In the ISAT study, the rebleeding rate related to the treated aneurysm was 0.13%/year in the coiled group and 0.02%/year in the surgical group, and this difference was statistically significant.

**Background:** With widespread availability of endovascular coil embolization for the treatment of intracranial aneurysms, there has been increased concerns about the durability of the treatment over time. The International Subarachnoid Aneurysm Trial (ISAT) study had shown a benefit in terms of functional outcome in patients randomized to endovascular treatment. The ISAT investigators have now reported the long-term follow-up of the original patient cohort reported on in 2002.

**Participants/Methods:** Between 1994 and 2002, a total of 2143 patients with ruptured intracranial aneurysms were enrolled. After a mean follow-up of 9 years, 2.7% of the patients were lost to follow-up. Described here are the follow-up data for a minimum of 6 years to a maximum of 14 years after randomization.

**Results:** At follow-up, 24 rebleeds occurred >1 year after treatment. Of these 24 rebleeds, 13 were related to the treated aneurysm. Eleven of these rebleeds occurred in the endovascular group and 2 in the neurosurgical group. There were 8447 person-years of follow-up in the coiling group and 8177 person-years of follow-up in the clipping group. The rebleeding rate related to the treated aneurysm was 0.13% per year in the coiled group and 0.02% per year in the surgical group and this difference was statistically significant. Of the 24 rebleeds observed, 11 originated from another untreated aneurysm present at the original presentation or from a de novo aneurysm. At 5 years, 11% of patients in the endovascular group and 14% of patients in the surgical group had died; this difference was statistically significant. Of interest, the majority of deaths were related to cancer or cardiovascular disease and only a very small percentage to a recurrent subarachnoid hemorrhage.

**Reviewer's Comments:** This is a long-awaited and landmark article. Although supporters of one treatment over the other will find arguments in this article to support endovascular and surgical treatment, the study unequivocally shows that the risk of rebleeding from the target aneurysm is higher in the endovascular group. However, this risk is still exceedingly low, 0.13% per year, and does not overcome the initial difference in outcome. Discussions and controversy will continue about the best treatment strategy for ruptured intracranial aneurysms and the best treatment should be individualized to the characteristics of each patient. This is best done, as the recent guidelines from the American Heart Association also suggest, in an environment where both treatments (surgery and endovascular embolization) are available. The long-term follow-up of this cohort of patients also confirms that patients who have suffered an aneurysmal subarachnoid hemorrhage have a lower life-expectancy than the general population and are at high-risk for cancer and cardiovascular death. Therefore, measures such as smoking cessation, aggressive treatment of hypertension, and lifestyle changes in this population of patients is equally important to the proper treatment of the index aneurysm. (Reviewer-Giuseppe Lanzino, MD).

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Keywords: Intracranial Aneurysms, Endovascular Tx, Subarachnoid Hemorrhage

Print Tag: Refer to original journal article
The excess mortality of patients with HS progressively decreases over time, and after 3 months, mortality risk following HS equals the risk following IS.

**Background:** The ratio of ischemic stroke (IS) to hemorrhagic stroke (HS) is estimated at 10:1. Comparing both entities in terms of prognosis and risk factors is somewhat challenging due to this disparity in distribution. Previous reports have correlated HS with a higher risk of fatality compared to IS. Nonetheless, these reports were characterized by small patient cohorts. Moreover, while certain risk factors have previously been correlated with HS and IS, the role of hypertension, smoking, and alcohol consumption is yet to be determined.

**Objective:** To compare HS and IS in terms of risk factors, stroke severity, and survival.

**Methods:** Data were gathered from a prospective, ongoing nationwide Danish stroke registry and included information about age, gender, admission stroke severity measured by the Scandinavian Stroke Scale, and a predetermined cardiovascular profile. The latter included data regarding alcohol intake, smoking, diabetes, atrial fibrillation, hypertension, prior MI, prior stroke, and intermittent claudication. IS versus HS was determined using CT/MR scanning. Hemorrhagic infarction was classified as IS. Exclusions included transient ischemic attacks, subarachnoid hemorrhage, patients <40 years old, and CT/MR scanning not done or unavailable. Only all-cause mortality was studied.

