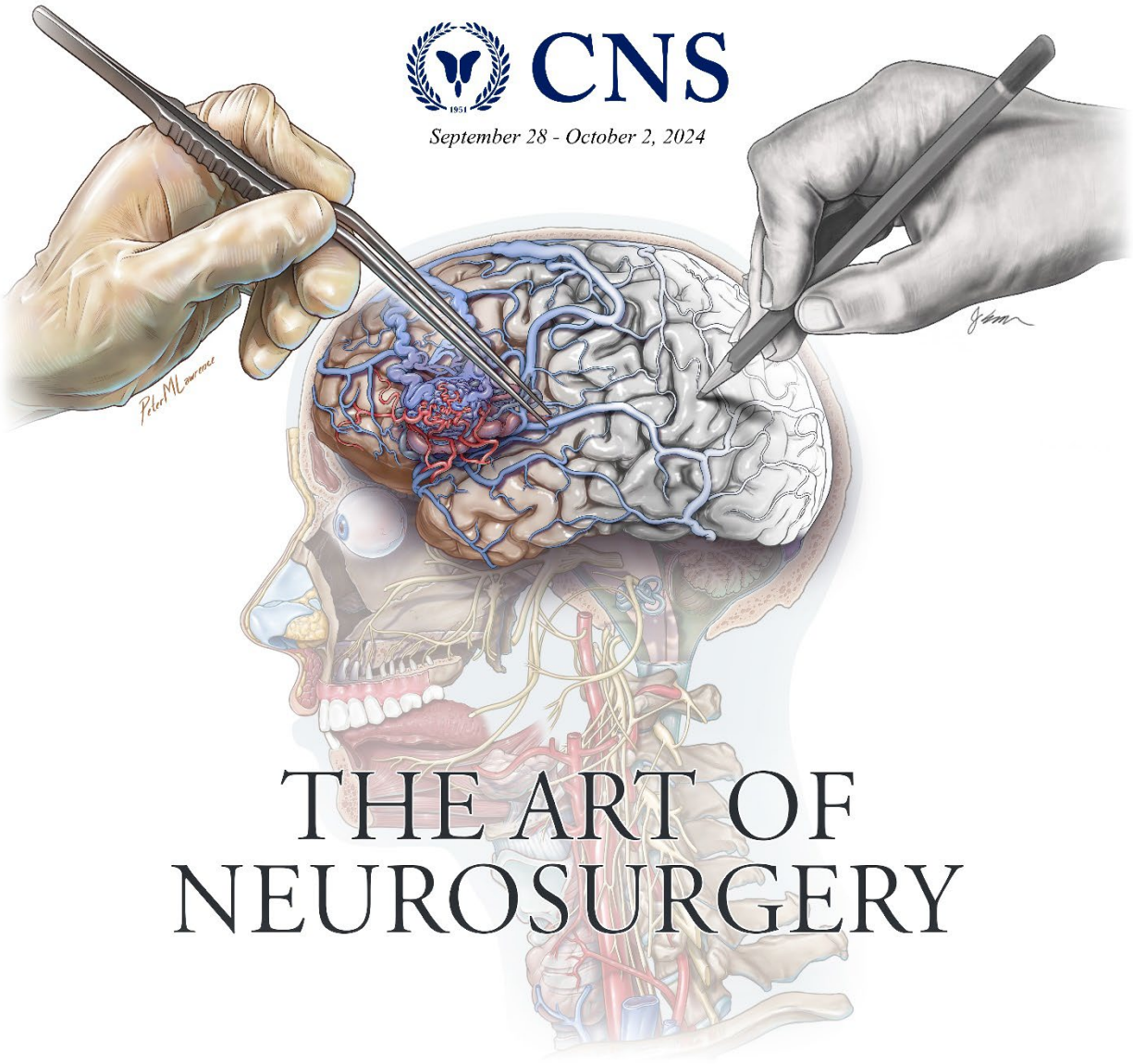
CNS

September 28 - October 2, 2024



THE ART OF NEUROSURGERY

Exhibiting Artists

1) Goodness Boluwatife Adenowo

No Pain, No Gain

The drawing illustrates a striking view of a man seated upright, with his skull opened to reveal his brain. A surgeon is seen operating on the brain while he is awake. The piece denotes pain and resilience in pursuit for recovery.

2) Robert O. Beach

Pterional transsylvian approach

Created with traditional acrylic paint. Published in Dr. Albert Rhoton's Cranial Anatomy and Surgical Approaches

3) Chandrima Biswas, MD

The Dancing Girl

A little girl dances oblivious to the crowd of patients around her, amusing her father who is waiting for his cancer treatment. I witnessed this scene as I walked past a busy hospital corridor in the largest institute dedicated to oncology in India.

