

## Personal Reflections on the Development and Change of Neurological Surgery

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At the outset, I ask you to please excuse any speech variations during this presentation. As many of you are aware, I have a left temporal lobe Anaplastic Astrocytoma, which often interferes with my speech.

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Discussing neurosurgical development with present neurosurgeons may appear unusual, but it has been my opinion that our specialty has had major changes since the time of my training. Also there have been more academic developmental sites as well as more residents. The most significant change has been in imaging.

During training, about 60% of patient care was with radiologic measures, almost all accomplished by neurosurgeons, very little by radiologists. Currently, the vast majority of these procedures are done by neuroradiologists, with little input by neurological surgeons.

Also, the description of neurosurgery, or if more desired, neurological surgery, has greatly changed. For example, the clipping of aneurysms, one of our previously most common procedures, has mainly moved to endovascular coiling. In addition, much of spinal surgery is now referred to the orthopedic spinal surgeons, and general surgery has made attempts to take over traumatic skull surgery, and other transient neurological procedures. There has also been competition within neurological surgery, with the development of subspecialties – which is much different from when I practiced and was expected to treat all aspects of neurosurgery, and was happy to do so. Some of the changes involved include neurosurgeons who refuse to do intracranial surgery (perhaps due to changes in liability concerns and also diminishing returns in compensation). I know I enjoyed doing intracranial work.

It appears to me that patient consideration and examination is less related to patient details and needs, with much more consideration given to radiological appearance and some physicians desiring to avoid areas of needed care. Also, nurse practitioners were unknown to neurosurgery, as were physician assistants.

Certainly, a very detailed and prolonged description of neurosurgery could be presented, but I instead choose to focus briefly on the contributions of the “founding fathers” of neurosurgery. I know I cannot mention everyone responsible for the development of our profession, and I apologize for any omissions.

## Our History, Our Future

or

If you don't know where you come from, how will you know where you are going?

We in neurological surgery have a very colorful and interesting history. During my residency, from 1964-1969, all of us were aware of the early names of neurosurgery, such as Cushing, Horsley, Frazier, Macewen, Krause and Dandy. Also there was Poole, Eddie Kahn, A. Earl Walker, Bronson Ray, Woodhall, Schwartz, Spurling, German, Schneider, Bucy and French just to name a few. But it appears that many who are in training or recently in practice do not appear to be aware of the significant contributions of the neurosurgical forefathers to our profession. I often bring up these names with the neurosurgeons I frequently come in contact with, and rarely receive a knowing response of who these individuals are or their contributions to the neurosurgical profession. Not being aware of our history is not being properly appreciative of the qualities of our initial surgical developments and past. Indeed, without the contributions of those who preceded us, we would not be able to care for our patients as well or in as advanced a way as we presently do.

To start with, one cannot consider the development of neurological surgery without considering the formation of our major important diffuse organizations. Indeed, not all of the organizations were formed in cooperation and agreement of the founding fathers of neurological surgery. Just briefly, here are those organizations:

- In 1904, it all began with a paper presented by Dr. Harvey Cushing at the Academy of Medicine in Cleveland titled "The Special Field of Neurological Surgery."
- In March 1920, the Society of Neurological Surgeons was founded by 11 neurosurgeons in Boston, but it only had limited membership.
- In October 1931, the Harvey Cushing Society was founded by Temple, Fay, Eustice, Semmer, Glen Spurling and Van Waggenen. The Cushing Society's first meeting was in May 1932 in Boston and its membership was limited to 35 neurosurgeons.
- In 1938, the American Academy of Neurological Surgeons was founded by 7 neurosurgeons who were not elected into the Harvey Cushing Society. The American Academy of Neurological Surgeons was initially open to all comers, but later was restricted membership due to the need for close fellowship and education.
- In 1940, the American Board of Neurological Surgeons was founded, and required only 2 years of neurosurgical training for membership
- In June 1948, the Neurological Society of America was founded but had only limited membership.
- In 1949, the Harvey Cushing Society (which, as most of you know, became the American Association of Neurological Surgeons) opened its membership to those neurosurgeons who were Board Certified; and
- In May 1951, the Congress of Neurological Surgeons was founded, holding its first meeting in Memphis in November 1951.

Interestingly, Walter Dandy refused to join any of these neurosurgical societies, but did join the American Neurological Association.

