Neurosurgery Concepts

Perspectives on key articles in neurosurgery

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REPEAT GAMMA KNIFE RADIOSURGERY FOR TRIGEMINAL NEURALGIA

Park, Kyung-Jae MD, PhD*; Kondziolka, Douglas MD*; Berkowitz, Oren RPA-C, MSPH*; Kano, Hideyuki MD, PhD*; Novotny, Josef Jr PhD*; Niranjan, Ajay MS, MCh*; Flickinger, John C. MD*; Lunsford, L. Dade MD* Neurosurgery, 2012 Feb;70(2):295-305

Study Question: What is the efficacy of repeat radiosurgery on patients with recurrent trigeminal neuralgia?

Methods: Park et al. performed a retrospective study on 119 patients who were previously treated with the gamma knife for trigeminal neuralgia. Patients were treated with a median target dose for 70 Gy (dose ranging between 50 and 90 Gy). The endpoints used were pain relief according to the Barrow Neurological Institute pain score and facial sensory dysfunction.

Results: The authors reported that their median follow-up was 48 months (ranging between 6 and 187 months). Their median interval for treatment was 26 months. The authors reported that 87% of their patients experienced initial pain relief. At 1 year, 3 years, and 5 years, the pain relief rates were 87.8%, 69.8%, and 44.2%, respectively. The authors found that patients who presented with recurrent facial pain in a distribution smaller than their initial presentation had a more favorable prognosis. Facial sensory dysfunction rates were 21% within 18 months; however, facial sensory dysfunction was a favorable indicator for pain relief. The authors also found that having a higher dose of radiation to the brainstem correlated with sensory dysfunction.

Conclusion: Park et al. conclude that repeat radiosurgery for trigeminal neuralgia can be as effective as the initial treatment in terms of pain relief.

Perspective: Radiosurgery for trigeminal neuralgia was initially reserved for patients who were not good candidates for a microvascular decompression. However, there are an increasing number of patients with trigeminal neuralgia who are treated with radiosurgery. Given that radiosurgery is not as durable as a microvascular decompression for pain relief, there are an increasing number of patients who present with recurrent pain. Park et al. report that repeat treatments can be just as effective in pain control. However, the rate of facial sensory dysfunction is higher for the second treatment. Interestingly, for repeat treatments, sensory dysfunction appears to correlate with pain relief. Despite the fact
that the rate of facial numbness is higher with a second treatment, the authors also point out that rhizotomies also carry a significant risk for facial sensory changes. Finally, the time to pain relief took 1.5 months which is similar to the latency for a first treatment. This paper suggests that we can safely use repeat radiosurgery for patients with recurrent TN.

Summary written by: Michael Lim

NEUROSURGICAL MANAGEMENT AND PROGNOSIS OF PATIENTS WITH GLIOBLASTOMA THAT PROGRESS DURING BEVACIZUMAB TREATMENT

Clark AJ, Lamborn KR, Butowski NA, et al. Neurosurgery, 2012 Feb;70(2):361-70

Study Question: What is the prognosis for glioblastoma patients after Stupp protocol treatment and progression during bevacizumab treatment? Do glioblastoma patients who progress through bevacizumab treatment and undergo repeat craniotomy display higher perioperative morbidity as compared to patients not treated with bevacizumab?

Materials and Methods: The authors retrospectively reviewed 209 consecutive patients requiring second or third craniotomies for recurrent glioblastoma. All patients had received at a minimum Stupp protocol which is chemoradiation after initial resection. No patients received bevacizumab in the initial Stupp treatment protocol. Patients were divided into three groups including those treated with bevacizumab prior to surgery for recurrence, those treated with bevacizumab after surgery for recurrence, and those not treated with bevacizumab. Rates of progression-free survival and overall survival served as primary outcome measures. Secondary outcome measures included incidence of seizure, surgical site infection, deep venous thrombosis, or pulmonary embolus, and death within 30 days of surgery.

