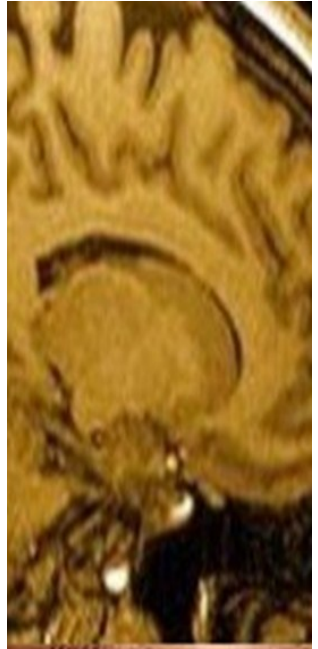


40th
ANNUAL

Louisiana Neurosurgical Society

MEETING



16
JANUARY

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NEW ORLEANS, LOUISIANA



2014 Abstract Award Winners

The Dean Echols Award for Best Laboratory or Research

Ilias N. Caralopoulos, MD (Tulane)

Cerebral aneurysm research at Tulane. A brief introduction.

Ilias N. Caralopoulos, M.D., Crissey L. Pascale, M.A., Lauren A. Pace, Ph.D., Aaron S. Dumont, M.D.

Tulane University School of Medicine Department of Neurosurgery, New Orleans, Louisiana, USA.

Introduction:

Cerebral aneurysm (CA) rupture is a catastrophic event leading to significant morbidity and mortality. The pathophysiology of aneurysm formation, progression and rupture, particularly at the cellular and molecular levels, remains incompletely understood.

Methods:

Continuing the senior author's previous work, we are investigating the effect of inflammatory stimuli and potential salvaging interventions on the clinical course and molecular phenotype of CA in animal models of the disease. We use a previously described mouse model of CA involving induced hypertension and injection of elastase in the basal cistern, which we have also newly adapted to rats. The effects of cigarette smoking are examined both by direct exposure to cigarette smoke in our animals and by the addition of cigarette smoke extract in the primary cell culture medium of cerebral vascular smooth muscle cells. Superoxide dismutase or the PPAR γ agonist, rosiglitazone are hypothesized to inhibit the molecular phenotype changes and clinical progression of CA in cigarette smoking. Direct exposure to inflammatory cytokines is also hypothesized to lead to CA formation, progression and rupture.

Conclusion:

In this presentation, we summarize the background, rationale, methods and preliminary results for the work we are undertaking to better characterize the molecular, cellular, and clinical features of CA with a translational aim.

2014 Abstract Award Winners

The John Jackson Award for Best Clinical Presentation

Anthony M. DiGiorgio, DO (LSUHSC-NO)

Trauma workup in the initial management of head trauma affects times to neurosurgical evaluation and operative decompression

Anthony M DiGiorgio, DO; Erin S Fannin, MS; Robyn R Givens, NP; Jason D Wilson, MD; Frank Culicchia, MD

Introduction

Traumatic brain injury (TBI) is an important public health problem both in the United States and world-wide. Globally, an estimated 10 million people are affected by TBI each year. There are approximately 5.3 million Americans living with disability related to TBI, totaling a cost of \$60 billion annually. Many complications of traumatic brain injury require emergent surgical intervention, typically a decompression via craniotomy or craniectomy. When an acute surgical lesion is found, shorter time to the operating room has been shown to affect outcomes for the better.

Methods

A chart review of patients receiving neurosurgical intervention after a traumatic brain injury was performed from the period of July 2012 through November 2013 at University Hospital, a Level I trauma center serving Southern Louisiana. Time points from arrival were recorded using chart review (including time to CT scan, neurosurgical evaluation, entrance to the operating suite and incision). Patients were included if neurosurgery was consulted as part of their initial workup and the initial neurosurgical consult included an emergent decompression as part of the plan. Patients were excluded if they had other injuries that necessitated a delay in neurosurgical intervention.

Results

42 patients met the criteria defined above. The method of injury was 15 falls, 11 gunshot wounds, 6 motor vehicle crashes, 4 auto versus pedestrian, 3 assaults and 3 found down. 38 (90.5%) of the patients were "trauma activations." The average time to neurosurgical evaluation was 1:32 (SD 1:07, Range 0:21 – 6:45) and the average time from arrival to incision was 3:02 (SD 1:10, Range 1:23 – 7:30). The patients that arrived as a trauma activation differed significantly in time to neurosurgical evaluation (Activated: 1:22, Unactivated 3:01 ($p = .004$)) and time to incision (Activated: 2:50, Unactivated 5:01 ($p = .0001$)). They did not differ significantly in time from neurosurgical evaluation to incision (Activated: 1:27, Unactivated 1:59 ($p = .17$)).

2014 Abstract Award Winners

The John Jackson Award for Best Clinical Presentation

Conclusion

A significant number of intracranial hemorrhages are not worked up as “trauma activations.” This leads to significant delays in evaluation by neurosurgery and time to operative decompression. It is unknown if these delays lead to a change in outcome, and a study correlating time from decompression to outcomes can be done in the future. However, these data should prompt further investigation into better screening for head trauma.

2014 Abstract Award Winners

The John Jackson Award for Best Clinical Presentation

Jai Deep Thakur, MD (LSUHSC-S)

Micro-Surgical Resectability, Clinico-neurological Outcomes and Tumor Control in Meningiomas Occupying the Cavernous Sinus: Lessons learnt over 17 years.

Jai Deep Thakur¹, Vijayakumar Javalkar², Imad Saeed Khan³, Ashish Sonig⁴, Anil Nanda¹

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Introduction

Cavernous sinus meningiomas (CSM) represent a cohort of challenging skull base tumors where the challenge lies in achieving a balance between optimal surgical resection, restoration of cranial nerve functions and good quality of life. To assess the preoperative, intraoperative and postoperative factors in relation to the clinico-neurological outcomes, morbidity, mortality and tumor control in CSM.

Methods

A single surgeon (A.N.) performed microsurgical removal of CSM on 65 patients from January 1996 to August 2013. Sekhar classification, Modified Kobayashi grading and KPS were used to define tumor extension, tumor removal and clinical outcomes respectively.

Results

Pre-operative cranial nerve dysfunction (CND) was evident in 64.6% patients. Most common was the second CN deficit. CN V was most amenable to some form of improvement while CN II followed by CN IV showed the worst form of recovery. Complete resection was achieved in 41.5% of cases and had no significant association with functional CN recovery. ICA encasement significantly limited the complete microscopic resection of CSM ($p < 0.0001$). Overall, 18.5% of the patients showed symptomatic recurrence after their initial surgery. The recurrence was significantly lower in the cohort of patients for which adjuvant SRS was administered ($p=0.04$). The use of adjuvant SRS for microsurgery independently decreased the recurrence rate ($p=0.04$).

Conclusion

Modified Kobayashi tumor resection Grade I-IIIb was possible in 41.5% patients. CN recovery and tumor control was not dependent on the extent of tumor removal. Safe maximal resection with adjuvant SRS can achieve excellent tumor control and the use of adjuvant SRS independently decreased the recurrence in CSM.

Abstracts



Scientific Session I

Moderator: Dr. Bharat Guthikonda

Marcus Ware, MD, PhD (Tulane-Ochsner)

Interaction of 4-Demethyl-cholesteryloxy carbonylpenclomedine (DM-CHOC-PEN) with Melanoma Melanin Metabolism and Cell Death

Andrew Conger, MD (LSUHSC-NO)

Pineoblastoma in Adults

Rimal Hanif, MD (LSUHSC-S)

The Kurdistan Experience: Building Neurosurgical Capacity in a Medically Underdeveloped Region

Marcus Ware, MD, PhD (Tulane-Ochsner)

Interaction of 4-Demethyl-4-cholesteryloxycarbonylpenclomedine (DM-CHOC-PEN) with Melanoma Melanin Metabolism and Cell Death

L.R. Morgan, E. Benes, A.H. Rodgers, DEKK-TEC, Inc.; B.S. Jursic, University of New Orleans, New Orleans, LA; R.F. Struck, Cancermedica LLC, W.R. Waud, Southern Research Institute, Birmingham, AL; P. Friedlander, Mount Sinai School of Medicine, New York, NY; R.S. Weiner, Tulane University Health Sciences Center, Marcus Ware, Ochsner Hospital, New Orleans, LA

Purpose: DM-CHOC-PEN is a polychlorinated pyridine cholesteryl carbonate, which is in Phase I clinical trials in patients with advanced cancer. B-16 melanoma was evaluated *in vitro* and *in vivo* for sensitivity to DM-CHOC-PEN.

Methods: B-16 melanoma cells were cultured and drugs were added to the cells in a growth phase and after 16 hrs removed. Adult C57BL mice in groups of 5-6 female mice with measurable SC growing B-16 melanoma nodules were dosed IP daily (150-200 mg/kg) for 5 days with DM-CHOC-PEN and monitored daily until death or moribund and sacrificed. Temozolamide (TMZ) was used as control.