### Neurological Surgery

Modern neurological surgery began at the turn of the 20<sup>th</sup> Century, around 1901, when Harvey Cushing was encouraged by William Halsted at the Johns Hopkins Hospital to develop a neurological surgery specialty. Harvey Cushing initiated many aspects of operative approaches to neurosurgery, creating a degree of patient improvement not previously seen. While many of us are aware of the contributions of Cushing, Walter Dandy also made significant inroads to neurosurgical patient care.

Cushing and Dandy (who was also at Hopkins) admired each other, but did not get along. Cushing left Hopkins for Boston in 1912. Dandy, who stayed at Hopkins, produced a well-developed neurosurgical practice. Walter Dandy described the function of cerebral spinal fluid and initiated air studies, which contributed to finding the location of lesions and thus improved operative approaches and results. Dandy was responsible for pneumoencephalography, ventriculography, spinal disk surgery, and surgery for Meniere's Disease, glossopharyngeal, trigeminal neuroalgia, and ticdoloreaux just to mention a few.

Subsequently, later neurosurgical operative and non-operative techniques have been developed, such as vascular and spinal, but certainly the most advanced neurosurgical developments have been in neuroimaging.

### Neuroimaging

Many of us recall reliance on plain x-rays of skull and spine and extremities. When necessary, a variety of studies were accomplished by neurosurgeons such as direct stick carotid angiography, retrograde brachial artery injections and ventriculography. Spinal studies mainly consisted of myelography utilizing Pantopaque or air myelography for sagittal area studies.

X-ray development for neurosurgery was initiated by Conrad Rontgen in 1896, which showed the human skeleton within living tissue. This discovery resulted in the first Nobel Prize in physics in 1901.

Thomas Edison then modified the x-ray to a fluoroscope, but viewing of the brain was unlikely with this method. In 1896, Edison developed the first contrast-related fluoroscope, resulting in neuroradiology.

After the pneumoencephalogram was developed by Walter Dandy, myelography emerged, utilizing iodized oil. Lipiodol was used in Europe, but was not used in the US until 1944. After Lipiodol, Pantopaque (an organic iodine compound which was more

stable than Lipiodol) was used as contrast material and produced excellent radiological studies.

In 1934 Mixter and Barr used Lipiodol myelography to show the rupture of the intervertebral disk. After several decades Metrizamide was used as the first non-ionic water-soluble contrast material.

In 1927, angiography was developed by Moniz (with Lima), which used thorostrast (Thoracic Dioxide). In the US this was replaced by Hypaque.

In 1951, the Seldinger Guide Wire was developed, and in 1963 Amplaty for femorocerebral catheterization.

Radioactive isotopes were pushed by Di Chiro, but their use declined in 1973 with the onset of the CT by a neurologist, Wilhelm Oldendorf.

The EMI was utilized by Kuhl via experiments done by the Navy. The EMI scan was the initial CT-type study that we considered groundbreaking and innovative. Soon, more detailed and readable CT scans occurred, progressively improving – especially with the onset of the MRI scan in the early 1980s.

Improved studies are now available through CT and MRI. CT and MRI have provided much better information and details of the disease or disorder, and patients find these studies more comfortable and convenient.

Other radiological mechanisms such as interventional neuroradiology (Luessenhap) with balloon catheter techniques, and Positron Emission Tomography (“PET” scans) have expanded the tools available to neurosurgeons.

In terms of treatment, John Adler, Jr. yesterday described the development of the Cyberknife. Brain Lab has similar products.

### The Training of Neurosurgeons

All of us in medical school, mine being at the University of Chicago, had to consider what our future activities and training will be. My focus from the beginning was neurosurgery, and I now want to just briefly mention some of my formative experiences.

Neurological surgery has been a fascinating and satisfying career. I can imagine that many of us could have followed other career paths – both in and outside of medicine – and many factors and influences have resulted in us meeting here as neurosurgeons. I was fortunate to have encountered a number of such influences.