Results: In the cohort, there were 23 patients in the preoperative bevacizumab group, 16 patients in the postoperative bevacizumab group, and 135 patients in the no bevacizumab group. Following surgery, patients receiving preoperative bevacizumab displayed a worse progression-free survival (P < 0.001) and overall survival (P < 0.001) compared to the other two groups. Length of survival after initial diagnosis was comparable between groups. Patients who progressed through bevacizumab treatment and who did not receive subsequent surgery displayed shorter overall survival compared to patients who received re-operation (P < 0.001). In addition, patients in the preoperative bevacizumab group displayed higher perioperative morbidity (44%) compared to patients in the other groups (21%).

Conclusions: Patients treated with bevacizumab prior to craniotomy for recurrent glioblastoma displayed decreased progression-free and overall survival compared to patients who underwent repeat craniotomy and either received or did not receive bevacizumab after repeat surgery. The former group also displayed increased perioperative morbidity as compared to the groups that did not receive preoperative bevacizumab.

Perspective: Bevacizumab is one of the only two chemotherapeutic agents FDA has approved for recurrent glioblastoma. However, there is evidence that treatment results in improved progression-free survival without improved overall survival. In addition, there is anecdotal evidence that patients treated with bevacizumab display decreased efficacy to subsequent chemotherapeutic regimens. The current manuscript provides another example in a growing body of literature of issues that arise from the use of this drug. While the authors display similar survival in each group after initial diagnosis, they state that their results confer a uniquely poor prognosis for patients who fail bevacizumab treatment. The unfortunate truth may be that bevacizumab truly provides little efficacy in improving patient survival with increased morbidity in its use as compared to other treatment options. The authors show that surgery has a role in the management of recurrent glioblastoma. However, perhaps bevacizumab should not be a part of this treatment algorithm. While anti-angiogenesis inhibitors will most likely have a role in the treatment of glioblastoma, only further research into the use of bevacizumab will show if it is the most efficacious anti-angiogenesis inhibitor for treatment of this disease. As the review was performed in a retrospective fashion, this should be taken into account when assessing the quality of the results. While there is a significantly higher proportion of patients in the no bevacizumab group, the authors take this into account in their statistical analysis.

Summary written by: Jonathan H. Sherman

HYPERTONIC SALINE FOR TREATING RAISED INTRACRANIAL PRESSURE: LITERATURE REVIEW WITH META-ANALYSIS

Mortazavi M, Romeo A, Deep A, Griessenauer G, Shoja M, Tubbs RS, Fisher W J. Neurosurgery (2012) 116:210-221

Study Question: Is hypertonic saline (HTS) more effective than mannitol in intracranial pressure (ICP) control, and what is the appropriate indication(s) and best method of delivery?

Methods: This is a literature review on human clinical
Seven hundred and eighty-seven articles were investigated 219 primary observational studies, 10 retrospective studies, and 5 cases studies. In 12 studies, the effect of HTS was compared to mannitol and 9 studies found HTS to be superior compared to mannitol in controlling ICP, with either greater reduction or longer duration of control. Looking at the method of delivery, 7 out of 11 studies that administered HTS as a continuous infusion showed that HTS is an effective method in reducing ICP. Out of 26 studies that administered HTS as a bolus, all but one study demonstrated the effectiveness of HTS as a bolus in ICP control. In terms of indications, HTS reduced ICP in patients with both traumatic and non-traumatic injury. The effect of HTS was also observed in studies involving pediatric patients. A meta-analysis of eight studies that reported treatment failure showed that HTS was associated with a lower rate of treatment failure compared to mannitol or normal saline. It shall be noted that while there is much data on the positive effect of HTS on ICP control, there is less data on whether HTS improves outcome compared to mannitol.

Conclusion: There is significant amount of data in the literature that shows HTS reduces ICP in patients with traumatic or non-traumatic injury.