Results: *In vitro*, DM-CHOC-PEN had an IC₅₀ of 0.5 µg/mL vs. B-16 melanoma cells. Floating heavily melanotic cells that formed were separated and analyzed for DM-CHOC-PEN and found to contain 125% more drug than did adhered amelanotic cells. For the *in vivo* studies, T-C for mice bearing B-16 melanoma treated with DM-CHOC-PEN vs. controls was 60-142%; thus supporting the *in vitro* observations. For TMZ, the T-C was 78%. Electronic modeling studies support DM-CHOC-PEN's ability to act as a pyridinium co-factor in the transfer of electrons from DOPA to the intermediary metabolism pool. Previously, we reported that dacarbazine inhibited DOPA oxidase and melanin formation in melanoma pts. Although tyrosine-DOPA transport/metabolism is not a target for DM-CHOC-PEN (its MOA is considered to be *via* alkylation/adduct formation with N⁷-guanine), the accumulation of intracellular melanin does influence/interfere with cellular metabolism. Given this finding, there is a possible role of DOPA oxidase in drug selection to treat melanoma.

Supported by NCI/SBIR grants – CA85021 and CA132257.

Andrew Conger, MD (LSUHSC-NO)

Pineoblastoma in Adults

Andrew R. Conger, MD, MS, Melissa Gener, Jamie Van Gompel, MD, Mohammad S. Ariai, MD, Mark Jentoff, MD, Jeremy S. Cardinal, José M. Bonnin, MD, Frank Culicchia, MD, Aaron A. Cohen-Gadol, MD, MSc

Objective: Pineoblastoma is a rare WHO grade IV primitive neuroectodermal tumor (PNET) primarily occurring in the pediatric population, with rare occurrences in adults. Reported 5-year survival is 10%. The scant existing literature on pineoblastomas in adults suggests a more favorable prognosis than in children. Our series of 15 patients is the largest to date.

Methods: A retrospective review of databases was performed at 3 institutions, identifying 15 cases of pineoblastoma in adults. The charts were reviewed and data collected regarding clinical, radiological, and histopathological features, as well as treatment provided and outcomes.

Results: Follow-up information was available for 13 of the 15 cases identified. Average follow-up was 85 months. 3 patients had recurrence of tumor during their follow-up (two local recurrences and one spinal metastasis). The remaining 10 patients were recurrence-free at the end of their follow-up. All three of the patients with recurrence ultimately died of their disease. Average time from recurrence to death was 48 months. One patient died of tumor burden with 11 months. A mitotic count of >10 per 10HPF or a Ki67 proliferative index $> 30\%$ were predictive of a worse clinical outcome

Conclusions: Pineoblastomas appear to have a more benign clinical course in the adult population despite no identifiable differences in clinical presentation, radiological or histopathological features, or treatment provided

Rimal Hanif, MD (LSUHSC-S)

The Kurdistan experience: building neurosurgical capacity in a medically underdeveloped region

Rimal H. Dossani, MD, Bharat Guthikonda, MD

Louisiana State University Health Sciences Center-Shreveport

Kurdistan is a roughly defined geo-political region where the Kurdish people form a majority population and where the Kurdish language, culture and identity have historically been based. The region of Kurdistan refers to large areas of eastern Turkey, northern Iraq, northwestern Iran and northeastern Syria. In particular, the Kurdistan Region of Iraq, although not sovereign, is an autonomous region with a parliamentary democracy. This region is divided into four governorates, comprising about 40,000 kilometers with a population of over 8 million people.

As part of The Kurdistan Region of Iraq, Duhok is financially well-endowed, owing to the natural resource of oil. Its infrastructure gleams of modern roads, buildings and bridges. Ironically, the development of medical infrastructure has not kept pace with the otherwise bustling economic growth. Hospitals are rural and medical equipment is sparse. Medical emergencies are often not met with a sense of urgency. The challenge of bolstering the medical infrastructure lies not only in advancing technology but also in inculcating an ethos compatible with the proficient practice of the art of medicine and surgery.

Gazi Zibari, an American-trained hepatobiliary surgeon who hails from Duhok, has led medical mission trips for well over a decade to the Duhok governorate. In May 2014, Dr. Zibari once again led a multidisciplinary team of US-trained doctors and other medical professionals in Duhok. Over the years, volunteer neurosurgeons have played an instrumental role in building neurosurgical capacity in the region. They have delivered lectures on fundamental neurosurgical topics and have mentored local neurosurgeons in performing basic and advanced neurosurgical procedures.

At LANS, we hope to present our cumulative neurosurgical experience in Duhok. We will present the various procedures we mentored local Duhok neurosurgeons to perform. Most importantly, we will showcase our efforts at building capacity by demonstrating that Duhok neurosurgeons are now able to routinely perform procedures they were not comfortable in handling prior to our presence.

Abstracts



Scientific Session II

Moderator: Dr. Jason Wilson

Christopher Storey, MD, PhD (LSUHSC-S)

Pre-thrombectomy Intravenous Tissue Plasminogen Activator Improves Outcomes in Acute Ischemic Stroke

Marcus Ware MD, PhD (Tulane-Ochsner)

A Comprehensive Assessment of Viral Transcripts in DNA- and RNA-seq Datasets from High-grade Gliomas Reveals No Association

Jonathan Riffle, MD (Tulane)

Surgical Treatment of Chiari I Malformations: Advantage of Linear Autologous Duraplasty

Jai Thakur, MD (LSUHSC-S)

Is Pathogenesis of Third Nerve Palsy in PComA Related only to Mass/Pulsatile Effect? Morphometrics Study

Anthony DiGiorgio, DO (LSUHSC-NO)

Experimental Design to Assess Blood Biomarkers in Concussed Collegiate Football Players: a matched cohort study.

Osama Ahmed, MD (LSUHSC-S)

Accuracy of CT Angiography in Predicting Fetal Origin of Posterior Cerebral Artery

Clifford Crutcher, MD (LSUHSC-NO)

10-Year National Healthcare Trends in Cervical Myelopathy Patients

Christopher Storey, MD, PhD (LSUHSC-S)

Pre-Thrombectomy Intravenous Tissue Plasminogen Activator Improves Outcomes in Acute Ischemic Stroke

Christopher Storey, MD, PhD; Hugo Cuellar, MD; Anil Nanda, MD.

LSUHSC Shreveport, Department of Neurosurgery

Introduction: The use of mechanical thrombectomy as an acute treatment for large vessel occlusion has shown increasing use. Many patients arrive at small hospitals without endovascular capabilities. We wanted to look at outcomes on patients who received thrombectomy receiving tissue plasminogen activator (tPA) at an outside hospital.

Methods: Using the national inpatient sample (NIS) database, we looked at patients from 2006-2010. ICD-9 code 39.74 was used to identify thrombectomy. ICD-9 code V45.88 was used to identify patients transferred within 24 hours of tPA administration. ICD-9 codes 433 and 434 were used to identify patient with vessel occlusion and ischemia. A ranked disposition was created based on the Medicare uniform disposition data. ANOVA on SPSS was used for statistics.

Results: Our analysis showed that patients who received preoperative intravenous tPA had significantly decreased in house mortality ($p=0.037$) and improved disposition ($p=0.032$). Those that received intravenous tPA showed a trend toward shorter length of stay and lower total cost. There was no significant difference in associated intracranial hemorrhage (ICH) which was about 15% for both. The NIS database showed an increase in utilization of thrombectomy from 2006 (37 cases) to 2010 (632 cases) by 1700%. Although there was not significant increase in ICH with preoperative intravenous tPA, ICH was a predictor of poor outcome, increased cost, and length of stay.

Conclusion: In conclusion, we believe this adds to the safety profile of thrombectomy in patients receiving outside intravenous tPA. Also, the improved outcomes give credence to allow smaller hospitals to continue to give tPA when transferring for thrombectomy without fear of adversely affecting the procedure. Although we are not able discern if benefit is due to patients being treated earlier or if tPA has protective value.

