

Enterprise Stent Has Low Inaccurate Deployment, Morbidity, Mortality Rates

Treatment of Intracranial Aneurysms With the Enterprise Stent: A Multicenter Registry.

Mocco J, Snyder KV, et al:

J Neurosurg 2009; 110 (January): 35-39

Caution is recommended when using Enterprise in patients with subarachnoid hemorrhage, as these patients seem to be associated with a high rate of fatal hemorrhagic complications.

Background: The development of self-expanding stents has led to great improvements in the endovascular management of intracranial aneurysms with wide necks. These devices are thought to help by way of several mechanisms, including: (1) acting as a mechanical buttress that minimizes intraluminal coil protrusion; (2) increasing packing density; (3) flow diversion; and (4) providing a scaffold for endothelialization. One such device, the Neuroform (Boston Scientific), was the only self-expanding stent for treating intracranial aneurysms in the U.S. until the recent FDA approval of the Enterprise stent. However, data regarding the safety and efficacy of Enterprise are lacking.

Objective: To present the authors' initial experience with Enterprise from a large multicenter registry.

Methods: The initial 3 to 6 months' experience with Enterprise from 10 U.S. institutions is presented herein. Consecutive data on all patients with intracranial aneurysms treated or with intent-to-treat with Enterprise were gathered. Information regarding demographics, procedures, and complications was recorded. Procedural outcome was classified as: 100% occlusion; 95% to <100%; 90% to <95%; 80% to 90%; partial (<80%); planned staged stenting when coiling was planned for a later session; unplanned staged when intended coiling couldn't be performed thus was deferred; aborted coiling; and aborted stent.

Results: 141 patients harboring 142 aneurysms underwent 143 attempted stenting procedures. Overall, 39% of patients had <7 mm aneurysms, 34% had 7 to 12 mm, 17% had 12 to 24 mm, and 3% had ≥ 25 mm. The 2 most common locations were paraclinoid in 50% and basilar tip in 13%. In 4 cases, no stenting could be performed due to challenging vascular anatomy. In total, 107 cases had attempted coiling. Of these, 33% were 100% occluded, 63% were $\geq 95\%$ occluded, and 76% were $\geq 90\%$ occluded. There were 3 unplanned staged procedures due to stent migration in 2 cases and unstable micro-catheter position in 1. There were 3 aborted coiling procedures due to coil protrusion with stent migration in 2 cases and coil protrusion only in 1. Morbidity was temporary in 6.0% of cases and permanent in 2.8%, among which were 1 intra-procedural stroke, 1 post-procedural intracerebral hemorrhage, 1 cerebellar stroke, and 1 aneurysm perforation. Mortality rate was 2.0% overall, 0.8% for unruptured aneurysms, and 12% for ruptured ones. Causes of death included aneurysm perforation and hemorrhagic complications that occurred post-procedure.

Conclusions: The Enterprise stent had a high rate of successful navigation and was associated with low rates of inaccurate deployment. Furthermore, low morbidity and mortality rates were noted. Nonetheless, the authors recommended prudence when using Enterprise in patients with subarachnoid hemorrhage, as they seem to be associated with a high rate of fatal hemorrhagic complications.

Reviewer's Comments: The early results of this large series demonstrate that the Enterprise stent is safe and can be successfully navigated in the intricate intracranial vasculature with high reliability. Nonetheless, a long-term follow-up study is warranted in order to evaluate its durability and long-term complication rates. (Reviewer-Ziad A. Hage, MD).

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Keywords: Enterprise Self-Expanding Stent

Print Tag: Refer to original journal article

Early Neurosurgical Procedures Enhance Survival in Blunt Head Trauma

Early Neurosurgical Procedures Enhance Survival in Blunt Head Trauma: Propensity Score Analysis.

Hedges JR, Newgard CD, et al:

J Emerg Med 2008; December 19 (epub ahead of print):

Early neurosurgical operative intervention is associated with improved survival after head injury.

Background: Survival of brain-injured patients has increased with development of trauma systems and Level I trauma centers. Guidelines for management of head injury are in practice; universal adoption is variable, and impact of interventions remains controversial.

Objective: To evaluate the role of early (within 24 hours) neurosurgical intervention on outcome of patients with significant blunt traumatic brain injury.

Design: Retrospective single-institution study.