4) Jason Brady

Infratemporal Fossa

Jason Brady is known for his luminous, naturalistic oil paintings. After discovering medical illustration, he merged his passion for art and science at the Johns Hopkins Department of Art as Applied to Medicine. He received the Frank Netter M.D. Award for his excellence in academic achievement and anatomical illustration and earned a Master of Arts in Medical and Biological Illustration in 2022. Jason is passionate about illustrating and animating the anatomical, histological, and molecular intricacies of the human body to help elucidate modern medicine. This illustration teaches medical students the complex spatial relationships of structures within the infratemporal fossa. This illustration was created through careful research and cadaveric dissection to understand how the nerves and arteries interweave between muscles to reach their target structures. ©2021 Jason Brady

5) V. Ramzes Chavez-Herrera

Wired Brain

A colorful digital drawing of a brain depicting the distant lobes. Wired in all it's entirety.

6) V. Ramzes Chavez-Herrera

Watercolor Ventricles

This is a watercolor painting that was done during the initial COVID era. It states the different colors of the ventricles and the surrounding structures.

7) Aaron Cole

Transcochlear Approach: C2-P2 Bypass

This series of surgical illustrations depicts the process of exposing the Petrous Internal Carotid Artery (pICA) and Posterior Cerebellar Artery (P2 PCA) through a transcochlear-subtemporal approach. The final stage focuses on the grafting of a portion of the Radial Artery from the the pICA to P2 PCA.

8) Frank M. Corl

Preoperative Planning for Apical Lung Tumor Removal

Illustration based on a 3D print from a patient's CT scan to assist in preoperative planning for an apical lung tumor removal. Created using pencil and Photoshop.

9) Mariye Erol Demirtuk, MD

The Titanium Angel

The drawing depicts a young girl who, after scoliosis surgery, gains wings that provideher a sense of freedom. \ These wings are not like those of a bird but rather angelic, adding a touch of beauty to her transformation.

10) Andrew Doty

Inland Empire

Unlike other traumatic injuries, the infarct of brain trauma is subtle. What "Island Empire" demonstrates is the inward betrayal of the mind and senses when the structure of the brain is adulterated, which is reflected in the abstraction on the patients right. The patient's left, while seemingly normal, is a duality meant to portray that traumatic brain injuries affect those we may outwardly consider healthy, but who may inwardly face debilitating malaise.

11) Russell Drake

Cerebellar Tumor Resection & Raney Clip Application

Original gouache paintings depicting various neurosurgical procedures, 1933

12) Russell Drake

Brain cysts. Enucleation of cystic glioma.

13) Russell Drake

Pencil sketch of aneurysmal varices of the right side of brain and sylvian fissure, anomalous vessel, temporal lobe.

14) Russell Drake

Pencil sketch of brain cysts. Enucleation of cystic glioma.

15) Russell Drake

Surgical consideration of brain tumor. Oligodendroglioma. Left frontal lobe. Tumor removal. (Color)

16) Josh Emerson
Neuroanatomy 101
Created using graphite and Photoshop

17) Reyna Escalante
A Shadow in the Or
As a medical student, my time in the operating room primarily involves observation. Though my role is limited in terms of direct involvement, I am deeply moved by the moments I witness. This piece is an amalgamatim of several pieces I created during my time shadowing a neurosurgery program. They are a reflection of the profound experience and knowledged gained during that period.

18) Eleanora Fry
Brain tumor. Section through brain and tumor.

No photography or photos please.

19) Eleanora Fry
Cerebral tumors. Calcareous tumor about to be removed and depression on brain surface exposed.

No photography or photos please.

20) Eleanora Fry
Extradural fibroneuroma of the spinal cord. Cyst eroding bony canal.

No photography or photos please.

21) Eleanora Fry
Spinal cord tumor. Dura opened. Incision made in cord substance.

No photography or photos please.

22) Matthew Goldman, MD
Brainstorming
After a productive and educational call shift, your brain is fried. Your sleep deprived neurons short circuit as you sign out the events of the night. The post-call exhausted dreamy state of mind fuels creativity.

23) Steve Graepel
Perivascular invasion of primary human glioblastoma cells in organotypic human brain slices: human cells migrating in human brain
Glioblastoma (GBM) is an aggressive primary brain cancer. Lack of effective therapy is related to its highly invasive nature. GBM invasion has been studied with reductionist systems that do not fully recapitulate the cytoarchitecture of the brain. The team at Mayo Clinic describe a human-derived brain organotypic model to study the migratory properties of GBM IDH-wild type ex vivo.
Full article published in the Journal of Neuro-Oncology July 25, 2023

24) Lydia Gregg

Perimedullary Arteriovenous Fistula Associated with a Paraspinal Arteriovenous Malformation in a Newborn