During my med school training at Chicago, my initial influence was Douglas Buchanan, a Scottish pediatric neurologist with a wonderful talent for teaching. Particularly memorable were Dr. Buchanan’s Saturday morning conferences where he

would spin a tale of the history of the selected disorder and provide patient demonstrations. One of my most vivid memories of medical school occurred after presenting a patient to Dr. Buchanan in neurology clinic, Dr. Buchanan asked me what I planned to do after I left medical school. I responded that I hoped to become a neurosurgeon. He looked at me for a few moments, then said “I have never met a neurosurgeon who was not a hydrocephalic” – perhaps the usual view of neurologists’ opinions of neurosurgeons. I also had a research advisor, Ruth Rhines, M.D., Ph.D. who was a wonderful supportive faculty member.

Drs. Richter, Sidney Schulman, Howard Barlow (later Chair at Harvard), and Robert Cutler (who joined Stanford) were also excellent neurological teachers; other Chicago neurosurgical influences were Drs. Raimondi, Torres, Jane and Hekmatpanah. But it was Joseph Evans and Sean Mullen who became my neurosurgical idols at that time – superb gentlemen, teachers and surgical technicians, excellent examples to identify with. Dr. Mullen was the author of one of the original neurosurgical training books, “Essentials of Neurosurgery for Students and Practitioners” published in 1961. During my senior year at Chicago, I took three elective rotations in neurological surgery – and I was hooked. (As you may recall, Dr. Mullen gave the 2010 WNS Cloward Award Lecture, “Some Neurosurgical Fossils.”)

At Duke for a surgical internship, I had the advantage of assisting Guy Odom, Barnes Woodhall and Blain Nashold – all well known to most of you.

During my neurosurgical residency at the University of Washington, Dr. Arthur Ward was the chief, quite demanding but he provided especially good stereotactic surgery and corticography with epileptogenic focus excisions as well as general neurosurgery. Eldon Foltz, Bill Kelly, Lowell White, and Basil Harris were demanding but valued examples of neurosurgery. George Ojemann arrived during my research year and has been a valued and supportive physician. It was at Washington that I had the pleasure of meeting fellow residents Randy Smith, John Kusske and John Loeser (who once commented that I was the only Washington neurosurgery resident trained in Chile when he saw me consulting a book, “Neurosurgical Techniques” written by Alfonso Asenjo, M.D., a Chilean neurosurgeon).

My next experience was a three-year stint as an Assistant Professor at the University of Missouri. During my time on the faculty of the University of Missouri on Columbia, my boss was Sam Black, who presented another informative perspective of neurosurgical philosophy and techniques, as did Warren Sights – a real character, an expert in reptiles (he had a whole basement of them) and an intriguing personality and intellect (a fellow University of Chicago graduate). Missouri was a very pleasant area to live in, and university life was always interesting.

In mid-1972, Romona and I, two children and one dog came to Fresno, CA from Missouri for what was to be a temporary stay. Forty years and an additional child (my son David) later we still reside in Fresno. In Fresno, I found a supportive, competent neurosurgical community, as well as well-equipped, progressive hospitals. I specifically

want to mention Fresno neurosurgeons Dave Zealer, a long-time WNS member who suggested I join the organization and sponsored my membership, and John Slater, a very good friend indeed.

Being President of the WNS has been a great experience, made easy for me by many members – but especially by the Executive Committee members. In particular, I mention the help of Charlie and Debbie Nussbaum, who shepherded my wife, Romona and I through the meeting planning process with pleasant grace. Charlie is an extremely productive and dedicated member of the WNS, and his and Debbie's help made the Presidency so much easier for me.

I am sure our next President, Jeff Rush, will present an exciting and desirable meeting, and I wish him well.

I have loved being a neurological surgeon -- loved the variety of pathology and cases, enjoyed my knowledgeable and supportive office staff (I was very fortunate that way), and cherished the pleasant, cooperative operating room and floor nursing personnel. Much of being a neurosurgeon has been challenging – but only by being challenged is a person likely to be satisfied.

In closing, as all can attest, the practice of neurosurgery affects not only the physician, but the physician's family as well. So I take this opportunity to thank the nurse who swore she would never marry a doctor – let alone a neurosurgeon – my wife, Romona.

During the 40-some years that I have practiced medicine, Romona has put up with a neurosurgeon's chaotic schedule – whether it is missed symphonies or soccer games due to emergency room call, late dinners due to meetings, or other impositions. I'm sure all the spouses present have experienced similar lifestyle adjustments. Nonetheless, Romona has stuck by me through 48 years of marriage. She is, simply, the love of my life, and I thank her for supporting my magnificent obsession.