Marcus Ware MD, PhD (Tulane-Ochsner)

A comprehensive assessment of viral transcripts in DNA- and RNA-seq datasets from high-grade gliomas reveals no association

Michael J. Strong, MS, MPH^{1,2}, Eugene Blanchard IV, BS³, Melody Baddoo, MS^{1,2}, Cindy Morris, PhD⁴, Zhen Lin, MD, PhD^{1,2}, Christopher M. Taylor, PhD³, Marcus L. Ware, MD, PhD^{5,6}, Erik K. Flemington PhD^{1,2,6}

¹Department of Pathology, Tulane University, New Orleans, LA, ²Tulane Cancer Center, New Orleans, LA, ³Department of Microbiology, Immunology & Parasitology, Louisiana State University School of Medicine, New Orleans, LA, ⁴Department of Microbiology and Immunology, Tulane University School of Medicine, New Orleans, LA, ⁵Department of Neurosurgery, Ochsner Medical Center, New Orleans, LA,

Glioblastoma multiforme (GBM) is a devastating disease with poor survival rates. Despite years of research, there has been little change in the median survival time. Human cytomegalovirus (HCMV) was reported in GBM over a decade ago and this finding has the potential to increase our understanding of the disease and it offers a potential tumor specific therapeutic target. Because of this promise, there is a fair amount of time, energy and money being directed towards understanding and utilizing this connection for eventual therapeutic purposes. Despite these ongoing efforts and the time lapsed since the discovery of HCMV in GBM, the association remains controversial. Here we utilized both RNA and DNA sequence data from high-grade gliomas from the Cancer Genome Atlas to assess the veracity of the association between GBM and HCMV (or other infectious agents). Sequence reads were aligned to a reference genome containing a human genome (hg19) and a library of virus sequences known to infect humans using STAR. Analyzing RNA-seq datasets from primary GBM (n=157), recurrent GBM (n=13), and normal brain (n=5), revealed no association with any known viruses. Furthermore, DNA-seq datasets from primary GBM (n=51) and normal blood (n=20) also revealed no association with any known viruses. Although HHV6/7 viral reads were detected in sequence datasets, inspection of the viral reads demonstrated all reads consisting of human chromosomal telomeric-like repeats, TAACCC. In addition, despite detection of low level EBV viral reads in sequence datasets, EBV reads consisted of lytic genes and are likely from infiltrating B-cells. Finally, low level HCMV reads were detected in 1 primary GBM RNA-seq dataset, 1 primary GBM DNA-seq dataset, and 1 normal blood DNA-seq dataset, which is well below the threshold for calling a sample positive. This analysis raises the possibility that viruses may not be associated with gliomas as previously reported.

Jonathan Riffle, MD (Tulane)

Surgical Treatment of Chiari I Malformations: Advantage of Linear Autologous Duraplasty

Jonathan Riffle, MD; Edison Valle, MD; Juanita Garces, MD; and C. J. Bui, MD

Tulane-Ochsner Neurosurgery Program, Tulane University & Ochsner Health System, New Orleans, LA

Introduction: Chiari malformation type I (CMI) exhibit an incidence of approximately 1 in 1000 births but often poses a significant diagnostic and treatment challenge for neurosurgeons. Although treatment outcomes are favorable, controversy remains as to the ideal surgical treatment paradigm. Recent experiences and data suggest that bony decompression (suboccipital craniectomy and C1 laminectomy) alone without duraplasty is favored due to the lower incidence of pseudomeningocele and aseptic meningitis. We believe that technical nuisances such as linear dural opening and use of autologous pericranium duraplasty maximize favorable outcome without significant concern of pseudomeningocele and/or aseptic meningitis.

Method/Result: We retrospectively reviewed 50 CMI patients surgically treated and followed by the senior author. We report long-term (>1 year) outcome and complication rate. We also discuss the current literature and controversies surrounding Chiari treatment paradigms in the neurosurgical community. Our female to male ratio was approximately 3:1 (37 females and 13 males) and median age was 22. Primary outcomes of significant improvement of exertion-headache and/or spinal syringomyelia were achieved in 96% (48/50) of patients at 1 year. There was only 1 patient who incurred CSF leakage and pseudomeningocele requiring surgical re-exploration/repair while 1 other patient was diagnosed with an asymptomatic pseudomeningocele at the 6-month follow-up MRI scan. No return ER visit or readmission for post-operative aseptic meningitis was seen. Both pseudomeningocele patients had favorable outcome at 1 year.

Discussion: The ideal surgical approach for CMI has yet to be elucidated. Suboccipital decompression and C1 laminectomy alone offers some advantages but it may miss 4th ventricular outlet obstructions such as arachnoid veils requiring re-operation in up to 10% of cases. Furthermore, it prevents direct tonsillar manipulation. Techniques allowing for simpler and more watertight duraplasty closure may offset risks of pseudomeningocele and aseptic meningitis. For symptomatic CMI patients, suboccipital craniectomy with linear autologous duraplasty is a safe and viable surgical treatment option that can provide excellent outcome without increased risk of surgery-related complications.

Jai Thakur, MD (LSUHSC-S)

Is pathogenesis of third nerve palsy in PComA related only to Mass/Pulsatile effect? Morphometrics Study

Jai Deep Thakur, Sudheer Ambekar, Osama Ahmed, Richard Murray, Richard Menger, Rimal Hanif, Anil Nanda, Hugo Cuellar

LSUHSC- Shreveport.

Introduction: The objective of our research is to study the morphometrics of both ruptured and un-ruptured posterior communicating aneurysm (PComA) regard to development of third nerve palsy (TNP).

Methods: A total of 60 patients and 72 PComA were retrospectively analyzed from 2010 till September 2013. Data was collected from 3-D reconstructions of CTA and four-vessel angiograms were used to evaluate the morphology of aneurysm with respect to the cranial nerve III.

Results: 59.7% aneurysms were ruptured, 33% were associated with TNP and 31% were mirror aneurysm. Most common aneurysm projection in AP-Lateral view was posterolateral (61%). Superior projection was noted in 21% aneurysms. Pseudoaneurysm/bleb in the aneurysm dome was found in 35% aneurysms. Incidence of TNP was higher if the aneurysm had a bleb 54% vs 23%, $p=0.013$. Mean aneurysm height (7.1 vs. 4.9 mm, $p=0.002$) and aspect ratio (2.8 vs. 2, $p=0.003$) was higher in patients with TNP. TNP was not statistically significant in aneurysms anatomically pointing towards third nerve. Counter-intuitively, aneurysm which had superior projection, there was no statistical difference in the rates of third nerve palsy. Binomial regression model showed that only pseudoaneurysm/bleb was an independent predictor of TNP (0.048, OR 0.321, 95% CI 0.104 to 0.991).

Conclusion: Morphometrics plays a role in TNP in PComA however anatomical orientation of aneurysm in relation to third nerve palsy is not consistently related to TNP development. Pseudoaneurysm/bleb formation in ruptured or un-ruptured aneurysm influences TNP and role of inflammation of the peri-aneurysmal environment needs to be explored.

Anthony DiGiorgio, DO (LSUHSC-NO)

Experimental design to assess blood biomarkers in concussed collegiate football players: a matched cohort study.

Anthony M. DiGiorgio¹, Erin S. Fannin¹, Eric Knott², Caroline L. Davidson², Rachel H. Kopkin², Janet L. Rossi², Bok Kyoo Jun², Brenda B. Chiappinelli², Shelly Mullenix³, Marisa Formica³, Jacques Courseault³, Vincent Shaw³, Stephen Etheridge³, Nicolas G. Bazan², Frank Culicchia¹, and Larry H. Hollier⁴

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Introduction: The neurologic consequences of repeated concussions in sports have been well established and include depression, cognitive disabilities, dementia, and decreased motor control. Accurate diagnoses of concussions are challenging and studies have been looking at biomarkers to provide an objective measure to assist in the diagnosis of concussion. We have designed and implemented a study of Louisiana State University (LSU) football players with the aim of exploring novel biomarkers, as well as known ones, to identify a potential panel that can be used to accurately evaluate concussed athletes. This study measures multiple substances in the blood and correlates them with concussive events, cognitive testing, and helmet accelerometer data.

Design: In this study we sampled 56 cohorts. The cohort group complied with the following criteria: male, 18-30 years of age, LSU football player, and who met the team's physical exam requirements. Sampling consisted of a baseline blood draw, three subsequent draws during the preseason, and a final draw at the end of the season for each of the cohorts. In addition, whenever a cohort presented with symptoms fitting the team's concussion criteria, post-concussion blood samples were taken at 2 hour and 18 hour marks. Blood was drawn for a matched control at the same time points. Physical exams and questionnaires were used to collect data on immediate mental, physical, or physiological changes related to injury. Helmet accelerometer data was retrospectively assessed and correlated with clinical and laboratory data.

Anthony DiGiorgio, DO (LSUHSC-NO)

Experimental design to assess blood biomarkers in concussed collegiate football players: a matched cohort study.

Cont.

Methods: Blood concentrations consisted of essential fatty acids, namely arachidonic acid (AA) and docosahexaenoic acid (DHA). In addition, lipid mediators, or precursors, eicosanoids and docosanoids 17-hydroxy (H) DHA, 14-HDHA, 12-hydroxyeicosatetraenoic acid (HETE), 15-HETE, resolvin D2 (RVD2), as well as, neuroprotectinD1 (NPD1), were analyzed by LC-MS/MS-based lipidomic analysis for all cohorts. Also, blood serum samples were tested for biomarkers S100B, apolipoprotein A-1 (ApoA1), total tau (t-tau), neuron specific enolase (NSE), glial fibrillary acid protein (GFAP) and spectrin, alpha, non-erythrocytic 1 (Alpha-Fodrin) (SPTAN1) using ELISA protein analysis. A subset of matched concussed/control cohorts was used for ELISA analysis.

Results: Mass spectrometry data showed significant increases in 12-HETE in both control and post-concussion groups from baseline draws to the 2 hour post-concussion time point. Only a subsequent decrease in the 2 hour to 18 hour post-concussion draws was displayed in the control group. Significant increases in the same baseline to the 2h post-concussion time point was shown in both concussed and control groups for 14-HDHA.