This piece depicts a rare combination of two vascular pathologies in a newborn. First, a perimedullary arteriovenous fistula (PMAVF): an abnormal connection between an artery and a vein on the surface of the spinal cord. Second, a paraspinal arteriovenous malformation (AVM): a tangled mass of abnormal vessels. The left side of the piece shows the locations of the lesions and the branches that supply them at vertebral levels T11 and L4. The inset shows the relationship of the PMAVF and abnormal feeding vessels to the spinal cord and the correct location for the catheter, which are crucial elements in achieving closure of the fistula. Dashed lines in the first image indicate the opening along the pedicles shown in the inset. The draining vein's exit from the spinal canal at level L5 is also shown. Created using Photoshop and Osirix for Neuroradiology Clinic, Klinikum Stuttgart, Stuttgart, Germany, 2020

25) Lydia Gregg

Supracerebellar Transtentorial Approach for Selective Amygdalohippocampectomy

This illustration provides an overview of the supracerebellar transtentorial approach for selective amygdalohippocampectomy. The orientation figure in the upper left clarifies the angles of the parasagittal and coronal sections in the main image. To highlight the depth of access achieved by this approach, selective lighting was used to draw the viewer's eye to the areas of focus. The surgical field is depicted with bright, warm-hued, high-contrast lighting, while the planes of section and background are treated with dark, cool-hued, low-contrast lighting. The viewing angle and planes of section allow for appreciation of features not simultaneously visible from the surgeon's view, including the elevated transverse sinus, tentorial incision, and trochlear nerve locations. The corresponding article was recently submitted to a neurosurgical journal that features labeled cover images. The text exceeds a 7:1 contrast ratio in accordance with WC3 accessibility standards. Created using Photoshop and 3D Slicer for Dr. Alexander Weil, Department of Neurosurgery, University of Montreal, 2024

26) Barbara Hanna

The Anatomist

"Let conversation cease –

Let Laughter fee –

This is where death delights to train the living."

- Attributed to Giovanni Morgagni, the father of anatomical pathology

27) Steven J. Harrison, PhD

Cervical Stabilization

Original airbrush & color pencil depiction of a Haid plate and screws for posterior plating of the cervical spine

Featured on the cover of BNI Quarterly 7(2), 1991

28) Steven J. Harrison, PhD

Grading System for Arteriovenous Malformations – Original Concept Drawings, Traditional Paintings, &1986 JNS Publication

An important factor in making a recommendation for treatment of a patient with arteriovenous malformation (AVM) is to estimate the risk of surgery for that patient. A simple, broadly applicable grading system that is designed to predict the risk of morbidity and mortality attending the operative treatment of specific AVM's is proposed. The lesion is graded on the basis of size, pattern of venous drainage, and neurological eloquence of adjacent brain.

Published in the article *A Proposed Grading System for Arteriovenous Malformations of the Foramen Magnum* written by Drs. Robert F. Spetzler & Neil A. Martin, 1986

29) Steven J. Harrison, PhD

Optic Nerve Vasculature

In this traditional line and stippling piece from Steve Harrison, the peripheral and periaxial vascular meshwork supplying the optic nerve is shown: ophthalmic artery, central retinal artery, short posterior ciliary arteries, and the circle of Zinn.

Published in the BNI Quarterly, Vol. 9 No. 2, 1993

30) Steven J. Harrison, PhD

Posterior View of Neck Anatomy

Original color pencil and pen and ink showing posterior cervical neck anatomy and incision revealing upper cervical vertebrae.

Created for the article *Posterior Atlantoaxial Arthrodesis*, 1991

31) Steven J. Harrison, PhD

Supracellar Granular Cell Tumor

Steve Harrison created this charcoal pastel and color pencil drawing of a suprasellar tumor invading the third ventricle in the summer of 1989 for the article, "Symptomatic Granular Cell Tumor: Case Report and Review of the Literature" written by Shih Sing Liu.

Published in the BNI Quarterly, July, 1989

32) Chandrasekaran Kaliaperumal

Stress and Bliss in Neurosurgical Training

These cartoons depict the life of a Neurosurgical trainee in a stressful and in a mindful state. The change noted is a cumulative evolution of a trainee during the training period.

33) Chandrasekaran Kaliaperumal

Women in Neurosurgery

An abstract art description the beautiful Women's mind.

34) Kristen Larson Keil

Cover Art for Color Atlas of Brainstem Surgery

This piece was created for the cover of the Color Atlas of Brainstem Surgery by Dr. Robert F. Spetzler et al. The image includes many of the pathologies discussed in the book, including a thalamic glioma, a pontine cavernous malformation, a lateral pontine AVM, a pineal tumor compressing the tectum, as well as an axial section through the midbrain highlighting the nuclei and tracts. The cerebral hemispheres and cerebellum were drawn using traditional graphite pencil, while the brainstem and its surrounding anatomy were painted digitally to draw the eye and reinforce the focus of the book. Kristen manages the Neuroscience Publications department at Barrow Neurological Institute, where she has worked as a medical illustrator since 2006.