Perspective: Osmotherapy remains the mainstay of controlling ICP in neurocritical care patients. Mannitol has a longer history in use, but hypertonic saline has been gaining popularity because of its effectiveness and association with fewer complications like hypotension. A recent survey of neurointensivists revealed that about 55% of those who surveyed used HTS as the primary osmotherapy agent (Hays et al., 2010). However, be it HTS or mannitol, the major issue with osmotherapy is the lack of pharmacokinetic data and dose response data. This is reflected in the wide range of methods used to deliver HTS or mannitol, including the various rates of infusion, concentrations of solution, and amount of solutes (osmols) being administered. Because of this lack of data, practitioners will often have to resolve to their personal experience when prescribing osmotherapy. Only when we get an understanding of the basic pharmacokinetic data of HTS (or mannitol) will we be able to better utilize these agents to treat patients.

Summary written by: Vincent Y. Wang

GLIOBLASTOMAWITHANOLIGODENDROGLIOMA COMPONENT: DISTINCT CLINICAL BEHAVIOR, GENETIC ALTERATIONS, AND OUTCOME

Yongzhi Wang, Shouwei Li, Lingchao Chen, Gan You, Zhaoshi Bao, Wei Yan, Zhendong Shi, Yin Chen, Kun Yao, Wei Zhang, Chunsheng Kang, Tao Jiang
Neuro Oncol 2012

Study Question: Is glioblastoma with an oligodendrogloma component (GBMO) a different tumor from conventional glioblastoma (GBM)?

Methods: Wang et al. investigated 219 primary glioblastoma, of which 40 (18.3%) were confirmed as GBMOs. They analyzed clinical features and genetic profile of GBMO, and compared with GBM without oligodendrogloma component.

Results: The GBMO group showed more frequent tumor-related seizures ($P = 0.027$), higher frequency of IDH1 mutation (31% vs. <5%, $P = 0.015$), lower MGMT expression ($P = 0.016$), and longer survival (19.0 vs. 13.2 months; $P = 0.022$). In multivariate Cox regression analyses, presence of an oligodendrogloma component was predictive of longer survival ($P = 0.001$). However, the extent of the oligodendrogial component in GBMO ($\leq 30\%$ vs. $>30\%$) appeared not to be linked to prognosis ($P = 0.664$). More surprisingly, 1p/19q co-deletions were infrequent (<5%) in both groups. And in terms of response to therapy, there was no survival advantage associated with aggressive treatment in the GBMO group, whereas a clear treatment effect was observed in the conventional GBM group.

Conclusions: This study result shows that the clinical behavior and genetic alterations of GBMOs differ from those of primary conventional GBMs but resemble those of secondary GBMs. GBMO appears to be favorable prognostic and predictive factor and should be considered as an important stratification variable in therapeutic trials of GBMs.

Perspective: Pathologically GBMO is defined as anaplastic oligo-astrocytoma with necrosis, but definite diagnostic criteria for this entity have not been determined. Though some controversy exists, GBMOs are thought to have a more favorable outcome than GBM. The current study shows some interesting results. Considering that this study population did not contain secondary GBM, it shows some interesting results. IDH1 mutations are very frequent in GBMO group (31% in GBMO, <5% in GBM.
without oligodendroglial component). IDH1 mutation is well known as significant molecular signature of secondary GBM, but is rare in primary (de novo) GBM. More interestingly, as an aspect of clinical presentation, GBMO group has higher frequency of tumor-related seizure occurrence, which is common in low-grade glioma. With clinical and genetic aspects, GBMO resembles the secondary GBM and differs from the primary (de novo) GBM. Although some discrepancy prevails on this study (low 1p/19q co-deletion rate), GBMO should be considered as an important stratification variable during therapeutic trials or clinical decisions.

Summary written by: Jin Mo Cho

DIFFUSION TENSOR IMAGING-BASED FIBER TRACKING FOR PREDICTION OF THE POSITION OF THE FACIAL NERVE IN RELATION TO LARGE VESTIBULAR SCHWANNOMAS

Gerganov VM, Giordano M, Samii M, Samii A J Neurosurg. 2011 Dec;115(6):1087-93. Epub 2011 Aug 26

Study Question: Can facial nerve diffusion tensor (DT) imaging based fiber tracking for patients with vestibular schwannoma (VS) be reliably performed to predict facial nerve anatomy during neurosurgery for VS?