ELISA analysis is currently being performed for the protein biomarkers, with preliminary data showing significant changes as follows: an increase in t-tau from baseline to 2 hour with a subsequent decrease between 2 hour and 18 hour in the concussed group, and no significant changes in the control subjects. SPTAN1 shows no significant changes in the concussed group, but a significant increase between baseline and 18 hour in the control group. Remaining biomarkers are still being evaluated.

Conclusions: The experimental design of this study gives a clear, reproducible protocol for collecting samples from the athletic field to be studied in the laboratory and correlated with physical exam, cognitive testing, and impact data. This promotes a multi-disciplinary approach to the association of blood biomarkers with concussions. We expect the present study will establish a protocol for the collection of a wide array of clinical and laboratory data, further increasing the accuracy with which concussions are diagnosed.

Osama Ahmed, MD (LSUHSC-S)

Accuracy of CT Angiography in Predicting Fetal Origin of Posterior Cerebral Artery

Osama Ahmed, MD¹, Richard Menger, MD¹, Benjamin Brown, MD², Piyush Kalakoti, MD¹, Shihao Zhang, MD¹, Anil Nanda, MD, MPH, FACS³, Bharat Guthikonda, MD⁴, Hugo Cuellar, MD¹

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Background and Purpose: The use of CT angiography (CTA) as the sole, vascular imaging study for preoperative planning for clipping of aneurysms is well described in the literature. CT angiography is widely available, provides quick acquisition, has low morbidity, and low cost. In this study, we describe the accuracy of CT angiography in determining the presence of a fetal posterior cerebral artery (PCA) in comparison to standard digital subtraction angiography (DSA).

Materials and Methods: Sixty-six patients with both CTA and DSA were reviewed by two independent neuroradiologists. The CTA was determined to have a fetal origin PCA if the PComA was of similar size to the P2 segment and smaller than the P1 segment by approximately 50%. If the PComA and P1 were the same size, it was considered to have a dual supply. If P1 and P2 were the same caliber and PcomA was smaller, it was deemed to have a posterior supply.

Results: Both reviewers had a sensitivity and specificity of 69% and 96%, respectively, in predicting the presence of a fetal PCA. They both had a positive predictive value of 82% and a negative predictive value of 93%. A small caliber P1 segment and large caliber PcomA led to inaccurate interpretations of CTAs. A fetal origin PCA was likely to be omitted on CTAs.

Conclusion: This study shows that one can accurately predict the presence of a fetal PCA. Knowing the presence of a fetal PCA is essential when clipping a PcomA aneurysm to avoid compromise in posterior circulation.

Clifford Crutcher, MD (LSUHSC-NO)

10– Year National Healthcare Trends in Cervical Myelopathy Patients

Clifford L. Crutcher II, M.D. and Jason Wilson, M.D.

Louisiana State University Health Science Center, Department of Neurological Surgery;
New Orleans, Louisiana, USA.

Introduction: Cervical myelopathy is often a progressive debilitating neurological condition resulting from compression of the spinal cord. Surgical decompression and fusion is safe and associated with improved neurological function postoperatively. Recent trends in hospitalizations and healthcare cost and utilization for cervical spondylotic myelopathy are lacking.

Methods: The Healthcare Cost and Utilization Project database was accessed to determine 10-year trends in healthcare cost and utilization in the United States.^{3,4} Using ICD-9-CM principal diagnosis codes 721.1, total discharges, mean length of stay (LOS), mean inpatient charges and cost in dollars, and discharge statuses were examined. ICD-9-CM code 721.1 codes for cervical spondylotic myelopathy.

Results: Over the 10 year period there has been nearly a 2-fold increase in hospitalizations for cervical spondylotic myelopathy from 20,666 to 38,320. The mean hospital length of stay has remained stable at approximately 3.7 days. Hospital charges have nearly doubled from \$35,099 to \$77,399. Similarly the cost of hospitalization has increased.

In hospital deaths have decreased by half (0.78% to 0.34%). Less patients are being discharged home with self care (72.07% to 66.14%) and more are going home with home health (6.89% to 11.53%). Additionally more patient are going to rehab centers, skilled nursing facilities or long term assisted care centers (17.83 to 20.45)

Conclusion: There has been an overall increase in admission for cervical myelopathy. Interestingly the hospital charges have increased while hospital LOS has remained the same. More patients are going to rehabilitation centers and other institutions prior to being discharged to home. Today less patients are dying that are admitted with cervical myelopathy as their principal diagnosis than ten years ago. As the average age of the United States population continues to increase, more patients suffering from cervical myelopathy will need to be treated. Efforts must be made to reduce the cost of treating these patients without sacrificing the quality of care delivered.

Abstracts



Poster Session

Osama Ahmed, MD (LSUHSC-S)

Anatomic Variations of Acromegalic Patients in Transphenoidal Surgery

Juanita Garces, MD (Tulane-Ochsner)

Atypical Teratoid Rhabdoid Tumor in the Pineal Region of an Adult: Case Report

Juanita Garces, MD (Tulane-Ochsner)

Chiari Malformation Treated with Ventriculoperitoneal Shunting: Case Report

Juanita Garces, MD (Tulane-Ochsner)

Benign Metastatic Sacral Meningioma, a Rare Entity: Case Report

Silvia Gesheva, MD (LSUHSC-NO)

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Short Fall Head Injuries: the Economic Impact on a Tertiary Children's Regional Medical Center

Osama Ahmed, MD (LSUHSC-S)

Anatomic Variations of Acromegalic Patients in Transphenoidal Surgery

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Objective: Acromegaly is a rare disease caused by an excess of circulating GH and IGF-1. Sinonasal anatomic variations in acromegalics can make surgical treatment via a transnasal-transphenoidal approach difficult. The authors sought to find out what anatomical variations are present in acromegalics and if the variations may lead to an increased difficulty of surgery.

Methods: Eight acromegalics were compared to eight non-functioning pituitary adenomas and eight patients without sellar pathology. All patients had a computed tomography angiography with 1 mm separation acquisition. All measurements were made by a single neuroradiologist.

Results: Four anatomic measurements were statistically significant: anterior-posterior (AP) distance from sphenoid sinus to sella ($p = 0.003$), distance from sellar floor to dorsum sella ($p = 0.011$), anterior-posterior distance of the sella ($p = 0.001$), and width of the carotid canal ($p = 0.004$). Post hoc analysis revealed that distance from the sphenoid sinus to sella, sellar floor to dorsum sella, and AP distance of the sella was not significant between acromegalics and non-functioning adenoma but significant between sellar and non-sellar pathology. Acromegalics were found to have a wider carotid canal than non-functioning adenomas ($p = 0.006$) and non-sellar pathology ($p = 0.013$). A statistical trend was noted in the type of sphenoid sinus, with acromegalics having a sellar or conchal sphenoid sinus ($p = 0.097$.)

Conclusion: Our study found acromegalics to have wider carotid canals. This anatomic variation should be noted when treating acromegalic patients.

Juanita Garces, MD (Tulane-Ochsner)

Atypical Teratoid Rhabdoid Tumor in the Pineal Region of an Adult: A Case Report

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Introduction: Atypical teratoid rhabdoid tumor (AT/RT) is a rare, highly malignant, central nervous system neoplasm classified as embryonal grade IV by the World Health Organization. AT/RT generally occurs in children younger than 3 years with fewer than 40 pathologically confirmed cases reported in adults. It is most commonly supratentorial, with only three of the 40 confirmed adult cases localized to the pineal region. Radiologic imaging of AT/RT is nonspecific, showing increased attenuation on non-contrast CT and enhancing on MRI. The population of rhabdoid, epithelial, mesenchymal, and primitive neuroectodermal cells resembles medulloblastoma and primitive neuroectodermal tumor. Immunohistochemistry is characterized by heterogeneous vimentin, epithelial membrane antigen, S100, GFAP, synaptophysin, cytokeratin and smooth muscle actin. Definitive diagnosis requires thorough cytogenetic/immunostain studies indicating INI1 tumor suppressor gene deletion from locus 22q11.2. Treatment consists of surgery combined with chemotherapy and radiotherapy.

Case Presentation: SS is a 29-year-old male with a history of chronic migraines and previously negative head CT who presented with worsening headaches and new onset diplopia with upward gaze palsy. A repeat head CT revealed a hemorrhagic pineal mass with extension into the right thalamus. MRI showed enhancement of the pineal mass with a small supratentorial component. CSF was negative for embryonic/germ cell markers. The patient underwent an infratentorial, supracerebellar approach for tumor resection. He developed post-operative acute hydrocephalus requiring a temporary ventriculostomy. He was discharged on post-operative day 10 with persistent upward gaze palsy.

Conclusions: We report a case of an atypical teratoid rhabdoid tumor in the pineal region of an adult, with diagnostic confirmation by immunohistochemical staining and molecular cytogenetics. This tumor has few characteristic features on clinical presentation or imaging, and basic morphological features are shared between multiple different tumor entities. A thorough pathological work-up of the resected specimen is vital to diagnosis in cases of suspected AT/RT.