35) Nicholas Kilner-Pontone

Pediatric Glioma Excision, Concept Sketches

2023

36) Nicholas Kilner-Pontone

Pediatric Glioma Excision

2023

37) Landry Konan

The Power of Sharing

This is an analogy between Michelangelo's fresco and the synaptic transmission to illustrate the fact the "magic" happens when we share knowledge from one to another.

39) Peter M. Lawrence

Seven Cavernomas

A collage of various illustrations created for Dr. Michael T. Lawton's Seven Cavernomas Series, 2024

40) Peter M. Lawrence

Scalp AVM 1

Created using traditional carbon dust

40) Peter M. Lawrence

Scalp AVM 2

Created using traditional carbon dust

41) Vikas Munjal

The Brain UnEarthed

"The Brain Unearthed" explores the origins of neurosurgery by symbolically depicting the human brain as a fundamental discovery emerging from the depths of the earth. This artwork represents the intersection of anatomical science and historical exploration, illustrating how neurosurgery has evolved from its ancient roots to the present day. The image evokes a sense of reverence for the intricate complexity of the brain and the profound journey of understanding that continues to shape the field.

42) Franciska Otaner

The Depth of Thought

"The Depth of Thought" illustrates the brain, the spinal cord, and the cell body of a neuron, all set against a colorful backdrop of space, with two fish swimming around a nebula. The blend of fish and stars symbolizes depth; both space and the ocean extend through great, unknown reaches. This profoundness mirrors our own nervous system, where within 100 billion neurons and 100 trillion synaptic connections, great complexity and mystery remain. This piece highlights the endless exploration and discovery within both our external world and our own minds.

43) Franciska Otaner

The Tree of Life

"The Tree of Life portrays a woman sleeping under a Weeping Willow, where the branches resemble neurons. As she falls into deep sleep, symbolized by the vibrant, abstract background, the neurons above her take charge, just as our neurons do without our awareness. They guide and protect us, sustain our life and manage our every function even in the depths of slumber.

44) Carolina Moreno Pace

A Grandfather Stroke

This piece is a tribute to my grandfather, who passed away in October 2022 at the age of 65, following a stroke. The same fate befell his parents, and through their loss, I found my path to neurosurgery. It is often in the shadows of our greatest sorrows that we discover our deepest passions. In the end, family is the most precious gift we have, guiding us through life's journey, even when they are no longer by our side.

45) Dave Peace

Posterior view with the cerebellum and the left half of the roof of the fourth ventricle removed

Published in the article *Microsurgical Anatomy of the Region of the Foramen Magnum* written by Drs. Evandro de Oliveira & Albert L. Rhoton, Jr., 1985

46) Dave Peace

Instruments for aneurysm dissection

A.) A 40-degree teardrop dissector, separating perforating branches and arachnoidal bands from the neck of a basilar artery aneurysm. A blunt-tip, 5-French, suction tube provides suction and facilitates retraction of the aneurysm neck for dissection. Structures in the exposure include the superior cerebellar, posterior communicating, posterior cerebral, and posterior thalamoperforating arteries and the oculomotor nerve.
B.) The wall of an aneurysm being retracted with a spatula dissector, and tough arachnoidal bands around the neck being divided with microscissors.
Published in *Rhoton Cranial Anatomy and Surgical Approaches*

47) Spencer Phippin & Mark Schornak

Spinal AVM classification

Mark Schornak's concept sketch, color study, and pen & ink (mastercopy by Spencer Phippen) showing an extradural spinal arteriovenous malformation in the cervical region

48) James D. Postier II, Dr. Jonathan M. Morris

Hematoma in pediatric patient

49) David Rini

Craniopagus Twins

50) David Rini

Block Sisters Craniopagus Twins

Created for Ben Carson, MD, 2004

51) David Rini

Bajani Sisters Craniopagus Twins

Created for Ben Carson, MD, 2003

52) David Rini

Cavernous Sinus Meningioma removal

Published in The Neurosurgical Atlas, Aaron Cohen-Gadol, MD, 2018

53) Amanda Cyntia Lima Fonseca Rodrigues

Spinal Symphony

Spinal Symphony is a fascinating black-and-white art that masterfully depicts the human spine using an intricate line art technique, bringing the vertebral column to life through a series of crafted lines that echo the aesthetics of topographic maps. Each curve and contour of the spine is accentuated by varying shades from deep black to light grey, creating a dynamic and three-dimensional visual effect. The surrounding lines flow gracefully, reaching the harmonious interplay of muscles and tissues, and evoke a sense of movement and fluidity, capturing the anatomical beauty of the spine, and showcasing its strength and flexibility.