Methods: From 1999 to 2003, data were collected on patients aged 18 to 65 years with significant structural brain injury (Abbreviated Injury Scale >3) who were directly admitted from the field with transfer to a Level I trauma center. Patients were grouped into those with early neurosurgical interventions (craniotomy or ventriculostomy) or those without. To reduce bias that more severely brain-injured patients are more likely to receive neurosurgical procedures, propensity analysis was performed using patient demographics, medical comorbidities, physiological measurements (including Glasgow Coma Scale (GCS) score and Index Severity Score), CT head findings, and use of mannitol and vasoactive medications in the first 24 hours. Outcome measures included patient survival and patient expressive functional status at discharge.

Results: 110 patients with mean GCS of 7.3 had early neurosurgical procedures (30 ventriculostomies, 93 craniotomies) and 408 with mean GCS of 10.7 did not. Neurosurgical procedures correlated significantly to presenting GCS; procedures were performed on 13% of patients with GCS >8 and 34% of GCS <8. Crude death rate was higher in procedure patients (18% vs 10%). In total, 54 of 145 patients (37%) meeting Trauma Foundation criteria for intracranial pressure (ICP) monitoring (GCS 3 to 8 with abnormal CT) died. In multivariable analysis incorporating propensity score, the odds ratio of in-hospital death was significantly less in those patients who had early neurosurgical procedures. Early neurosurgical intervention did not affect expressive functional capacity.

Conclusions: Propensity scores analysis suggests that early neurosurgical intervention with craniotomy or ventriculostomy is associated with greater patient survival. Therefore, transfer of at-risk head-injured patients to centers with high-level neurosurgical capabilities is warranted.

Reviewer's Comments: Most neurosurgeons are unfamiliar with propensity score analysis. The authors use this research technique to show that neurosurgical intervention in the form of ventriculostomy or craniotomy within the first 24 hours after injury is associated with improvement in survival. The study has several limitations cited by the authors, including variations in an individual's practices and use of only the data retrievable from the database for propensity score model. In addition, the use of ICP monitoring is not well described in the population studied, nor are the indications for operative intervention. Even so, the results and conclusions fit a common sense approach to care of patients with significant traumatic brain injury. Patients with neurological deficits or structural abnormalities on head CT after head injury should receive prompt evaluation and treatment by neurosurgeons to optimize survival. (Reviewer-N. Scott Litofsky, MD).

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Keywords: Blunt Head Trauma

Print Tag: Refer to original journal article

Radiosurgery May be Option for Carefully Selected Patients With ≥ 10 Metastases

Gamma Knife Radiosurgery for Ten or More Brain Metastases.

Kim CH, Im YS, et al:

J Korean Neurosurg Soc 2008; 44 (December): 358-363

Stereotactic radiosurgery for ≥ 10 brain metastases can be safely performed with some efficacy.

Background: Stereotactic radiosurgery can be an effective treatment for brain metastases. Few studies discuss treatment of ≥ 4 brain lesions with radiosurgery.

Objective: To study the outcome of patients with ≥ 10 brain metastases treated with gamma knife radiosurgery.

Design: Retrospective single-institution study.

Methods: 26 patients with ≥ 10 brain metastases (21 non-small-cell lung carcinoma, 3 breast carcinomas, and 2 unknown) were treated with gamma knife radiosurgery. Mean number of lesions was 16.6 (range, 10.0 to 37.0). Mean cumulative volume was 10.9 mL and mean margin dose was 1500 cGy (range, 900 to 2300 cGy). Radiosurgery followed recurrence after whole brain radiotherapy (WBRT) in 13 patients (50.0%), followed WBRT as boost in 5 (19.3%), and was used alone in 8 (30.7%). Follow-up was initially at 1 month following treatment and every 3 months thereafter.

Results: Overall median survival was 34 weeks (range, 8 to 199 weeks). Cause of death was from neurological progression in 10 (56.0%), systemic progression in 6 (33.3%), and unknown in 2 (11.1%). At 3 months, 63.7% of lesions were smaller, 23.2% were stable, and 13.1% were larger, for a local control rate of 86.9%. Local control of surviving patients at 6 months was 79.4%. Seven patients (26.9%) developed new metastases by 6 months. One patient developed radiation necrosis. Favorable prognostic factors for survival included synchronous onset (46 vs 18 weeks), Karnofsky performance status score ≥ 80 (51.0 vs 21.5 weeks), chemotherapy ≥ 2 cycles (54 vs 23 weeks), and systemic disease control (54 vs 24 weeks). Number of lesions (≥ 16 vs < 16) and total tumor volume (≥ 10 mL vs < 10 mL) did not affect survival.