Juanita Garces, MD (Tulane-Ochsner)

Chiari Malformation Treated with Ventriculoperitoneal Shunting: A Case Report

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Introduction: Chiari I Malformation (CM-I) is a disorder characterized by the caudal displacement of the cerebellar tonsils below the foramen magnum. It is often associated with syringomyelia and occasionally with hydrocephalus. Treatment is usually posterior fossa decompression with C1 laminectomy and possible duraplasty, but guidelines are uncertain for treatment of infants with symptomatic CM-I.

Case Report: We report a case of an 8 month-old male with significant CM-I and holocord cervical spinal syrinx presenting with stridorous breathing, possible lower cranial nerve symptoms, and increased tone. Symptoms were aggravated by crying. MRI revealed cerebellar tonsils descending to the level of C3-C4, syrinx extent from C4 to T4, compression of the cervicomedullary junction, fourth ventricular outflow obstruction, and hydrocephalus. Due to age and amount of tonsillar descent, we elected to place a ventriculoperitoneal shunt (VPS) instead of performing decompressive surgery. The infant had significant symptomatic relief at 6 month and 9 month follow-ups. MRI revealed resolution of the syrinx, return of normal ventricular size, and ascension of cerebellar tonsil herniation to the level of C2-C3.

Discussion/Conclusion: We report a case of symptomatic CM-I in an infant successfully treated with VPS. This case does lend more evidence to the long held hypothesis that Chiari is a cerebrospinal fluid (CSF) flow pathology. We review the literature on Chiari pathophysiology and discuss the implication of this unique case.

Juanita Garces, MD (Tulane-Ochsner)

Benign Metastatic Sacral Meningioma, A Rare Entity: Case Report

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Tulane-Ochsner Neurosurgery Program, Tulane University¹ & Ochsner Health System², New Orleans, LA

Introduction: Meningiomas are common intracranial tumors with a very low metastatic rate. Those that do metastasize often show histopathological signs of malignancy. In rare cases, both the primary and secondary tumor are histologically benign.

Case Presentation: We report a case of benign intracranial meningioma metastasizing to the sacrum. This patient is a 57 year-old female with a history of meningioma for 30 years that has been operated 6 times and treated with stereotactic radiosurgery. At previous surgeries, pathological analysis showed benign meningioma. She had a residual parietal convexity meningioma (1.5 x 1.5 x 1.8 cm) that we followed with serial MRIs. She later developed lower back pain. MRI showed a fracture of her sacrum with evidence of bone marrow replacement.

Results: Biopsies showed meningothelial meningioma without atypical features. Tumor cells were positive for EMA and progesterone and negative for S-100 protein. She was treated with 54 Gy to the sacrum in 30 fractions with resolution of symptoms. Six months later, she developed left leg weakness. MRI showed growth of her intracranial mass (2.6 x 2.8 x 2.4 cm). She underwent craniotomy for tumor resection. Pathological evaluation showed evidence of benign meningioma without atypical features.

Conclusions: We report a rare case of a patient with a successfully treated metastatic benign meningioma. We also describe this patient's clinical course and review the literature for similar cases. She recovered well from this procedure and returned to her baseline in several weeks. There is no evidence of recurrence in either location.

Silvia Gesheva, MD (LSUHSC-NO)

Long-term Seizure Outcomes Following Pediatric Epilepsy Surgery – Our experience at Children’s Hospital New Orleans

S. Gesheva, MD, L. McBride, MD

Objective: Determine the correlation between pre and perioperative variables on the outcome of children undergoing surgery for medically intractable seizures.

Methods: A retrospective analysis was performed of a cohort of patients younger than 21 years of age who underwent surgical intervention and had at least 1 year of follow up. Charts were reviewed from 2005 till present. We analyzed outcome based on postoperative seizure frequency, medications and neurocognitive testing, as compared to age of onset, duration, preoperative cognitive impairment, location, histopathology, preoperative workup such as SPECT and fMRI, and extent of resection.

Results: A majority of patients underwent epileptogenic focus resections, while others had corpus callosotomies and hemispherectomies. On chart review, there appeared to be prevalence of seizure freedom post-operatively and overall positive outcome. Few patients relapsed and required further surgical interventions, either further lesion resection vs vagal nerve stimulator.

Conclusion: Significant improvement can be achieved in pediatric epilepsy surgery through the use of an individualized and multidisciplinary team approach.

Lora Kahn, MD (Tulane-Ochsner)

Pediatric Applications of Deep Brain Stimulation: Tourette's and Dystonia

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Introduction: Deep brain stimulation (DBS) has been employed for treatment of intractable movement disorders since the 1980s. Though it is used widely in adults, applications in pediatric patients have been more limited. Indications are less evident, and choosing an appropriate target can be challenging. We present two pediatric patients with refractory disease who were identified as candidates for stimulation of the bilateral globus pallidus interna (GPi). We review the literature and discuss the nuances of each case.

Cases:

Patient A: A 6-year-old male presented with refractory concomitant spasticity and dystonia. He had exhausted medical management including intrathecal baclofen. His symptoms were so devastating that his family and neurologists pushed to be more aggressive. We felt he was a reasonable DBS candidate. He underwent successful placement of bilateral GPi electrodes.

Patient B: A 14-year-old male with severe Tourette's syndrome presented after exhausting medical therapy. His motor tics were so severe and violent that they resulted in multiple cervical spine fractures and myelopathy secondary to spinal cord contusions. He was offered bilateral GPi electrode placement. He experienced improvement in both motor tics and obsessive-compulsive symptoms.

Discussion: We present two pediatric patients with refractory diseases who responded well to deep brain stimulation after failing more traditional therapies. While the GPi has traditionally been targeted in dystonia, there are limited data based on multiple potential targets in Tourette's; thus, the GPi was targeted based on case series reports. Further longitudinal follow-up is required for these patients' long-term outcomes, but we propose that DBS can be a safe and efficacious option for the appropriate child with refractory movement disorder. However, both selecting and technically reaching the right target is more challenging in children and should be done with great care.

Walid Radwan, MD (LSUHSC-NO)

A resolved lumbar herniated disc: a case report

Robert J Derenbecker, BS, Gabriel Claudiu Tender, MD, Walid Radwan, MD, Anthony Michael DiGiorgio, DO.

Introduction: Lumbar herniated nucleus pulposus is the most common cause of sciatica. Conservative treatment has been shown to lead to symptom resolution in many cases.

Case Presentation: A 50-year-old female patient with a height of 1.62 m (5'4"), a weight of 78 kg (172 lbs), and a BMI of 29.5 kg/m² presented to the neurosurgery service complaining of low back pain radiating into the left leg and associated right buttocks numbness. The left leg pain was worse than the low back pain and radiated down her calf to the dorsal aspect of her foot, in a typical L5 distribution. The back pain had been present for eight years, whereas the leg pain started insidiously about a year prior to presentation. The physical examination showed an antalgic gait, full motor strength, normal muscle tone, and no atrophy. An MRI taken approximately one year prior to the clinic visit showed a large left paracentral L4-5 disc herniation and a minimal grade 1 spondylolisthesis at that level. A microdiscectomy was scheduled after informed consent was obtained. A pre-operative MRI was scheduled, as the prior imaging was greater than a year old.

The day of surgery, the patient expressed that her back pain was still present, but the leg pain was moderately improved. The leg pain was no longer shooting in nature, rather simply a residual numbness. The new imaging was reviewed and it showed complete resolution of the herniated fragment. The spondylolisthesis was unchanged. The L4-5 microdiscectomy was cancelled and flexion/extension X-rays were scheduled.

Conclusion: Due to the possibility that a herniated lumbar disc will resolve, up to date imaging is necessary before proceeding to surgery. This is even more paramount if the patient has a change in symptoms.

Ilias Caralopoulos, MD (Tulane-Ochsner)

The effect of cigarette smoke on intracranial aneurysm formation and rupture: data from *in vitro* and *in vivo* models

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Introduction: Cigarette smoking is implicated as a risk factor for aneurysmal subarachnoid hemorrhage. Previous work suggests the role of smoke-induced production of reactive oxygen species and induction of inflammation. This study was undertaken to determine the effects of smoke exposure in a mouse model of intracranial aneurysm (IA) and *in vitro* culture of vascular smooth muscle cells (VSMCs).

Methods: IAs were induced in $n = 46$ C57BL/6 mice via a well-characterized model.³ Twenty-four of the animals were exposed to cigarette smoke daily (80 mg/m³ for five hours) for two weeks. Rates of aneurysm formation and rupture were measured, and aneurysm tissue was collected from the animals for gene expression analysis. In addition, primary VSMC from rat cerebral arteries were treated with cigarette smoke extract (CSE) to examine the effect on gene and protein expression. PCR arrays for oxidative stress (OS) and cytokines and chemokines (CC) were analyzed. The effect of CSE treatment on VSMC marker proteins smooth muscle actin, SM-22, and myosin heavy chain were analyzed by quantitative immunocytochemistry.