54) Amanda Cyntia Lima Fonseca Rodrigues

The Vertebral Landscape

The Vertebral Landscape is a black-and-white art that artistically renders the human spine using a line art technique reminiscent of topographic maps. This artwork captures the spine's complex structure through meticulously drawn lines that mimic the natural curves and forms of vertebrae. The dynamic interplay of light and shadow across this art creates a special three-dimensional effect, highlighting the spine's complex textures and shapes. Varying shades, from deep black to light grey, are skillfully employed to enhance the depth and intricacy of the vertebral column, evoking the appearance of mountain ridges and valleys. The flowing lines surrounding the spine symbolize the interconnection and fluidity of our body's central support structure.

55) Sumaiya Sayeed

It Takes Two to Tango

In the operating room, the art of neurosurgery lies in the coordinated dance between two surgeons. To co-operate with someone is to know your co-surgeon, to complement each other without obstructing one another.

56) Mark Schornak

Bifrontal pericranial flap

Created using traditional airbrush and acrylic paint, 1993

57) Mark Schornak

Type IV-C spinal arteriovenous malformation

Created as cover art for the Spring, 1992 cover of the Barrow Quarterly. The background represents a radiographic series showing high-flow shunting through the arteriovenous fistula. Made with a combination of airbrush, alkyds, and watercolor.

58) Mark Schornak

Color Atlas of Microneurosurgery

This illustration, drawn in pencil with color added in Photoshop, depicts a comprehensive overview of surgical techniques and various neuropathologies referenced within the textbook: extracranial revascularization, spinal tumors, arteriovenous malformations, carotid bifurcation stenosis, thrombus and embolus, internal carotid artery (ICA) dissecting aneurysm with cervical to petrous ICA saphenous vein bypass, vertebral artery stenosis with endovascular stent, ventral arteriovenous fistula, extramedullary tumor, and intramedullary tumor & cyst. Published on the cover of Color Atlas of Microneurosurgery, Volume 3, Thime Medical Publishing, Wolfgang T. Koos, Robert F. Spetzler, ©2000, Barrow

59) Mark Schornak
Barrow Quarterly Covers: Meyer's Loop, Endovascular Treatment of Orbital Lesions, Dural Arteriovenous Fistulae

60) Ian Suk
All-posterior en bloc resection of large cervical sarcoma tumor
Showing initial critical steps in an all-posterior cervical resection of a large sarcoma tumor with intradural infiltration strangulating the spinal cord and affecting multiple vertebral levels. A comprehensive, posterolateral oblique view with corresponding axial sections reveals the precarious location of the tumor and its proximity to critical surrounding structures such as pharynx, trachea, jugular and carotid vessels. Created with pencil and Photoshop. Published in *Operative Neurosurgery*, Dec 2015

61) Ian Suk
Stereotactic biopsy of contralateral pontine tumor
Following a bur hole craniectomy, the needle traverses a plethora of critical neurovascular structures to reach the tumor. Major landmark structures to avoid, such as the sinuses, ventricles, circle of Willis, and tentorium cerebelli, are included to accurately depict the needle's course in 3-dimensional space. Created with pencil and Photoshop. Published in Journal of Neurosurgery, March, 2005

62) Ian Suk
En Bloc total sacrectomy performed in a single stage thraough a posterior approach
Complex en bloc resection required intimate knowledge of critical landmark anatomy including pelvic vasculature, sacral plexus, GI anatomy, and lumbosacral trunk. Illustration is a comprehensive view showing the final critical step of dividing the internal iliac vessels to resect the specimen in one piece. Posterior oblique view shows a plethora of transparent anatomy to reveal their position in 3d space. Top figures outline a series of sequential steps to final rendering in this layered approach. Created with pencil and Photoshop. Published in Neurosurgery, July, 2008

63) Aureliana Toma
Taming The Beast
This charcoal drawing represents a basilar artery aneurysm. "Taming" this beast requires utmost skill, resilience and precision – qualities every neurosurgeon must master. Referring to the aneurysm as a beast captures the inherent danger and unpredictability of the condition. The artwork is a powerful testament to the relentless battle fought in the operating room, where mastery over such life-threatening conditions is a matter of survival and hope.

64) Michael J. Ward
Wild Signals
This piece was inspired by the many surgical epilepsy patients who generously donated their time to my research endeavors. Working with them in the epilepsy monitoring unit, I developed a deep passion for neurosurgery and the unique opportunities it presents for formulating and testing hypotheses that can rapidly produce substantial clinical and basic scientific impact. Each of those patients contributed greatly to my journey to medical school at UCLA and my still growing motivation to explore the confluence of science, art, and medicine as a neurosurgeon.

65) Scott Weldon

Far Lateral Approach

The far lateral approach begins as the retrosigmoid approach, but the craniotomoy is extended inferiorly to open foramen magnum and expose the cervical spinal cord. This illustration depicts a hypoglossal schwannoma where, usually, cranial nerves IX, X, and XI are displaced posteriorly, and the brainstem and cervical spinal cord are compressed.