Conclusions: The outcome for gamma knife treatment of numerous brain metastases is not as poor as previously thought. Therefore, radiosurgery may be an option for carefully selected patients with ≥ 10 metastases.

Reviewer's Comments: The authors describe their experience using gamma knife radiosurgery to treat patients with ≥ 10 brain metastases. Most patients had non-small-cell lung carcinoma. The authors do not describe their indications for treatment, so we are unsure of why a patient was treated and how many patients with numerous metastases were not treated. Because the radiosurgery treatment group was not compared to a control group, the overall benefit of radiosurgery for patients with numerous metastases cannot be determined from this study. The majority of patients still succumbed to neurological progression. The authors do not discuss the time required for planning or treating these numerous lesions, nor do they discuss the dosimetry problems associated with treating a large number of lesions. Before embarking on routine radiosurgery for numerous brain metastases, even in highly selected patients, these issues should be more stringently elucidated. (Reviewer-N. Scott Litofsky, MD).

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Keywords: Gamma Knife Radiosurgery

Print Tag: Refer to original journal article

Poor Survival Among Elderly Patients With Glioblastoma May Reflect Patterns of Care

Patterns of Care in Elderly Glioblastoma Patients.

Iwamoto FM, Reiner AS, et al:

Ann Neurol 2008; 64 (December): 628-634

Age, marital status, and comorbidities influence the probability of receiving radiation therapy or chemotherapy in elderly patients with glioblastoma.

Background: Glioblastoma affects all age groups, yet the peak incidence of this disease is among those aged >65 years. Clinical trials often exclude patients aged >70 years, leaving the medical community to apply outcomes data to the elderly.

Objective: To assess the pattern of care in patients aged >65 years diagnosed with glioblastoma using the Surveillance, Epidemiology, and End Results (SEER) registry.

Design: Retrospective cohort study based on data from 1994 to 2002 entered in the SEER registry.

Methods: Patients' demographic and medical characteristics were analyzed with respect to the probability of undergoing surgery, radiation therapy, and chemotherapy within 3 months of diagnosis.

Results: 5909 patients aged >65 years diagnosed with glioblastoma were identified; 4139 were analyzed. There were more men (54%) and 62% of patients were married. In total, 92% of the cohort was white. Resection, rather than biopsy, was performed in 61% of patients. The odds of undergoing surgical resection were influenced by increasing patient age ($P < 0.0001$) and black race ($P < 0.008$). Sixty-five percent of patients underwent radiation therapy within 3 months of diagnosis, while only 10% received chemotherapy. Among those receiving chemotherapy, 92.4% received both radiation therapy and chemotherapy, while 7.6% received chemotherapy only. Overall, 35% of the cohort received neither therapy after diagnosis. Median survival was 4 months and older age was a worse prognostic factor ($P < 0.0001$). Unmarried patients also had a shorter survival compared to married patients ($P < 0.0001$).

Conclusions: This population-based study allows robust data analysis of an uncommon disease. It has shown that the pattern of care of elderly patients, such as the high proportion who did not receive adjuvant therapy, may account for the overall poor survival.

Reviewer's Comments: This study's strength is in the robust statistics, representing only 1.35% of all primary cancers diagnosed annually. Although there are several data points missing that would interest all neuro-oncologists, such as the patients' Karnofsky performance status. The analysis reveals startling findings, ie, that 35% of the cohort received neither radiation therapy nor chemotherapy. Also, that unmarried patients fare poorly compared to those with a spouse. The chemotherapy data should be regarded with some caution, given that the current "gold standard" protocol of concurrent temozolomide with radiation therapy was not published until 2005, well beyond the study period. This study does pave the way to further study and understanding of the factors that drive medical decision making among physicians and patients. (Reviewer-Kenji Muro, MD).

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Keywords: Patterns of Care

Print Tag: Refer to original journal article

Microsurgery of ACoA Safe, Useful Strategy, Despite Decrease in Verbal Memory

Quality of Life and Brain Damage After Microsurgical Clip Occlusion or Endovascular Coil Embolization for Ruptured Anterior Communicating Artery Aneurysms: Neuropsychological Assessment.

Proust F, Martinaud O, et al:

J Neurosurg 2009; 110 (January): 19-29

Side of approach for microsurgical clipping of ACoA aneurysm does not affect neuropsychological outcome.

Objective: To assess quality of life (QOL), cognitive function, and brain injury in patients treated for ruptured anterior communicating artery (ACoA) aneurysm by microsurgical clipping compared to endovascular coiling.

Design: Longitudinal prospective study.

