, NY  1954  Thom, William C., Cincinnati, OH
1897  Rhodes, John Edwin, Chicago, IL  1927  Tobey, Harold G., Boston, MA
1884  Rice, Clarence C., New York, NY  1963  Tolan, John F., Seattle, WA
1905  Richards, George L., South Yarmouth, MA  1950  Tremble, G. Edward, Montreal, Canada
1956  Richardson, John R., Searspart, ME  1925  Tucker, Gabriel, Haverford, PA
2010  Ritter, Frank, Ann Arbor, MI  1943  Van Alyea, Oliver E., Chicago, IL
1878  Robinson, Beverly, New York, NY  1941  Violé, Pierre, Los Angeles, CA
1938  Salinger, Samuel, Palm Springs, CA  1892  Wagner, Henry L., San Francisco, CA
1959  Sanders, Sam H., Memphis, TN  1892  Watson, Arthur W., Philadelphia, PA
1921  Sauer, William E., St Louis, MO  1948  Whalen, Edward J., Hartford, CT
1934  Schenck, Harry P., Philadelphia, PA  1922  White, Francis W., New York, NY
2010  Schild, Joyce, Albuquerque, NM  1939  Wilson, J. Gordon, Old Bennington, VT
1923  Sewall, Edward C., Palo Alto, CA  1905  Wood, George B. Wynnewood, PA
1930  Seydell, Ernest M., Wichita, KS  1935  Woodward, Fletcher D., Charlottesville, VA
1907  Shambaugh, George E., Chicago, IL  1953  Work, Walter, Green Valley, AZ
1558  Simonton, Kinsey Macleod, Ponte Vedra Beach, FL
1937  Simpson, W. Likely, Memphis, TN

Active Fellows

2006  Adams, George L., Excelsior, MN  1935  Eggen, Murdock S., Atlanta, GA
1958  Alfaro, Victor R., Washington, DC  1919  Eves, Curtis C., Philadelphia, PA
1880  Allen, Harrison, Philadelphia, PA  1914  Faulkner, E. Ross, New York, NY
1969  Andrews, Albert H., Jr, Chicago, IL  1901  Fetterolf, George, Philadelphia, PA
1917  Arrowsmith, Hubert, Brooklyn, NY  1917  Freeman, Walter J., Philadelphia, PA
1879  Asch, Morris, New York, NY  1897  Friedberg, Stanton A., Chicago, IL
1942  Ashley, Rae E., San Francisco, CA  1940  Frothingham, Richard, New York, NY
1906  Ballenger, William L., Chicago, IL  1940  Gibb, Joseph S., Philadelphia, PA
1880  Bean, C. E., St Paul, MN  1878  Gill, William D., San Antonio, TX
1949  Beck, August L., New Rochelle, NY  1913  Glasgow, William Carr, St Louis, MO
1904  Berens, T. Passmore, New York, NY  2001  Goldstein, Max A., St Louis, MO
1924  Bigelow, Nolton, Providence, RI  1905  Gray, Steven D., Salt Lake City, UT
1938  Blassingame, Charles D., Memphis, TN  1934  Grayson, Charles P., Philadelphia, PA
1951  Boyden, Gay L., Portland, OR  1988  Gassack, Gerald S., Atlanta, GA
1895  Boylan, J. E., Cincinnati, OH  1933  Hanson, David G., Chicago, IL
1932  Brown, John MacKenzie, Los Angeles, CA  1957  Harkness, Gordon F., Davenport, IA
1892  Brown, Moreau R., Chicago, IL  1878  Harrill, James A., Winston-Salem, NC
1933  Buckley, Robert E., New York, NY  1945  Hartman, J. H., Baltimore, MD
1915  Canfield, R. Bishop, Ann Arbor, MI  1879  Hickey, Harold L., Denver, CO
1934  Carmack, John Walter, Indianapolis, IN  1907  Holden, Edgar, Newark, NJ
1924  Carmody, Thomas E., Denver, CO  1882  Holmes, Christian R., Cincinnati, OH
1889  Casselberry, William E., Chicago, IL  1893  Hooper, Franklin H., Boston, MA
1883  Chamberlain, C. W., Hartford, CT  1938  Hope, George B., New York, NY
1876  Chamberlin, William B., Cleveland, OH  1939  Houn, George E., St Louis, MO
1906  Chappell, W. F., New York, NY  1925  Hyatt, Frank, Washington, DC
1902  Cockley, Cornelius G., New York, NY  1878  Igual, Samuel, Cincinnati, OH
1913  Coffin, Rockwell C., Boston, MA  1882  Ingals, E. Fletcher, Chicago, IL
1918  Cox, Gerald H., New York, NY  1938  Ives, Frank L., New York, NY
1880  Cushing, E. W., Boston, MA  1880  Jackson, Chevalier L., Philadelphia, PA
1878  Cutter, Ephraim, West Falmouth, MA  1879  Jarvis, William C., New York, NY
1880  Daly, W. H., Pittsburgh, PA  1879  Johnson, Hosmer A., Chicago, IL
1878  Davis, F. H., Chicago, IL  1960  Johnson, Woolsy, New York, NY
1941  Davis, Warren B., Philadelphia, PA  1961  Johnston, Kenneth C., Chicago, IL
1926  Dennis, Frank Lowens, Colorado Springs, CO  1944  Jones, Edley H., Vicksburg, MI
1901  Dickerman, E. T., Chicago, IL  1979  Jones, Marvin F., New York, NY
1969  Dickinson, John T., Pittsburgh, PA  1964  Kealhofer, R. H., St Louis, MO
1878  Donaldson, Frank, Baltimore, MA

## Active Fellows

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<thead>
<tr>
<th>Year</th>
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<td>King, Edward D.</td>
<td>North Hollywood, CA</td>
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<td>King, Gordon</td>
<td>New Orleans, LA</td>
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<td>Knight, Frederick</td>
<td>Irving, Boston, MA</td>
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<td>Knight, John S.</td>
<td>Kansas City, MO</td>
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<td>1953</td>
<td>Kyle, D. Braden</td>
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<td>Langmaid, Samuel W.</td>
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<td>Morrison, Lewis F.</td>
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<td>Murray, T. Morris</td>
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<td>Porter, Charles T.</td>
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<td>Pressman, Joel J.</td>
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<td>Allegheny, PA</td>
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<td>Richards, Lyman G.</td>
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