Published in the Atlas of Neurotologic and Lateral Skull Base Surgery by John S. Oghalai, MD and Colin L.W. Driscoll, MD, 2016

66) Scott Weldon

Combined Approach to the Middle and Posterior Fossa

The approach combines a presigmoid, retrolabyrinthine craniotomy with the middle fossa craniotomy. The two craniotomies are connected by splitting the superior petrosal sinus and dividing the tentorium. After dividing the tentorium, the retractors work much more effectively, and visualization of the petroclival junction is substantially enhanced. This illustration depicts all the structures that can be seen after the opening has been completed.

Published in the Atlas of Neurotologic and Lateral Skull Base Surgery by John S. Oghalai, MD and Colin L.W. Driscoll, MD, 2016

67) Medical Illustrator William B. Westwood, MS, CMI

Transseptal, Transsphenoidal Approach to the Pituitary Exhibit Wax Model

In 1972 or 73, Mayo surgeons Drs. Eugene Kern (Rhinologic surgeon) and Edward Laws (Neurosurgeon) teamed up to begin performing procedures on the pituitary gland that were done through the nose, rather than the then only accepted technique of doing such operations transcranially. This procedure was intended to manage a number of clinical entities including sellar and parasellar lesions including microadenomas of the pituitary gland.

Trans-nasal approaches to the pituitary had originally been pioneered by Harvey Cushing (Father of Modern Neurosurgery) at Johns Hopkins in the early 1900s. Cushing enjoyed early success, but abandoned the procedure in 1926, opting for transcranial approaches. Cushing's world-wide influence was so great that his change in surgical preference resulted in most of the international neurosurgical community also abandoning the fledgling transsphenoidal procedure in favor of transcranial approaches.

Laws, a Hopkins graduate and Cushing admirer, joined the Mayo Staff in 1972, and quickly began performing transsphenoidal procedures, much to the concern of his neurosurgical colleagues. Soon after arriving at Mayo, he became friends with Eugene B. Kern, a young rhinologist and they would play a transformative role in the renaissance of the transsphenoidal approach.

In what would become a new innovation in performing the procedure, Kern and Laws partnered in the procedure, with Kern to do the transnasal opening and closure portions and Laws handled the neurosurgical management of the tumor.

Kern & Laws team concept in transsphenoidal surgery had never been done before. In early 1976, Kern (who I'd been doing illustrations for since 1972) approached me about doing illustrations for a surgical film on their 'new" transsphenoidal technique. Though unfamiliar with the procedure, I readily agreed and began joining them in the OR to observe. (I sat in on over a dozen procedures until I understood each step completely.) Though the first project concept was a surgical film, in an early meeting with the surgeons, I suggested instead that a large traveling surgical exhibit, fully explaining nd demonstrating their "new" technique might be a superior communication vehicle. They agreed.

Part of our goal for the project focused on the need to overcome the perceived, outdated and incorrect beliefs about the procedure. Among them: poor lighting, low visibility, no room to work in a small deep hole, dirty field/post-op infections. We wanted to prove that the procedure as carried out by this “new” technique, overcame all these past objections and offered many advantages.

AND IMPORTANTLY, we needed to refute an admonition by prominent neurosurgeon Dr. Walter Dandy in his 1932 book “The Brain” in which he stated unequivocally that: “The nasal route is impractical and can never be otherwise.”

Dandy, Professor of Neurological Surgery at Johns Hopkins was trained under Harvey Cushing. He was at the time, the one of the most influential neurosurgeons in the world and was adamantly opposed to operating on the pituitary through the nose. Even today he is considered (along with Cushing) to be one of the founding fathers of modern neurosurgery.

I want to emphasize that the Transseptal, Transsphenoidal Approach to the Pituitary exhibit and its models was my original concept and project. Vince Destro, Medical Graphics Section Head approved my taking on the project and my being the project manager.

The project conception was to build a 50” traveling exhibit using 3D wax and epoxy models to demonstrate and explain Kern’s and Laws’ Transsphenoidal Approach to the Pituitary. In the 1950s and into the 70s, scientific exhibits were an important vehicle for the rapid communication of advancements in medicine and surgery. The largest and most prestigious forum for such exhibits was the annual meeting of the American Medical Association, which commonly hosted over 200 such exhibits annually. We wanted to enter the exhibit in the Scientific Exhibit category at the 1977 annual meeting in San Francisco, CA.

I also recommended the creation of a comprehensive surgical booklet extensively illustrating each step of the operative procedure and covering other information from patient selection to entities treated. This booklet would be handed out to every physician visiting the exhibit.

It was a huge project and had to be completed in approximately 1 year. It involved many steps and the expertise numerous individuals within Medical Graphics and several other Mayo Sections.