Methods: In a prospective manner, 22 consecutive patients with VS underwent 1.6-mm DT magnetic resonance imaging (MRI) with a 3-T MRI unit. Comparative analysis was performed at the time of surgery to assess the location of the facial nerve as either superior, inferior, anterior, or posterior.

Results: After 2 weeks, 64% of the patients had House Brackmann grade 1 or 2 facial nerve function postoperatively. Based on the comparative analysis, DT MRI was accurate in 90% of the treated patients. The facial nerve was found anterior to the tumor in 86% of the cases, with the remainder in the superior or inferior position. The posterior position of the facial nerve was not found by either DT MRI or surgical assessment in this series.

Conclusion: Using fine 1.6-mm DT MRI, it appears that facial nerve position can be accurately assessed preoperatively with DT MRI with a high degree of accuracy. These results will need to be validated in larger, multicenter patient series, and the clear benefit to clinical outcome of facial nerve preservation with this improved imaging is yet to be established.

Perspective: This unique analysis demonstrates the proof in concept and feasibility of accurately predicting facial nerve anatomy and position for VS surgery. This DT MRI imaging currently requires specialized imaging and processing to do the fiber tract analysis of the facial nerve, but may become more accessible as this imaging and processing become more widespread with technological advances. While this study does establish the ability to analyze facial nerve location preoperatively, this must be studied in larger patient series, and ultimately, the final benefit to facial nerve preservation with VS surgery utilizing this DT MRI for facial nerve analysis must be studied to further assess the utility of fiber tract analysis for the facial nerve.

Summary written by: Isaac Yang

ENDOSCOPIC TRANSSPHENOIDAL SURGERY FOR ACROMEGALY: REMISSION USING MODERN CRITERIA, COMPLICATIONS, AND PREDICTORS OF OUTCOME

John A Jane, Jr., Robert M Starke, Mohamed A Elzoghby, Davis L Reames, Spencer C Payne, Michael O Thorner, John C Marshall, Edward R Laws, Jr., Mary Lee Vance JCEM, 2011 Sep;96 (9):2732-40

Study Question: What are the outcomes following endoscopic transsphenoidal resection of growth hormone (GH) secreting adenomas in the current era of endoscopic skull base surgery and using stringent hormonal remission criteria?

Methods: A retrospective chart review of 60 patients was conducted to define outcomes following endoscopic transsphenoidal resection of GH adenomas. Hormonal remission was defined as a normal IGF-I and either a suppressed GH less than 0.4 ng/ml during an oral glucose tolerance test or a random GH less than 1.0 ng/ml, and typically tested 2 months following the operation.

Results: The median follow-up time was 19 months. There were 14 microadenomas and 46 macroadenomas. Biochemical remission was achieved in 42 of 60 patients (69.7%) including 100% of patients with microadenomas and 60.9% with macroadenomas. In-hospital postoperative morning GH levels less than 2.5 ng/ml provided the best prediction of remission (P = 0.001). Preoperative variables predictive of remission included Knosp cavernous sinus invasion score (P = 0.017), IGF-I (P = 0.050), and GH (P = 0.042) levels. New endocrinopathy consisted of diabetes insipidus in 5%, adrenal insufficiency in 5.4%, and new hypogonadism in 29% of men and 17% of women. The most common complaints at first follow-up were sinonasal (36 of 60, 60%) including nasal congestion in 25 (42%), alteration in taste or smell in 18 (30%), self-reported sinusitis in 18 (30%), and epistaxis in 4 (6.7%) patients. All but
two patients ultimately experienced resolution of their sinonasal symptoms. Major complications occurred in 3 (5%) patients. Of the 18 patients who experienced an intraoperative cerebrospinal fluid (CSF) leak, 1 (5.5%) patient experienced postoperative rhinorrhoea requiring a return to the operating room. One patient experienced a carotid injury with pseudoaneurysm treated with endovascular embolization, and one patient experienced postoperative meningitis treated with intravenous antibiotics.