**Results:** Of 39,484 patients included in the registry, 89.9% had IS and 10.1% had HS. Patients with IS more frequently had diabetes, atrial fibrillation, prior MI, and intermittent claudication. Those with HS had more severe strokes, more frequently had high alcohol intake, and more frequently were smokers. The relative frequency of HS and increasing stroke severity had a positive correlation: 2% of HS patients had the mildest strokes versus 30% who had the most severe strokes. Multivariate analysis showed that diabetes, atrial fibrillation, and intermittent claudication favored IS, while alcohol intake and smoking favored HS. Of 3993 HS patients, 49.2% died, and of 35,491 IS patients, 25.9% died. Unadjusted case fatality rates in IS versus HS patients at 7, 30 and 90 days were 1.8% versus 13.2%, 4.8% versus 19.8%, and 10.9% versus 25%, respectively. After adjusting for stroke severity, age, sex and cardiovascular risk factors, multivariate analysis demonstrated that HS had an overall significantly higher risk of all-cause death compared to IS. It was also determined that the excess mortality of patients with HS progressively decreased over time, being 4-fold initially, 2.5-fold at 1 week, and 1.5-fold at 3 weeks. After 3 months, mortality risk following HS equalled the risk following IS.

**Conclusions:** HS tends to be more severe than IS. Within the first 3 months, HS is associated with a markedly higher mortality.

**Reviewer’s Comments:** This large comparative study demonstrates the more aggressive character of HS when compared to their ischemic counterpart. In fact, immediately following the ictus, the mortality-rate associated with HS is 4 times that of IS and only levels down to become equal to it at 3 months. On the other hand, when comparing the data herein with the reported literature, the correlation of risk factors with stroke subtype remains inconsistent. (Reviewer-Ziad A. Hage, MD).

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**Keywords:** Cerebral Infarct; Intracerebral Hemorrhage; Mortality; Risk Factors; Stroke Recovery

**Print Tag:** Refer to original journal article
Nondiagnostic stereotactic brain biopsies are most likely to occur if the lesion is small or nonenhancing or if frozen section is nondiagnostic.

**Background:** Nondiagnostic stereotactic biopsies (NDSBs) occur occasionally. Most patients require an accurate diagnosis, necessitating optimization of technique and tissue handling.

**Objective:** To define clinical, radiographic, and technical factors that contribute to NDSBs, to determine how a diagnosis is subsequently reached after NDSB, and to determine if NDSB affects patient outcome.

**Design:** Single-institution, retrospective chart review.

**Methods:** Patients undergoing stereotactic biopsy were identified by hospital billing records. Either Leksell or CRW frames or Medtronic Stealthstation or Radionics Omnisight frameless neuro-navigational techniques were used. Enhancing walls of contrast-enhancing lesions (any enhancement) or the center of nonenhancing lesions were targeted. Tissue was routinely analyzed by frozen section or touch preparation. NDSB was defined as the inability to make a definitive diagnosis using available clinical information and histopathological analysis; 26 mm (median size of biopsied lesions) separated small lesions from large lesions. Deep lesions were defined as thalamus, basal ganglia, internal capsule, brain stem, or cerebellum.

**Results:** 100 patients, (9 with HIV positivity and 10 with cancer) had stereotactic biopsies; 24 were NDSB. Univariate analysis showed NDSB more likely occurred with small lesions, nonenhancing lesions, and in HIV-positive patients. Multivariate analysis showed small lesions and nondiagnostic frozen sections were associated with NDSB. Two NDSB patients died promptly of disease progression, 6 were lost to follow-up, and 11 were eventually diagnosed. Of 7 NDSB tumors, diagnosis was eventually reached by outside pathological review in 2, repeat biopsy in 3, LP in 1, and unknown in 1. One infection responded to empiric antibiotics, 1 patient was diagnosed with multiple sclerosis, 1 stroke was diagnosed on serial MRI, and 1 vasculitis responded to medications. Of the 5 discharged patients without a diagnosis, 2 succumbed to disease progression after several months and 3 were stable (1 treated with stereotactic radiosurgery). To help prevent NDSB, additional specimens may be warranted if frozen section is nondiagnostic; outside pathological review may also be helpful. Lumbar puncture, repeat biopsy, or open biopsy may be needed. NDSB does not appear to adversely affect outcome in patients with brain tumors.