In Medical Graphics, these included: Vince Destro (Section Head), Mert Severud & George DeVinny (Graphic designers), Martin Roessler (Medical Sculptor), Earl Stellmacher and Peter McConahey (Assistant). Also enlisted were individuals from the Engineering Section,

Carpentry and Electricians. All aspects of the final exhibit were created “in house”, from the carpentry, to painting and silk screening all the copy on the panels, to making custom light cans, to the electrical wiring designed so that the whole exhibit could be lighted using just one plug.

Our new project title became: “A TRANSSEPTAL TRANSSPHENOIDAL APPROACH TO THE PITUITARY An Old Approach, A New Technique In The Management of Pituitary Tumors And Related Disorders”

I boiled down the lengthy surgical procedure to a limited number of major steps where my realistic wax surgical and epoxy models would demonstrate the most important ones in the combined procedure. The models would be placed on three large, curved panels (totaling 50’). Each panel would focus on one of the three parts of the procedure. The first panel was Kern’s rhinologic opening, which was shown through the creation of three models.

PANEL ONE: RHINOLOGIC OPENING
The first model shows the creation of the left anterior/posterior and inferior tunnels beneath the nasal mucosa by way of an intranasal incision just behind the caudal end of the septum. (Mucosa is partially cut-away to better show the Cottle elevators creating the tunnels.) The enlarged pituitary gland is shown sitting in the sella turcica.

The second model shows the vertical incision having been made in the cartilaginous septum with a Cottle knife and the beginning of the right posterior tunnel back to the face of the sphenoid sinus. These steps will free up the septum for moving it to one side, creating a path to the face of the sphenoid sinus.

After the tunnels are complete, the third model shows a two bladed transsphenoidal speculum that has been introduced through an incision in the buccogingival fold allowing entry into the nasal cavity and access back to the face of the sphenoid. (Only one blade of the speculum is shown for clarity.) A chisel is being used to open and enter the sphenoid.

PANEL TWO: NEUROSURGICAL TECHNIQUE
The second (center panel) set of five models show Dr. Laws' steps in exposing and removing the pituitary tumor. Three cut-away models through the skull and posterior sphenoid sinus were created and modified to show each step Laws used to open the sella floor, open the dura, perform an intrasellar dissection (removing the tumor with a ring curette) and then placing a piece of allograph muscle into the empty sella and wedging it in place subdurally with a piece of septal cartilage. Also attached to this panel is a functioning operating microscope which allows viewers to view a model of the opened sella, opened dura and face of the tumor. An actual transsphenoidal speculum is seen on the face/head model. Note: The use of the microscope allowed visitors (especially those skeptical of the transsphenoidal technique) to see that the tumor could be easily seen, and there was room to maneuver.

Again, relevant legends were placed next to each model.

PANEL THREE: RHINOLOGIC CLOSURE
The third panel used another three models to demonstrate Kern's steps in reconstructing the nasal septum. Reconstruction is critical to prevent the possibility of post-op nasal collapse. The first end of the septum is sutured to the pre-spine fascia, the sublabial incision is closed, crushed bone and cartilage are placed in the septal space and septal stents are placed (with packing) each side of the septum for post op support.

The first model shows the placement of the crushed bone & cartilage into the septal space. The second model shows the placement of the flexible plastic stents and the third model shows the final placement of an external wax protector with final external taping. Relevant surgical illustrations with legends were placed under each model to more fully explain each step shown by the models.

As mentioned, I designed the exhibit, selected the colors, oversaw its construction by highly skilled carpenters, prepared the copy for each of the panels (except the copy pertaining to "Clinical Entities Treated, Visual recovery and Complications" – provided by Drs. Kern and Laws.) Martin Roessller, who was a master model maker, had tutored me in model making during my first few years at Mayo. He advised me on various problems that arose during the making of the models and exhibit, as did Vince Destro.

I hand-made each of the 7 wax models myself as well as designing and plastic forming the base for each. Martin Roessler made the initial neurosurgical skull sections, which I then modified to show Dr. Laws' various steps. Peter McConahey helped me and Martin Roessler with various aspects of putting the whole exhibit together, including the making of the clear plastic bubbles over the wax models and some of the basic mold making and epoxy casting.

The illustrated surgical booklet that accompanied the exhibit contained 28 pen & ink illustrations explaining each step of the procedure in more detail. (It was designed by George DeVinny.) The idea was to give each visitor as much information on the technique as possible from the initial incision to the final stent and bandage placement. This amount of illustrated visual detail from opening incision to final closed nasal packing had never been provided by surgeons in any of the early attempts to operate on the pituitary through the nose. The models and surgical booklet visually explained every major step of the procedure from the opening incision to the final placement of stents.

Remember too, we were attempting to change just over 50 years of ingrained bias against operating on pituitary tumors through the nose. The completed exhibit was packed up and shipped to the AMA meeting where it won the 1977 BILLINGS GOLD MEDAL for Scientific Exhibits that year. The Billings Gold Medal was the highest award in the country for a scientific exhibit. Drs. Laws and Kern had made me a co-author on the project.