Conclusions: The endoscopic endonasal approach offers a high degree of safety and efficacy in achieving hormonal remission for GH-secreting pituitary adenomas. Tumor invasion continues to be the greatest challenge toward achieving hormonal remission and tumor control. Nearly 70% of patients will experience hormonal remission following endoscopic transsphenoidal surgery for a GH adenoma.

Perspective: This report by Jane Jr. et al. represents a large surgical case series of patients with GH adenomas treated using only endoscopic endonasal operations at the University of Virginia. Hormonal remission was achieved in 70% of patients and in all patients with microadenomas. Tumor invasion into the surrounding dura and cavernous sinuses, as defined in this study by the Knosp invasion criteria, continues to be the major barrier to achieving tumor control. Although direct comparison with previous microscopic transsphenoidal series is not possible, a very experienced center reports excellent outcomes in a current endoscopic series, compared to historical control studies, despite using very stringent hormonal criteria for remission. As neurosurgeons learn to maximally utilize the benefits of neuroendoscopy and advanced neuroimaging techniques continue to evolve, reports such as this will continue to set the bar for the surgical treatment of functional pituitary tumors.

Summary written by: Gabriel Zada

NFkBIA Deletion in Glioblastomas

Markus Bredel, Denise M Scholtens, Ajay KYaday, et al.
New England Journal of Medicine 2011; 364;7

Study Question: Does deletion of NFkBIA (encoding nuclear factor of κ-light polypeptide gene enhancer in B-cells inhibitor-α), an inhibitor of epidermal growth factor receptor (EGFR) signaling pathway, promote tumorigenesis in glioblastomas that do not have alterations of EGFR?

Methods: Seven hundred and ninety glioblastoma samples were analyzed for deletions, mutations, or expression of EGFR and NFkBIA, and these molecular results were compared with outcomes of the glioblastoma patients. In addition, tumor suppressor activity of NFkBIA was studied in cell culture.

Results: NFkBIA is deleted but not mutated in glioblastoma, and these deletions usually occur in the nonclassical subtype of glioblastoma in exclusivity of EGFR gene amplification. Restoration of NFkBIA activity in tumors with NFkBIA deletion decreased tumorigenesis and increased the sensitivity to chemotherapy. Restoration of NFkBIA activity also reduced viability of the cells that were EGFR amplified, but not in cells with normal expression of both genes. Importantly, deletion and low expression of NFkBIA in glioblastoma patients was associated with poorer outcomes and were similar to patients with EGFR amplified glioblastoma when compared to patients with tumors that exhibited normal EGFR and NFkBIA signaling. A two-gene model based on the expression of NFkBIA and O-6-methylguanine DNA methyltransferase was strongly associated with the clinical course of the disease.

Conclusions: NFkBIA deletion is important in glioblastoma tumorigenesis and is associated with a poorer outcome in glioblastoma patients.

Perspectives: Glioblastoma is a genetically heterogeneous tumor, and numerous laboratories have been studying many of these altered pathways. This article demonstrates that NFkBIA is an important gene in glioblastoma tumorigenesis in vitro. Importantly, this data further demonstrates that deletion or low levels of this gene are associated with poor patient outcome, giving strength to the argument that this gene is biologically important in these tumors and should be studied further.

Summary written by: Gordon Li

Early Development and Progression of Heterotopic Ossification in Cervical Total Disk Replacement

Lee, SE, Chung CK, Jahng TA
J Neurosurg Spine, 16: 31-36, 2012

Study Question: Does the development of postoperative ossification limit long-term outcomes following the placement of cervical artificial disks?

Methods: The authors conducted a clinical and radiological study in 28 consecutive patients who underwent cervical total disk replacement (TDR) surgery with the Mobi-C prosthesis (LDR Medical). Radiological outcomes were evaluated with lateral dynamic films, both before surgery and at 1-, 3-, 6-, 12-, and 24-month postoperative time points. Cervical range of motion was also evaluated. Clinical outcomes were followed with visual analog scale (VAS) and neck disability index (NDI).