Results: Rates of aneurysm formation were not significantly different between smoke-exposed (45.8%) and smoke free (54.5%, $p = 0.38$) animals. However, the rate of aneurysm rupture was significantly increased in the smoke group (91.7%) versus the smoke-free group (27.3%, $p = 0.002$). CSE treatment of VSMC showed significant up-regulation of OS genes and significant down regulation of CC genes compared to controls. CSE treatment was also shown to significantly diminish the expression of VSMC marker proteins.

Conclusions: This study demonstrated a causal effect of cigarette smoke exposure on aneurysm rupture in an animal model. The *in vitro* data suggest that cigarette smoke may contribute to aneurysm rupture via OS and CC gene expression leading to a pro-inflammatory, matrix remodeling phenotype in VSMC.⁴

Durga Sure, MD (LSUHSC-NO)

Delayed Hematomyelia in an Expansive Cervical Thoracic Syrinx after Chiari Type I Malformation Decompression. A case report.

Clarence Greene, Jr., M.D., Lori McBride, M.D., and Durga Sure, M.D

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Objective: Hemorrhage into a syrinx is extremely rare. Roughly once a decade a case finds its way into the literature. Most patients who suffer the consequences of such a lesion have had trauma coagulation disorders, associated tumors, or as a result of surgery in the spinal cord.

Method: Retrospective chart review and reporting

Results: We report a 7-year-old patient who came to medical attention with scoliosis and was found to have Chiari I Malformation with extensive syringomyelia. Months after a bony decompression and dural scoring, she presented with paraplegia secondary to a hemorrhage within the syrinx. Urgent surgical treatment ultimately led to total recovery of lower extremity strength.

Conclusion: We believe our patient to be the youngest child yet reported with intra syringal hemorrhage, and likely the first child to have such a spontaneous hemorrhage remotely in time from a Chiari decompression, and without another inciting event, or syndrome.

The case is an alert as to the possible consequences of a persistently dilated syrinx. Further, this development would question whether just stabilization in syrinx size after surgery is enough to be considered a good outcome.

Jerome Volk, MD (LSUHSC-NO)

Short Fall Head Injuries: the economic impact on a tertiary children's regional medical center.

Jerome M. Volk, M.D., Clarence Greene, M.D., Lori McBride, M.D.

Introduction: Trauma remains the leading cause of death in the pediatric population. Even more common, although much less dramatic are the short fall incidents that occur thousands of times a day across the country. These falls can lead to head injuries with a wide range of severity, from benign concussion to intracranial hemorrhage. While there are numerous published guidelines for the appropriate work-up of these patients, it is not uncommon that initial examining physician does "what he is comfortable with" in regards to the work up. We have examined our volume of such cases, treated via the Emergency Department at Children's Hospital New Orleans, which is a pediatric regional referral center.

Methods & Materials: A retrospective chart review was performed from the dates January 1st, 2010–December 31st 2013. All patients seen in the inpatient setting (ER visits or direct transfers) from 0-21 years of age were included with the appropriate ICD-9 diagnosis codes (854.00, 852.40, 850.90, 852.20, 430.00, 803.00, 803.90, 801.00 920.00) were included. All patients with NAT, only facial trauma, and incomplete documentation were excluded.

Results: A total of 2200 patients were identified in the review. As we looked into the total expense to the hospital we then broke this down into: imaging cost, physician cost, total hospital cost, and transportation cost. The overwhelming majority of the patients had Medicaid as the primary source of insurance. The majority of patients arrived for care by family transportation.

Discussion: Despite our best efforts, true costs for the individual treatments or images could not be calculated by our management. However, based on the amount of money being spent and the amount that providers such as Medicaid reimburse hospitals, it is no stretch to see how much money the hospital loses. This does nothing to mention the radiation exposure in this population as well. Therefore, it is our goal to use this study to better educate physicians at our hospital and surrounding hospitals in order to better serve the patients of our area.

Abstracts



Scientific Session III

Moderator: Dr. Ricky Medel

Osama Ahmed, MD (LSUHSC-S)

Treatment of Vertebrobasilar Fusiform Aneurysms with Pipeline Embolization Device: long-term follow-up

Juanita Garces, MD (Tulane-Ochsner)

Comparative Study of Two Minimally Invasive Techniques for Lumbar Degenerative Spondylolisthesis: an Ochsner Experience

Richard Menger, MD (LSUHSC-S)

An Analysis of 2012 Medicare Reimbursements to Neurosurgeons in Louisiana

Olawale Sulaiman, MD, PhD (Ochsner)

Outcomes of Lumbar Spinal Surgery in Patients Older than 65 Years Old– Does Minimally Invasive Surgery Make a Difference?

Shihao Zhang, MD (LSUHSC-S)

Anterior Stabilization for Unstable Traumatic Thoracic and Lumbar Spine Burst Fractures: Clinical Outcomes

Marcus Ware, MD, PhD (Tulane-Ochsner)

Chemosensitivity of Primary and Metastatic Brain Tumors to 4-Demethyl-4-cholesteryloxycarbonylpenclomedine (DM-CHOC-PEN) and Temozolomide

Juanita Garces, MD (Tulane-Ochsner)

Minimally Invasive Lumbar Laminectomy in a More Cost Effective Treatment for Degenerative Spinal Stenosis Compared to Open Laminectomy: an Ochsner Experience

Marc Manix, MD (LSUHSC-S)

Utility of Post-operative CT Scans in Elective Craniotomy

Juanita Garces, MD (Tulane-Ochsner)

Mini-open Thoracolumbar Corpectomy– Functional Outcome and Cost-Utility Analysis Compared to Open Corpectomy

M. Daniel Eggart, MD (LSUHSC-NO)

A 14-Year Retrospective Cross-sectional Study of Pediatric Intracranial Infections in Southeastern with Dedicated Review of Socio-economic and Demographic Factors Relating to Intracerebral Abscess, Subdural Empyema, and Epidural Abscess.

Osama Ahmed, MD (LSUHSC-S)

Treatment of Vertebrobasilar Fusiform Aneurysms with Pipeline Embolization Device: long-term follow-up

Osama Ahmed, MD¹, Christopher Storey, MD, PhD¹, Piyush Kalakoti, MD¹, Jai Thakur, MD¹, Shihao Zhang, MD¹, Anil Nanda, MD, MPH, FACS², Bharat Guthikonda, MD³, Hugo Cuellar, MD¹

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Introduction: Treatment of complex intracranial aneurysms with Pipeline embolization device (PED) (ev3/Covidien Vascular Therapies) has gained recent popularity. One application of PEDs that is not well described in the literature is the utility and long-term safety in treatment of vertebrobasilar fusiform (VBF) aneurysms. The authors provide long-term follow-up of VBF aneurysms treated with PEDs.

Methods: We retrospectively reviewed 5 patients that were treated for vertebrobasilar fusiform aneurysms with PEDs from 2012 – 2014. All patients were treated by one neurointerventionalist under general anesthesia. All patients were placed on dual anti-platelet therapy.

Results: Follow-up was from 12-25 months with a 20% morbidity and 60% mortality rate. Case 1 developed a recurrence after initial treatment and developed ischemic strokes after another treatment, which led to death. Case 2 had a delayed onset of hemiparesis after treatment, which remained at the 18 month follow-up. Case 3 had an uneventful course and remains neurologically intact with obliterations of the aneurysm. Case 4 developed a recurrence after 1 year which required retreatment. Case 5 developed immediate ischemic injury to the brainstem and eventually, brain death.

Conclusion: Despite reports describing successful treatment of vertebrobasilar fusiform aneurysms with PEDs, delayed complications after obliteration and remodeling of the aneurysm can occur. Holobasilar fusiform aneurysms tend to have higher complications due to telescoping constructs required to treat the length of the aneurysm. Segmental fusiform aneurysm may be more amenable to treatment with PEDs. We advocate long-term follow-up despite successful obliteration of the aneurysm. To our knowledge, this report presents one of the longest follow-ups in the literature.

Juanita Garces, MD (Tulane-Ochsner)

Comparative study of two minimally invasive surgical techniques for lumbar degenerative spondylolisthesis: an Ochsner Experience

Juanita Garces, MD^{1,2}, Mansour Mathkour, MD², Teresa Arrington, BA², Olawale Sulaiman, MD, PhD²

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Introduction: Multiple lumbar interbody fusions techniques have been reported with the aim of improving fusion rates. Minimally invasive techniques continue to be developed with several advantages over the open traditional techniques: minimize the skin incision and perioperative pain, less narcotic use, less estimated blood loss (EBL), shorter hospitalization (LOS), early mobilization, lower risk of infection and early recovery and quality of life (QOL). However, there is limited data on how MIS techniques compare with each other, especially in the treatment of a specific spine diagnosis such as degenerative spondylolisthesis (DS). The purpose of this study is to compare MIS- lateral interbody fusion (LIF) to MIS- transforaminal interbody fusion (TLIF).

Methods: A retrospective analysis of 71 patients was performed from 2011-2014 at Ochsner Medical Center for DS. Patient sex, age at surgery, pre-op BMI, EBL, hospital LOS, duration of surgery, post-operative complications, patient reported functional outcomes (Oswestry Disability Index-ODI and Visual Analog Scales-VAS) and direct surgical cost were reviewed. These outcomes are reported at pre-op, 6 weeks, 6 months, and 1 year+ postoperative. We used paired t test and a two-sample t-test with equal variances to determine means, standard errors, and p values for statistical significance.