The rapid wide-spread international attention our exhibit received and the many subsequent published articles by Kern and Laws, containing some or all of the illustrations from the booklet, not only led to large numbers of referrals to Mayo for the procedure, but was the catalyst that revived the procedure from near extinction.

I feel that our exhibit, with the models and the illustrations I was privileged to create for Drs. Laws and Kern, played a key role in the final renaissance and broad acceptance of the "NEW" transsphenoidal approach and its re-establishment by the 1980's, as the predominant method for surgically addressing pituitary tumors.

My contribution to the renaissance of this procedure remains one of the highlights of my medical illustration career and I appreciate that I was asked to be a co-author on both the exhibit and most of the subsequent journal articles.

The worldwide acceptance of the transsphenoidal approach has led to continued surgical improvements in the technique.

In the 1990's, the use of the endoscope resulted in yet another significant modification of the transsphenoidal technique eliminating the need for buccal incisions, submucosal tunnels and complete septum take-downs.

And now these endoscopic procedures are evolving again as surgeons are using the basic transseptal approach to provide access to lesions throughout the whole midline skull base.

68) William Westwood

Nasopharynx (transseptal-pituitary surgery). Transseptal pituitary surgery (nasopharynx).

69) William Westwood

Nasopharynx (transseptal-pituitary surgery). Transseptal pituitary surgery (nasopharynx).

No photography or photos please.

70) William Westwood

Nasopharynx (transseptal-pituitary surgery). Transseptal pituitary surgery (nasopharynx).

No photography or photos please.

71) William Westwood

Nasopharynx (transseptal-pituitary surgery). Transseptal pituitary surgery (nasopharynx).

No photography or photos please.

72) William Westwood, Peter McConahey

Nasopharynx (transseptal-pituitary surgery). Transseptal pituitary surgery (nasopharynx).

No photography or photos please.

73) Celina Yang

Scarlet Synapses

This fluorescence microscopy image depicts a mouse hippocampal slice meticulously prepared over a month-long process: beginning with a precise viral injection into the CA3 hippocampus via stereotaxic surgery, followed by the mouse navigating through behavioral tasks after recovery, and eventually culminating in this vibrant display post-perfusion and antibody staining after brain extraction. The brilliance of the image mirrors the intensity of viral expression, with the CA3 region glowing as the epicenter of this luminous network, extending its tendrils across the brain's intricate circuitry. Immersed in the fusion of science and art, I've come to appreciate the profound interconnectedness of my daily endeavors—from laboratory discoveries and patient interactions to the expansive realms of book learning. This reflective artistry has intricately shaped my journey in medical education, casting light on this nuanced path toward becoming a neurosurgeon.

74) John Zubro

Sanctum Sanctorum

The Sanctum Sanctorum in Judaism refers to the "Holy of Holies". In Hinduism it is the 'Garbhagrihra', the house within the house. In neurosurgery, it is the operating room hidden deep within a sprawling hospital complex. But it is also the seat of our very consciousness, our brain - ourselves - so carefully tucked into its many layered investiture.

75) Jonathan Morris & Jim Postier

Comparative Model of Pediatric Head Trauma: Intracranial Hemorrhages

Maxon ZBrush, HP – 580 Multijet fusion color printer

Head trauma is the most common cause of mortality and morbidity in pediatric patients. Therefore, teaching medical professionals the distinct etiologies, mechanisms and effects of intracranial hemorrhages resulting from head trauma (accidental or abusive) is crucial. For the learner, gaining a comprehensive and accurate understanding is challenging when relying on two-dimensional images due to their limited perspective of a complex, three-dimensional, cascade of events. This model was built with co-registered data from multiple patients including CT, MRI, MRV, CTA, and angiograms to illustrate epidural and subdural intracranial hemorrhages. It was strategically cut with booleans to visualize pertinent neurovascular structures, skull fractures, hematomas, displaced ventricles and brain herniation. It provides an opportunity for studying and comparing these types of injuries, offering a deeper spatial understanding, surpassing traditional two-dimensional and digital resources.

76) Sachin Govind

Almost There

Inspired by vivid, chaotic moments I witnessed in the ER during medical school, this piece captures the disorienting transition of a patient from the ambulance into the trauma bay. It reflects the fluid passage between the external world and the structured urgency within the hospital walls, with blurred forms representing the rapid and uncertain nature of these critical moments.

77) Sachin Govind

Mosaic

This mosaic reflects the multifaceted identity of doctors, who must constantly shift between roles—caregiver, leader, problem-solver—while navigating complex emotional landscapes. Each fragment represents a different challenge or perspective they must balance, coming together to form a cohesive yet layered whole. It's rare to see all of a doctor's faces at once, as they often stitch together their many roles to meet the diverse demands of their profession.