**Reviewer's Comments:** The rate of NDSB in this study is higher than that reported in other studies. The factors identified by the authors as contributing to NDSB (small lesions, nonenhancing lesions, HIV positivity, and nondiagnostic frozen section) are all consistent with others’ observations; acknowledgement of these findings, in addition to following the authors’ recommendations, may help the neurosurgeon minimize the occurrence of NDSB. Since almost 10% of patient (4 out of 24) died from disease progression shortly after NDSB, I do not agree with the authors’ conclusion that NDSB does not affect outcome. If NDSB occurs, efforts to establish a definitive diagnosis promptly are necessary; otherwise, why do the biopsy in the first place? (Reviewer-N. Scott Litofsky, MD).

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**Keywords:** Brain Tumor; Stereotactic Biopsy, Nondiagnostic Stereotactic Biopsy

**Print Tag:** Refer to original journal article
Traumatic brain injury, independent of when pharmacological prophylaxis is instituted, is a risk factor for deep venous thrombosis.

**Background:** Traumatic brain injury (TBI) has been identified as a risk factor for the development of deep venous thrombosis (DVT). The role of pharmacological prophylaxis for DVT has not been considered in these previous studies.

**Objective:** To compare the risk of DVT in patients with TBI to patients without TBI, according to DVT prophylaxis.

**Design:** Single-institution, retrospective chart review.

**Participants/Methods:** Patients with TBI were compared to patients with other blunt or penetrating trauma (excluding those who died or were discharged within 24 hours) from 2000 to 2007. Patients received mechanical DVT prophylaxis upon admission. Pharmacological prophylaxis with low-dose unfractionated heparin or low-molecular weight heparin was started on trauma patients as soon as feasible; prophylaxis in TBI patients was started when deemed safe after neurosurgical consultation. Time of onset of prophylaxis was recorded as (1) no prophylaxis, (2) 0 to <24 hours, (3) 24 hours to <48 hours, and (4) ≥48 hours. Risk ratios and 95% confidence intervals were adjusted for other confounding variables.

**Results:** 2000 TBI patients were compared to 13,259 other trauma patients. TBI patients in the no prophylaxis group were slightly older than non-TBI patients. Patients with TBI had increased risk of DVT in the groups receiving prophylaxis. The risk of DVT increased with an increase in time before prophylaxis was started (per 100 patients): 0 to <24 hours - TBI 3.6, non-TBI 0.7; 24 to <48 hours - TBI 4.5, non-TBI 0.8; ≥48 hours - TBI 15.4, non-TBI 5.4. If no prophylaxis was given, risk was 0.4 for TBI patients and 0.1 for non-TBI patients, but this group had the lowest index severity score, the lowest incidence of lower extremity fractures, the lowest proportion of severe abdominal injuries, and the lowest duration of hospital stay.

**Conclusions:** TBI is associated with a 3- to 4-fold increase in risk of DVT across pharmacological prophylaxis groups.

**Reviewer's Comments:** DVT and subsequent pulmonary embolism are significant complications that have continued to plague patients with TBI despite mechanical prophylaxis devices. Therefore, pharmacological prophylaxis is being used with increasing frequency in many medical centers. This study suggests that DVT risk increases as time to start pharmacological prophylaxis increases and TBI patients are at increased risk for DVT than are other trauma patients. One shortcoming is that the rationale for time of onset of pharmacological prophylaxis is not specified; treatment groups may not be the same. What constitutes "neurosurgical safety" is also not specified. The impact on patient outcome measures is also not determined, including the incidence of progression of intracranial hemorrhage in patients with TBI who receive pharmacological prophylaxis. Further investigation is essential to optimize pharmacological prophylaxis of DVT, including the best drug and best timing for administration to minimize DVT and intracranial hemorrhage incidence in TBI. (Reviewer-N. Scott Litofsky, MD).
Open vs Tubular Diskectomy--Is There a Clear Choice?

Tubular Diskectomy vs Conventional Microdiskectomy for Sciatica: A Randomized Controlled Trial.

Arts MP, Brand R, et al:

JAMA 2009; 302 (July 8): 149-158

Tubular microdiskectomy does not result in superior outcomes compared with conventional open diskectomy.

Objective: To determine if minimally invasive diskectomy is superior to conventional microdiskectomy.

Design: Randomized controlled trial (RCT).