Results: There were 32 and 39 patients in the LIF and TLIF groups respectively. There was no significant difference in age, BMI, direct cost, hospital LOS, or duration of surgery between the 2 groups. EBL was significantly less for LIF patients (p value 0.0007.) Both LIF and TLIF patients had significantly improved clinical outcomes at each time points post op with a tendency for improved outcome in TLIF patients (p values .0029 and .0039.)

Conclusions: Both MIS-LIF and MIS-TLIF demonstrate significant and sustained improvement outcomes in patient pain and quality of life. When compared against each other, MIS TLIF seems to offer better functional outcomes. We plan to carry out a RCT of TLIF versus LIF in the treatment of degenerative spondylolisthesis.

Richard Menger, MD (LSUHSC-S)

An Analysis of 2012 Medicare Reimbursements To Neurosurgeons in Louisiana

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Introduction: The dollar amount reimbursed in 2012 by Medicare to each individual physician was recently made public, and information about this data has been widely misrepresented. Third parties often use summary statistics to identify and highlight physicians receiving the highest Medicare payments (e.g. High-Expenditure Physicians or HEP). By doing so, the surgeons' billing practices are inferred to be the main driving force for excessive Medicare spending. Our objective is to examine the factors contributing to Medicare surgeon reimbursements in Louisiana.

Methods: This study used data from the 2012 Medicare Reimbursement Database and the United States Census. Medicare dollar amounts were attributed to individual physicians, and demographic characteristics were recorded for Louisiana parishes. Physicians were assigned to a parish based on his/her primary city of practice. Pairwise comparisons were used to investigate differences between parishes with >50% or ≤ 50% of their neurosurgeons receiving above average Medicare reimbursements. High-Expenditure Physicians were identified as the top 10 surgeons in Medicare reimbursements in the state. Simple linear regression analyses were conducted to identify factors contributing to average Medicare expenditures per capita as well as average Medicare expenditures per capita per surgeon in Louisiana.

Results: Parishes with >50% of their neurosurgeons receiving above average Medicare reimbursements had significantly lower median home values and significantly larger geographic size ($P<0.05$). Overall Medicare spending did not differ between parishes that contained a HEP and those that did not, and the number of HEP in each parish was not correlated with increased Medicare reimbursements. Regression demonstrated that larger geographic size, rural setting, lower education level, and lower median home value correlated with increased Medicare expenditures per surgeon ($P<0.05$).

Conclusions: This study shows that neurosurgeons who served large geographic rural areas populated by patients with less education and lower home values were more likely to receive Medicare reimbursement. The presence and number of high-expenditure physicians were not major factors related to Medicare spending in Louisiana parishes. This suggests that variation in Medicare reimbursement is not directly related to individual neurosurgeons' practice patterns but to census demographics. Considering the widespread and misleading use of the Medicare Reimbursement Database, neurosurgeons need to take a proactive role in understanding this information and its analysis.

Olawale Sulaiman, MD, PhD (Ochsner)

Outcomes of lumbar spinal surgery in patients older than 65 years old- Does Minimally Invasive Surgery make a difference?

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Purpose: The benefits of spine surgery are often challenged, especially in the geriatric population. Minimally invasive surgery (MIS) techniques generally result in smaller surgical incisions, reduced hospital length of stay (LOS) and surgical morbidity including blood loss (BL), post-operative pain, and infection rate. Despite these purported benefits for the elderly, MI lumbar spine surgery has rarely been directly compared to open surgery in patients over 65 years old. The purpose of this study is to retrospectively analyze our database for patients over age 65 who underwent MIS of the lumbar spine.

Methods: Our clinical database and patient medical records were consulted for patient demographics, direct surgical cost, pre-op BMI, perioperative complications including EBL, LOS, surgery duration, post-operative complications, and patient-reported Oswestry Disability Index (ODI) and Visual Analog Scales (VAS). These outcomes were reported at pre-op, 6 weeks, 6 months, and 1 year+ post-operative. Means and standard errors were calculated for two-sample t-test with equal variance and paired t-test. Patients were analyzed as a whole group and as subgroups by decade of life.

Results: Of the 183 patients analyzed, the average EBL and LOS were 128.38cc and 2.52 days, respectively. Compared to their preoperative scores, patients in both groups reported significantly enhanced quality of life at last follow-up in the ODI and VAS (fusion pre-op vs 1+years post-op ODI: 51.2 vs 32.6, $p=1.2E-10$; non-fusion: 51.7 vs. 29.7, $p=3.1E-19$, fusion VAS: 6.1 vs 3.7, $p=1.5E-9$; non-fusion 6.2 vs. 3.3, $p=2.5E-16$). Only the 80-89 and 90-99 fusion subgroups did not show statistically significant improvement in reported quality of life.

Conclusions: Lumbar spine MIS is a safe, effective treatment option for patients older than 65 years of age. All patients in our study have significant improvement in their quality of life (based on ODI) except those older than 90 years old where the functional benefit of MIS fusion appears to be diminished.

Shihao Zhang, MD (LSUHSC-S)

Anterior Stabilization for Unstable Traumatic Thoracic and Lumbar Spine Burst Fractures: Clinical Outcomes

Shihao Zhang, M.D., Jai Deep Thakur, M.D., Sunil Kukreja, M.D., Richard Menger, M.D., Bharat Guthikonda, M.D., Donald Smith, M.D., Anil Nanda, M.D., FACS.

Department of Neurosurgery, Louisiana State University Health Science Center; Shreveport, LA

Introduction: Traumatic injuries to the thoracic and lumbar spine result in a high incidence of unstable fractures. Surgical management includes adequate decompression and stabilization. We have analyzed operative and postoperative features of anterior surgical approaches.

Methods: We retrospectively analyzed the medical records of 45 patients that presented with traumatic unstable thoracolumbar fractures who underwent anterior corpectomy with stabilization from January 1999 to January 2009.

Results: The average age of the patients was 37.6 years (range: 13-70), with a male-to-female ratio of 1.5:1. Retroperitoneal approach was used in 64.4%, transthoracic in 13.3%, and transthoracic transdiaphragmatic in 22.2%. The average operation time, estimated blood loss (EBL), and length of stay after surgery was 412.3 minutes, 1098 ml and 9.1 days, respectively. A BMI>25 was associated with longer operative times ($p<0.02$) and higher EBL ($p<0.006$). The mean sagittal angulation improved from 15.5 degree preoperatively to 8.7 degree postoperatively ($P<0.001$). At final follow up, 96% of patients showed radiological evidence of bony fusion. Postoperative neurological status was in 18 patients (pre-op: ASIA-E, postop: unchanged), 14 patients (pre-op: ASIA-D, postop 7 improved), 8 patients (pre-op: ASIA-C, postop: 5 improved), and 5 patients (pre-op: ASIA-B, postop: 1 improved). There were no cases of neurological deterioration postoperatively, and 84.4% of the patients were discharged home. At latest follow-up (mean: 27.2 months) there were no new cases of neurological deficits, and 9 patients had a further improvement of neurological status.

Conclusions: In our study, traumatic thoracic and lumbar burst fractures could be managed with an anterior surgical approach with no risk of neurological deterioration. With this approach, there is improvement in neurological function, significant correction of kyphotic deformity, and low rate of pseudarthrosis.

Marcus Ware, MD, PhD (Tulane-Ochsner)

Chemosensitivity of Primary and Metastatic Brain Tumors to 4-Demethyl-4-cholesteryloxycarbonylpenclomedine (DM-CHOC-PEN) and Temozolomide

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The gold standard in treatment of high-grade astrocytomas includes resection, concomitant temozolomide (TMZ) and radiation followed by maintenance TMZ. The efficacy of TMZ is limited by drug-resistance mediated by O⁶-methylguanine-DNA methyltransferase (MGMT). Brain metastases are difficult to treat and currently no standard chemotherapeutic therapies exist. 4-Demethyl-4-cholesteryloxycarbonylpenclomedine (DM-CHOC-PEN) is a polychlorinated pyridine cholesteryl carbonate whose mechanism of action is *via* alkylation of DNA at N⁷-guanine. This agent has had early therapeutic success in treating both primary and metastatic CNS malignancies in Phase I and Phase II clinical trials. To better understand the sensitivity and mechanisms of resistance in primary and metastatic CNS tumors, we collected tissue from subjects (n=30) with brain and spine tumors between March-November 2014 for chemosensitivity studies. These included high-grade astrocytomas (8), metastatic brain tumors (5) meningiomas (5), and other more benign tumors such as pituitary adenomas (3), hemangioblastoma (1), and chondrosarcoma (1). Using viable tumor cell explants from surgery, cells were grown under standard conditions (RPMI/FBS, 5%CO₂, 37°C), *in vitro* chemosensitivity profiles were obtained comparing DM-CHOC-PEN vs. TMZ and other commonly used anti-cancer agents. Tumor cells exhibited higher susceptibility to DM-CHOC-PEN than to TMZ (RR=2.71, p=0.0149, 95% confidence interval [CI], 1.06-5.05 vs. TMZ). In a subgroup analysis of high-grade astrocytomas, atypical meningiomas, and secondary metastases in this cohort, an association was noted between TMZ-resistance (μ_{IC50} =3.2, S.D.=0.51) and DM-CHOC-PEN-sensitivity (μ_{IC50} =1.0, S.D.=0.29) using two-sample independent, Student's t-test with Fisher's exact P-value (p=0.001, t(23.72)=3.7, df=23.72). These preliminary results suggest that DM-CHOC-PEN may promote cell death in tumors possessing acquired MGMT-mediated drug-resistance. Furthermore, it supports roles for this promising new agent in the treatment of primary and metastatic brain tumors and in treatment of high-grade astrocytomas, either in combination with TMZ or alone in cases of TMZ-resistance.