Results: The authors followed all 28 patients in the initial follow-up periods, but at the 2-year time point, 6...
were lost to follow-up. Radiological outcomes showed a significant rate of postoperative heterotopic ossification. At the final radiographic follow-up, 18 of 28 patients had evidence of heterotopic ossification. High-grade ossification (growing into the disk space or bridging ossification that limits movement) was found in four patients. Progression of HO was proportional to follow-up period. At 1-month follow-up, 10.7% had HO. At 3-month and 6-month follow-ups, HO was found in 25.0% and 42.3%, respectively. Mean cervical range of motion was found to decrease significantly after surgery from 10.0° ± 1.2° to 5.5° ± 1.1° (P = 0.083). However, a comparison of the VAS score and the NDI value among groups with each grade of HO revealed there was no statistical significance related to the improvement of postoperative clinical outcomes.

Conclusions: The overall incidence of HO after cervical TDR is relatively high and not insignificant. HO development may also begin quite early after surgery; however, initial results fail to show an impact on patient outcomes.

Perspective: This retrospective radiographic and clinical analysis shows a potential shortcoming of total disk arthroplasty. Cervical TDR has the potential to preserve motion in the postoperative segment and to decrease adjacent segment disease. However, postoperative osteophyte formation may limit these advantages and also some of the advantages sought by this new technology. Similar limitations have been found following lumbar disk replacement surgery. Further, this has also been seen with other TDR devices in the cervical spine. As with any new technology, the clinician must be aware of the potential complications and limitations of new techniques. Further studies including higher class evidence and larger long-term outcome studies may help to identify the importance of this finding further.

Summary written by: Zachary Smith

1. McAfee, PC, Cunningham BW, Devine J, (Williams E, Yu-Yahiro J). Classification of heterotopic ossification (HO) in artificial disk replacement. J Spinal Disord Tech 2003;16:384-9.
2. Wairaevens J, Demaerel P, Suetens P, van Calenbergh F, van Loon J, Goffin J. Longitudinal prospective long-term radiographic follow-up after treatment of single-level cervical disk disease with the Bryan Cervical Disc. Neurosurgery 2010;67:679-87; discussion 687.

ICTAL CLINICAL AND SCALP-EEG FINDINGS DIFFERENTIATING TEMPORAL LOBE EPILEPSIES FROM TEMPORAL “PLUS” EPILEPSIES

C Barba, G Barbati, L Minotti, D Hoffmann, P Kahane
Brain 2007;130:1957–67

Study Question: To evaluate whether the diagnosis of complex epileptogenic seizures (temporal “plus” epilepsies) may be reached non-invasively based on seizure semiology.

Methods: This was a retrospective study of 80 patients, who were part of a group of 212 consecutive patients suffering from medically intractable seizures and who were operated on, after surface electroencephalogram recordings at Grenoble Hospital from 1990 to 1998. They were selected on the basis of the following criteria: (i) absence of any detectable lesion on MRI, with the exception of hippocampal sclerosis; (ii) SEEG recordings showing that seizures involved at least mesial and/or lateral TL structures; (iii) surgery performed according to SEEG results, taking into account anatomical constraints; and (iv) at least 5 years of postoperative follow-up.

Results: The two groups of patients were difficult to differentiate on the basis of general clinical features or MRI data. Even the presence of hippocampal sclerosis did not distinguish the two groups. Conversely, both ictal clinical symptoms and scalp EEG findings significantly differentiated temporal lobe (TL) from temporal “plus” (T+) patients. Patients with TL epilepsies more frequently presented an ability to warn at seizure onset (P < 0.005), an abdominal aura (P < 0.05), gestural automatism (P < 0.04), and post-ictal amnesia (P = 0.02). Patients suffering from T+ epilepsies more frequently had gustatory hallucinations (P < 0.02), rotatory vertigo (P < 0.02), and auditory illusions (P < 0.02) at seizure onset; they exhibited more frequently contraversive manifestations of the eyes and/or head (P < 0.001), piloerection (P < 0.03), and ipsilateral tonic motor signs (P < 0.05), and they were more often dysphoric in the post-ictal phase (P < 0.0001). Cluster analysis mainly indicated that some associations of symptoms were relevant for differentiating TL cases from T+ cases. Intertitial EEG of TL patients more frequently exhibited bilateral or precentral abnormalities, while ictal EEG more frequently pointed over the anterior frontal, tempo-parietal, and precentral regions. Neither TL interictal spikes nor TL ictal EEG onset allowed us to definitely rule out the possibility of T+ epilepsies.