Participants/Methods: 328 patients (age range, 18 to 70 years) with lumbar disk herniation resulting in persistent radiculopathy for >8 weeks were enrolled from January 2005 to October 2006 from 7 sites. A total of 167 patients were randomized to receive tubular diskectomy and 161 to conventional microdiskectomy. Patients and observers were blinded. Follow-up was at 1 year. The primary outcome measure was the Roland-Morris Disability Questionnaire (RDQ), scored from 0 to 23, with higher scores representing greater disability. Secondary outcome measures included visual analog back and leg pain scores and patient-reported recovery Likert (7-point scale) outcome. An intention-to-treat analysis was used.

Results: Randomization was performed in the operating room and there was minimal crossover. The preoperative mean RDQ scores were similar in both groups. The mean RDQ score during the first year after randomization for the tubular diskectomy cohort (167 patients) was 6.2. For the conventional diskectomy cohort (161 patients), the mean RDQ score was 5.4 (not significantly different). Visual analog scores for leg and back pain were better in the conventional microdiskectomy group. In the tubular diskectomy cohort, 107 of 156 patients (69%) reported a good recovery while 120 of 156 patients (79%) reported good recovery in the conventional microdiskectomy cohort (P =0.05).

Conclusions: Tubular microdiskectomy did not result in improved outcome compared with conventional microdiskectomy using the RDQ outcomes measure. In addition, conventional microdiskectomy appeared to have similar patient-reported visual analog back and leg pain scores.

Reviewer's Comments: The authors are to be congratulated for performing a well-designed RCT comparing minimally-invasive muscle splitting tubular diskectomy to conventional microdiskectomy, which involves subperiosteal muscle dissection. No clinically important difference between the 2 groups was identified using the RDQ outcomes measure. The authors report in their published conclusion that tubular diskectomy resulted in less favorable visual analog pain scores. This is misleading. The difference between the groups for back pain was 3.5 mm for back pain and 4.2 mm for leg pain. However, the minimal clinically important difference for the 100 mm visual analog scale is 20 to 35 mm (as the authors point out in their discussion). The key point of the paper is that there is no clear difference even at 2 weeks between these 2 groups. Similar results have been observed in 3 previously reported smaller RCTs. While this study does not demonstrate any benefit for the utilization of the tubular retractor for performing a microdiskectomy, the concept of reducing muscle trauma using a muscle splitting technique might still be valid. There was no attempt in this study to measure biomarkers for muscle injury. The muscle splitting technique might be more beneficial in fusion cases where there would be expected to be more muscle dissection and trauma. (Reviewer-Zoher Ghogawala, MD).

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Keywords: Tubular Diskectomy, Conventional Microdiskectomy, Sciatica

Print Tag: Refer to original journal article
Alternative to Traditional Supraorbital Craniotomy

Transciliary Orbitofrontozygomatic Approach to Lesions of the Anterior Cranial Fossa.

Warren WL, Grant GA:

Neurosurgery 2009; 64 (ONS suppl 2): 324-330

In this study, the authors used the transciliary orbitofrontozygomatic approach for midline anterior fossa lesions with low surgical morbidity.

Background/Objective: A minimally invasive more direct approach to the anterior cranial fossa (a so-called keyhole approach) has been touted as a reasonable alternative to traditional approaches to supraorbital craniotomy in select cases. An example of a keyhole approach is the transciliary orbitozygomatic approach. The authors describe details of this approach. Description of Technique: The patient's neck is flexed and extended 20°. The head is rotated contralaterally 15° and lateroflexed to the contralateral side. An incision is made in the eyebrow from the supraorbital notch to the lateral brow. The frontalis muscle is opened. When the dissection reaches the orbital rim, an elevator reflects the periorbita away from the orbital roof. The exposed bone extends from the supraorbital notch 2.5 cm superiorly and laterally to the keyhole. The first 1 cm of the zygomatic arch is exposed. A burr hole is made at the superior aspect of the exposed bone and another at the keyhole, grooving the underside of the zygomatic arch. A groove is made lateral to the supraorbital notch to expose dura and flatten the orbital rim. A craniotome makes cuts in the orbital rim medially and laterally, extending across the zygoma toward the temporal burr hole. The burr holes are connected and the craniotomy is reflected. The medial sphenoid wing is drilled flat to the meningo-orbital band. The orbital roof is removed or drilled until thin. The undersurface of the zygomatic arch and the underside of the craniotomy defect is drilled or undercut. The dura is opened and reflected.