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Juanita Garces, MD (Tulane-Ochsner)

Minimally invasive lumbar laminectomy is a more cost effective treatment for degenerative spinal stenosis compared to open laminectomy: An Ochsner Experience

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Introduction: Lumbar spinal stenosis (LSS) is a common cause of leg pain and difficulty walking. The standard surgical procedure is decompression by laminectomy and bilateral laminotomy. This surgery is very effective, although further degeneration of the spine can occur. Limited long-term follow-up publications exist which report on cost-effectiveness and clinical outcomes of minimally invasive (MIS) laminectomy compared to conventional open laminectomy.

Methods: A retrospective chart review was performed from 2009 - 2014 on all patients who underwent spinal decompression at Ochsner Medical Center and diagnosed with LSS. Epidemiological factors including gender, age at surgery and pre-op BMI were analyzed. Procedure details were noted including EBL, hospital LOS, duration of surgery, post-operative complications and direct cost of surgery. Clinical outcomes were assessed using patient reported ODI and VAS score. Questionnaires were assessed at pre-op, 6 weeks, 6 months, and 1 year+ post-operative for outcome analysis. Paired t-test and two sample t-test with equal variances were performed to determine means, standard errors, and p-values for statistical significance.

Results: There were 116 patients in the MIS group and 13 patients in the open group. Outcomes in the MIS group were significantly more favorable in EBL (58 v 171), direct cost (\$4,903 v \$9,210), and hospital LOS (1 day v. 6 days), (p values 0.0000). Compared to their preoperative scores, there was significant and sustained improvement in the ODI and VAS scores at each follow-up point for MIS patients. The outcomes in the open group were significantly improved at all follow-up points except 6 months for ODI and VAS.

Conclusions: We present a series of over 100 patients that have been treated with MIS laminectomy with excellent functional outcomes at reduced direct cost to the hospital. These findings not only prove that MIS laminectomy is clinically effective but also cost effective.

Marc Manix, MD (LSUHSC-S)

Utility of Post-operative CT scans in Elective Craniotomy

Objective: Early post-operative CT scanning after elective craniotomy is commonly performed to assess surgical results and for early detection of complications. Although commonplace, this practice exposes the patient to radiation and is an extra cost that may not be warranted. The purpose of this study was to see if there is any information gained from post-operative CT scans that will lead to a surgical intervention.

Methods: A retrospective review of a prospectively collected database of all elective craniotomies done at a single institution over a 10 month period, and with an early post-operative CT scan. Primary endpoint was need for a surgical intervention (return to operating room, or placement of an external ventricular drain). Post-operative neurologic exam, age, pre-operative labs, type of surgery, and pathology were all analyzed as well.

Results: A total of 174 patients had elective craniotomies performed with a post-operative CT scan done as well. Only 1/174 (0.5%) needed return to the OR based on findings and neurologic exam. Changes on post-operative CT scans did not predict a need for unplanned surgical intervention.

Conclusion: A post-operative CT scan for elective craniotomies is not necessary in non-comatose patients; and the neurologic exam can be used to monitor post-operative complications, where an unexpected decline in status should prompt imaging studies to be performed.

Juanita Garces, MD (Tulane-Ochsner)

Mini-Open thoracolumbar corpectomy- functional outcome and cost-utility analysis compared to open corpectomy

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Purpose: Open thoracolumbar corpectomy carries significant morbidity often requiring prolonged hospitalization, rehabilitation and substantial postoperative pain management. Due to these limitations, newer mini-open (MO) surgical techniques have the potential to reduce hospital and patient costs and improve patient outcomes. However, there are few published comparisons of open versus MO corpectomy techniques. The purpose of this study is to review and assess the outcomes of open and MO thoracolumbar corpectomy cases performed at Ochsner Medical Center between 2011 and 2014.

Methods: Our clinical database was reviewed including demographics, age at surgery, pre-op BMI, estimated blood loss (EBL), hospital length of stay (LOS), direct hospital cost, duration of surgery, post-operative complications, and patient-reported functional outcomes (Oswestry Disability Index-ODI and Visual Analog Scales-VAS). Patient-stated quality of life (QOL) assessments were reported pre-operatively, 6 weeks, 6 months, and 1 year+ post-operatively. We used a paired t-test and two-sample t-test to analyze results.

Results: Between the open (n=17) and MO group (n=21), there was no significant difference in age, BMI, or length of surgery. Compared to the open group, patients that underwent MO surgical technique had less EBL (1146 mL vs. 585mL, $p=0.037$) and trended toward reduced hospital LOS (6 vs 9 days, $p=0.128$). Patients who had MO surgeries had lower hospital direct costs (\$34,373 versus open: \$45,376, $p=0.045$) and improved at more than one year follow-up (MO: ODI pre-op 51.4 to 38.6 at last follow-up, $p=6.9E-4$; VAS 6.7 to 4.1, $p=9.6E-4$). Patients treated with open corpectomy also reported improvements at 6 months follow-up (ODI pre-op 44 to 32 at last follow-up, $p=3.6E-4$; VAS 5.8 to 4.3 $p=0.013$).

Conclusions: MO corpectomy is a more cost-effective treatment option compared to open corpectomy as noted in the persistent improvement in outcomes. Patients recorded enhancement of QOL when they had MO surgery. Although patients who had open surgery also reported improvement at 6 months, our data suggest that MO procedures are better suited for these patients.

M. Daniel Eggart, MD (LSUHSC-NO)

A 14-year Retrospective Cross-sectional Study of Pediatric Intracranial Infections in South-eastern Louisiana with Dedicated Review of Socioeconomic and Socio-Demographic factors Relating to Intracerebral Abscess, Subdural Empyema, and Epidural Abscess.

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Introduction: Intracranial infection as a complication of sinusitis and otitis media and congenital heart disease (CHD) continues to afflict children despite contemporary advances in neuroimaging, antibiotics, and surgical techniques. Previous studies have shown higher rates of sinusitis related complications of intracranial infection in male children with lower socioeconomic backgrounds.³ Children of lower socioeconomic class have more complications and poorer outcomes which have previously been attributed to lack of primary care, follow up, delayed antibiotic initiation, and inappropriate antibiotic coverage for resistant bacteria. In this study, we investigate the incidence of pediatric intracranial infections at our regional Children's Hospital over a fourteen year period of time. We relate patient socioeconomic status as well as race to occurrence and explore disparity in treatment for potentially preventable neurosurgical disease.

Methods: Investigators reviewed all admitted patients from 2001-2014 discharged from Children's Hospital New Orleans with an ICD-9 code 324.0. From 2001-2014, 81 patients were identified with diagnosis of intracranial infection at discharge. After further review of a total of n=41 met the inclusion criteria. Respective to each infection, patient sex, age, etiology of infection, race white vs. non-white and insurance coverage was stratified into the cohort. Insurance type was delineated into 2 groups: public insurance and private insurance. Infection incidences with regard to insurance, sex, and race were compared to population demographic estimates published by the United States Census Bureau for the State of Louisiana and the Data Resource Center for Child and Adolescent Health 2003.

Results: In 2003 there were 1.1 million children in the state of Louisiana, 54.6% white and 45.4% non-white including black, Hispanic and other as defined by the National Survey of Children's Health. From 2001-2014 at Children's Hospital New Orleans 26 of 41 patients or 63.4% of patients diagnosed with intracranial infections were white, and 15 or 36.5% were non-white (p=.015). According to the Data Resource Center for Child and Adolescent Health in 2003, 48.9% of Louisiana children aged 0-17 were insured privately and 51.1 % were insured with public plans (44.7% Medicaid and 6.4% self-pay without insurance). Comparatively, intracranial infection patients from 2001-2014 at Children's Hospital, 8 of 41 or 19.5% of patients were privately insured and 33 of 41 or 80.4% had public health insurance (p<.001). Of the intracranial infections, 27 patients were male and 14 patients were female. Intracranial infection etiologies were 25 related to previous sinus disease, 7 related to previous otitis media, 5 related to CHD or endocarditis, 1 dermal sinus, and 3 were unknown.

Conclusion: There is a significant difference between socioeconomic status, as determined by insurance and race, and incidence of intracranial infection.