Conclusions: Certain ictal clinical signs, especially when found in specific clusters, as well as some interictal and ictal EEG abnormalities may highlight T+ epilepsy in the context of TL epilepsy, and hence those who should undergo invasive recordings before surgery to improve postoperative prognosis, provided the whole epileptogenic area can be safely removed.

Perspective: Barba et al. assessed whether the diagnosis of complex epileptogenic seizures (temporal “plus” epilepsies) may be reached non-invasively based on seizure semiology. The authors found specific clusters of clinical semiology that may be useful for identifying, among patients suffering from “atypical” non-lesional TL
epilepsies, those who should undergo invasive recordings before surgery. Their results, even if not conclusive, confirm that some ictal clinical signs, especially when found in specific clusters, as well as some interictal and ictal EEG abnormalities can allow to suspect T+ epilepsy in the context of TL epilepsy, even in the case of hippocampal sclerosis. These findings may be useful for identifying, among patients suffering from “atypical” TL epilepsy, those who should undergo invasive recordings before surgery. This might be significant for improving postoperative prognosis, provided the whole epileptogenic area can be safely removed.

Summary written by: Chaim B. Colen

CHARACTERIZATION OF THE SUPPLEMENTARY MOTOR AREA SYNDROME AND SEIZURE OUTCOME FOLLOWING MEDIAL FRONTAL LOBE RESECTIONS IN PEDIATRIC EPILEPSY SURGERY

Kasabeh AS, Yarbrough CK, Limbrick DD, Steger-May K, Leach JL, Mangano FT, et al. Neurosurgery 2011 Nov 23

Study Question: Are medial frontal lobe resections safe and effective for the treatment of supplementary motor area (SMA) epilepsy in pediatric patients?

Methods: Thirty-nine pediatric patients with medically intractable epilepsy who underwent surgery in the medial frontal lobe were retrospectively reviewed. The progression of neurological impairment and seizure outcome following surgery was evaluated, and the extent of cortex resected was analyzed.

Results: Following resection in the region of the SMA, 23 (59%) patients developed postoperative neurological impairment, while 16 (41%) patients did not. Of the 23 patients, 17 were identified as SMA syndrome, a disorder characterized by transient motor impairment, and 6 patients experienced permanent neurological impairment. The majority (82%) of patients who developed SMA syndrome had resolution of their symptoms by 1 month postoperatively. The definitive lesions like tumors in the preoperative MRI were found to be associated with a significantly decreased likelihood of developing SMA syndrome (P = 0.02). Of the 22 patients with long-term follow-up, 16 (73%) patients showed a favorable seizure outcome (Engel’s classification I and II).

Conclusion: Surgery for medically intractable epilepsy in the region of the SMA area is effective and associated with reversible neurological impairment, an SMA syndrome, in pediatric patients. All patients had resolution of their SMA syndrome by 6 months postoperatively.

Perspective: This current report represented the largest study of SMA syndrome following surgery in the medial frontal lobe and was the first to be done in an exclusively pediatric patient population. However, the definition of SMA and the resected cortical area should be described more concretely. Because the extent and topography of the resected medial frontal area have been well-known associative factors for the characteristics of the SMA syndrome, as previously reported, the resection of the SMA and Rolandic area is still challenging to neurosurgeons. The authors suggested that intraoperative direct cortical stimulation mapping and evoked potential monitoring might guarantee safe resection of those regions. Moreover, the exact understanding of the topographical characteristics of those regions can help neurosurgeons to plan the resected area.

Summary written by: Chae-Yong Kim