Results: The authors reviewed the records of 105 patients. Transient frontalis weakness was the most common complaint, but this returned to normal within 30 days' postoperatively with the exception of 2 patients. Transient hypesthesia was due to traction on the supraorbital nerve. One patient reported unilateral anosmia. Two patients experienced intraoperative ruptures of their aneurysms; however, these were clipped in both cases. One of these patients remained neurologically intact, and the other died due to sepsis. Two patients had postoperative CSF leaks.

Conclusions: The transciliary orbitofrontozygomatic approach provides full accessibility and exposure to lesions in the anterior cranial fossa. Low morbidity and excellent exposure to midline lesions makes this minimally invasive procedure a valuable addition to the neurosurgeon's skill set. The authors advise cadaveric practice prior to using this approach in humans. They advise avoiding giant aneurysms, given the need for greater visualization from multiple angles.

Reviewer's Comments: The authors’ results strongly support incorporating this approach into practice. I agree with the authors that this approach can be used selectively but must be performed only after significant experience with cadaveric heads. I advise being prepared for a more traditional technique if this method fails to achieve adequate exposure in select cases. (Reviewer-Bernard R. Bendok, MD).

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Keywords: Cranial Base, Keyhole Approach, Orbitozygomatic Approach, Transciliary

Print Tag: Refer to original journal article
Expanding Role of Quick-Brain MRI

Quick-Brain Magnetic Resonance Imaging for Nonhydrocephalus Indications.
Missios S, Quebada PB, et al:
J Neurosurg Pediatr 2008; 2 (December): 438-444

Background: CT scanning has been the imaging modality of choice during the initial evaluation of patients with many types of suspected intracranial pathology. Despite its established diagnostic usefulness, this modality possesses distinct disadvantages including associated exposure to radiation, artifacts related to patient motion, limitations in visualizing the posterior fossa, and occasionally the need for sedation. MRI is an alternative. However, a complete study with standard sequences involves long acquisition times limited by movement artifact and the need for sedation. In addition, it is costly. Recent advancements in imaging technology have produced MRI protocols with reduced acquisition times with the preservation of useful image quality. MRI sequences such as single-shot fast-spin echo (“quick-brain” or QB) and half-Fourier acquisition single-shot turbo spin echo offer very short acquisition times. The QB MRI technique is an attractive modality due to the availability of multiplanar views, rapid acquisition times, and elimination of radiation exposure.

Methods: In 2003, the Dartmouth team implemented the use of QB MRI in an effort to decrease the number of CT scans and associated radiation exposure in neurosurgery, specifically in the pediatric patient population. Initially, the majority of studies were obtained in patients with known hydrocephalus, leading to high patient and physician satisfaction, which led to increasing frequency of its use for evaluation and follow-up of nonhydrocephalic indications. Between February 2003 and December 2007, 1146 consecutive QB MRI studies were obtained. All data were prospectively entered and retrospectively reviewed. The imaging protocol consisted of 1.5-T MRI and standard software and hardware, with an acquisition slice thickness of 5 mm and approximately 20 slices per plane. Images were obtained in the sagittal, axial, and coronal planes. A scout view was also obtained. The imaging time was 30 seconds for each plane. The total imaging time for the entire study was <2.5 minutes.

Results: The total number of QB imaging studies performed increased each year with a proportional increase for nonhydrocephalic indications. QB MRI was used extensively for the initial evaluation and follow-up of patients with little need for additional studies. Conclusion: The role of QB MRI for nonhydrocephalic indications is expanding, and it appears promising for a number of screening and surveillance paradigms. “Quick-brain plus” protocols for specific indications may add sensitivity and are under development.

Reviewer’s Comments: I believe utilizing the various available MRI sequences and formulating pathology-specific protocols is a promising addition to the ever-evolving medical field. This paper reflects a successful experiment in adopting these protocols. However, experience is still lacking. As our experience grows, false-negatives will decrease. In our institution, we have developed specific protocols for different needs, including tumor protocol, stroke protocol, cavernoma protocol, etc. (Reviewer-Joseph Adel, MD).

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Keywords: Quick-Brain MRI, Nonhydrocephalus Indications

Print Tag: Refer to original journal article
Fatal Hemorrhage After Treatment of BA Stenosis

Fatal Hemorrhage After Attempted Treatment of a Basilar Artery Stenosis.
Gralla J, Rennie ATM, et al:

J Neurosurg 2009; 111 (July): 102-104

In this case report, the authors describe attempted endovascular intervention on a basilar artery stenosis, which resulted in a fatal subarachnoid hemorrhage.

**Background:** The treatment of basilar artery (BA) stenosis includes antiplatelet drugs, statins, and, if symptoms are refractory to medical management, endovascular intervention with angioplasty and/or stenting. Endovascular intervention has moved to the forefront of treatment, but complications are hard to predict. The most feared complication is intraoperative rupture.

**Objective:** The authors at John Radcliffe Hospital in Oxford, England, describe a patient with symptomatic high-grade BA stenosis and kinking at the site of stenosis treated with angioplasty and stenting but resulting in fatal hemorrhage. **Case Report:** A 59-year-old man with transient ischemic attacks (TIAs) for 6 months prior to intervention. The patient was on aspirin and Plavix but still had TIAs. Angiography confirmed >80% mid-BA stenosis with a length of 18 mm and a severe vessel kink. Both posterior communicating arteries were hypoplastic. After induction of anesthesia, a 6-Fr sheath was placed, a guide catheter was navigated into the right vertebral artery, and heparin was administered. A 0.014-inch exchange wire was navigated across the stenosis and into the left posterior cerebral artery. A 3 x 15 mm angioplasty balloon was advanced and inflated. Some straightening was seen in the BA. After angioplasty, a 4.5 x 20 mm stent was placed but could not be deployed due to high internal friction of the entire system. After a few minutes, this stent was abandoned, and the decision to deploy a smaller stent was made. During distal wire access, the BA was observed to move, and massive extravasation of contrast was noted. Anticoagulation was reversed, and a balloon was placed in the mid-BA and inflated to facilitate clotting. The patient suffered cardiac arrest, but was resuscitated. An extraventricular drainage catheter was placed; however, the patient expired 18 hours later due to increased intracranial pressure. Autopsy confirmed subarachnoid hemorrhage and swelling. A 3-mm rupture of the BA proximal to the stenosis at the transition zone to the severely indurated vessel was noted. No perforation was found at the basilar tip or in the PCA.

**Conclusions:** Vessel kinking at the site of an intracranial stenosis could be a risk factor for angioplasty and stenting. Apparently, the vessel rupture in this case was not due to the microwire or stent. The rupture was a result of the sustained force, which straightened and possibly overstretched the BA.

**Reviewer’s Comments:** In challenging cases such as this, an alternative to consider would be angioplasty alone or a staged approach starting with angioplasty followed by stenting several weeks later. The recognition and management of friction, which is encountered during device navigation, is an important skill. Ultimately, intracranial atherosclerosis can severely damage intracranial vessels, making intervention occasionally treacherous. (Reviewer-Bernard R. Bendok, MD).

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Keywords: Basilar Artery Stenosis, Intracranial Stent, Subarachnoid Hemorrhage

Print Tag: Refer to original journal article
In this study, the authors analyzed the histopathology of AVMs treated with Onyx or NBCA and found Onyx to have chronic foreign body giant cells and recanalization.

**Background/Objective:** Arteriovenous malformation (AVM) embolization has been made more effective by use of the liquid embolic agents N-butyl cyanoacrylate (NBCA) and ethyl vinyl alcohol. Prior to 2005, NBCA was most commonly used. While NBCA is an adhesive agent with a rapid polymerization rate, Onyx is a nonadhesive agent with a slow polymerization rate. To date, a careful comparison of the histological reaction to these 2 agents has not been performed. The authors, from the University of Washington Harborview Medical Center, histologically analyzed 32 resected AVMs that were embolized with Onyx and NBCA.

**Participants/Methods:** 32 patients with AVMs were treated by embolization and microsurgical resection (22 with Onyx and 10 with NBCA). Clinical data were collected including presentation with hemorrhage, day of bleeding, embolic agent used, number of sessions, and maximum exposure time. These factors were correlated with histopathological changes. Specimens were fixed with 10% buffered formalin and embedded in paraffin. H & E and Verhoeff-van Gieson (VVG) stains were used for histological examination.

**Results:** 5 of 10 patients in the NBCA group and 11 of 22 patients in the Onyx group were treated after acute AVM hemorrhage. The average maximum exposure time was 17.9 days in the Onyx group and 7.7 days in the NBCA group. Inflammation was seen in 20 of 22 and in 9 of 10 specimens in the Onyx and NBCA embolization groups, respectively. Angionecrosis was noted in 13 of 22 specimens in the Onyx group and in 4 of 10 specimens in the NBCA group. The smallest vessel embolized was 5 μm in the Onyx group and 20 μm in the NBCA group. Foreign-body giant cells were observed in 12 of 22 Onyx specimens but in none in the NBCA group. Recanalization was seen in 4 of 22 specimens after a maximum exposure time of ≥42 days with Onyx. No recanalization was seen in this group when exposure time was <42 days. No recanalization was noted in the NBCA group, but the exposure time was ≤24 days. Wall integrity was maintained in all vessels, and there was no correlation between infarction, inflammation, the embolic agent used, and maximum exposure time to the agent. **Conclusion:** Onyx penetrates smaller vessels better than NBCA. Inflammation occurs in equal frequency. Chronic foreign body giant cells and recanalization after Onyx embolization raises questions about the permanence of occlusion with Onyx.

**Reviewer's Comments:** This paper points out that the reaction to embolization is not a static one biologically. While the short-term benefits of embolization are well known, now there are questions about the permanence of occlusion. This becomes an important question when embolization is used for cure or prior to radiosurgery. When embolization is used for these purposes, diligent imaging follow-up is needed to ensure satisfactory long-term results. (Reviewer-Bernard R. Bendok, MD).

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Keywords: Angionecrosis, AVM, Embolization,N-Butyl Cyanoacrylate, Onyx, Recanalization

Print Tag: Refer to original journal article
Does Insular Glioma Surgery Affect Language Skills?

Functional Outcome After Language Mapping for Insular World Health Organization Grade II Gliomas in the Dominant Hemisphere: Experience With 24 Patients.

Duffau H, Moritz-Gasser S, Gatignol P:

Neurosurg Focus 2009; 27 (August): E7

Detailed speech and language testing combined with careful intraoperative mapping can result in excellent outcomes in challenging insular glioma surgeries.

Background: Insular glioma surgery is a challenging operation, especially when performed on the dominant hemisphere. Previously published surgical series report a permanent morbidity between 8% and 15%; this series is unique in its focus on low-grade gliomas of the dominant hemisphere, with particular attention to language outcomes.

Objective: To report the language outcomes after dominant hemisphere low-grade glioma surgery in the insular region with awake mapping.

Design: Retrospective case series from 1997 to 2008.

Methods: The longitudinal language testing results, intraoperative technique, and functional outcomes were reported.

Results: Over the 12-year period, the author performed 68 surgeries for insular gliomas; 24 of these were located in the dominant insula with a diagnosis of World Health Organization Grade II glioma. Each patient was evaluated with a detailed speech and language test preoperatively and postoperatively. Twenty-three of 24 patients presented with seizures. Seven of 24 patients had a mild language disorder preoperatively. Intraoperatively, language sites were found in 21% of the insulas. Subcortical mapping was performed to delineate the functional limit of the resection. No perioperative mortality occurred. In the immediate postoperative period, there was some reduction in language performance in 50% of patients. There were no motor or sensory deficits and no lenticuloistriate territory ischemic infarctions. At 3 months’ postsurgery, all patients had returned to their preoperative baseline language and speech function. Of the 7 subjects who had a mild language disorder preoperatively, 6 improved their performance. Although all patients remained on antiepileptic agents, only 4 of 23 who presented with seizures continued to suffer seizures. Most importantly, all patients returned to their premorbid social and professional life.

Conclusions: Although insular glioma surgery remains a challenge, with careful testing and intraoperative monitoring, it can be performed safely with excellent language outcomes.

Reviewer’s Comments: This article adds valuable data to the existing literature on insular gliomas. The strengths of this report are the detailed speech and language examination on a longitudinal basis by dedicated speech pathologists and the use of cortical and subcortical stimulation techniques. It remains curious that the non-involved opercula were resected in several cases; however, the surgical results are impressive. In this technically demanding surgery among a cohort of patients with excellent preoperative function, there were no motor, sensory, or permanent language deficits, whereas previous series have reported, on average, 8% to 15% permanent neurological morbidity. Dr. Duffau should be congratulated for this excellent outcome, which will serve as a benchmark against which future outcomes will be compared. (Reviewer-Kenji Muro, MD).

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Keywords: Insula, Low-Grade Glioma, Awake Language Mapping, Outcome

Print Tag: Refer to original journal article