Methods: From January 2001 to December 2004, patients treated for ruptured ACoA aneurysm were prospectively evaluated for functional outcome, QOL, neuropsychological outcome, and MRI evidence of brain injury. Only patients aged 18 to 75 years without prior neuropsychiatric disease who survived without significant disability were included. Functional outcome, QOL, and neuropsychological evaluation were performed in a blinded fashion 6 to 54 months after subarachnoid hemorrhage (SAH). MRI was obtained 10 to 72 months after SAH.

Results: 98 patients were treated during the study period and 50 of these patients (36 patients clipped and 14 coiled) were enrolled. Demographics were comparable between the 2 groups. Nearly 60% presented as Hunt-Hess Grade I-II. Nearly 75% had aneurysms that were >5 mm in size. A single patient re-bled in the coiling group, and none re-bled in the clipping group. Functional outcome and QOL scores did not differ significantly between groups. Neuropsychological outcome and executive function did not differ significantly between groups. Verbal memory was significantly impaired in patients clipped compared to coiled. MRI demonstrated significantly more areas of focal encephalomalacia in patients clipped compared to coiled. Side of surgical approach and intraoperative events in the microsurgical group were separately analyzed and did not statistically correlate with outcome.

Conclusions: Patients treated with microsurgery for ruptured ACoA aneurysms have similar functional outcomes and QOL compared to those treated with coiling, despite a decrease in verbal memory and evidence of increased brain injury on MRI.

Reviewer's Comments: The authors have systematically analyzed the QOL, functional and neuropsychological outcome utilizing validated instruments after ACoA aneurysm SAH in patients treated with microsurgery compared to endovascular coiling. The small size of the study might limit any ability to detect differences between the techniques. The authors did find that verbal memory was more affected in the microsurgical group, although no difference was observed when side of approach was analyzed. More lesions were identified on MRI after clipping, although they were not associated with a difference in outcome. The study is limited by its small size and exclusion of patients without good outcome. Although the authors note that 20 of 98 patients treated for ruptured ACoA aneurysm during the study period were excluded for Glasgow Outcome Score >2, we are not told how these patients presented nor how they were treated. The data presented suggest that increased number of structural lesions found on MRI after clipping might not correlate with functional outcome or QOL. Larger studies are necessary before making conclusions regarding the differences between clipping and coiling when treating ruptured ACoA aneurysms. (Reviewer-Zoher Ghogawala, MD).

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Keywords: -QOL & Brain Damage

Print Tag: Refer to original journal article

Increased EPC in MMD May Play Role in Increased Arteriogenesis, Angiogenesis

Increased Levels of Circulating Endothelial Progenitor Cells in Patients With Moyamoya Disease.

Rafat N, Beck GCh, et al:

Stroke 2009; 40 (February): 432-438

Endothelial progenitor cells may not be entirely mediated by vascular endothelial growth factor or granulocyte-macrophage colony-stimulating factor as previously thought.

Background: Moyamoya disease (MMD) is a rare cerebrovascular disease often resulting in hemorrhagic or ischemic stroke. Patients with MMD, unlike patients with chronic cerebral ischemia, have a strong capacity for arteriogenesis and angiogenesis. Endothelial progenitor cells (EPC) are cells that have the ability to differentiate into mature endothelial cells. Increased levels of EPCs are mediated by the activation of metalloproteinases and upregulation of adhesion molecules such as vascular endothelial growth factors (VEGF) and granulocyte-macrophage colony-stimulating factor (GM-CSF).

Objective: To better understand if circulating EPCs are increasingly mobilized during MMD.

Design/Methods: 20 patients with MMD were enrolled consecutively between 2004 and 2006 before revascularization. As controls, 8 patients with atherosclerotic cerebrovascular disease (ACVD) and 15 healthy volunteers were recruited. Blood samples taken from all patients were processed for specific EPC markers and analyzed for serum concentrations of VEGF, GM-CSF, and IL-8. Statistical analyses were represented as mean±SEM. Analysis of variance and Kruskal-Wallis test were used to compare the 3 groups. When results were significant, a *t* test analysis was performed. *P* value <0.05 was statistically significant.

Results: There was a significant increase in hematopoietic stem cells in patients with MMD, which was greater than in patients with ACVD and much greater than in the healthy control group. Compared to the healthy controls, VEGF concentration was increased in MMD and ACVD patients; however, there was no significant difference between the MMD and ACVD group. The results were similar for the concentration of GM-CSF with significant difference between the healthy group and the pathological groups, but no difference between the 2 pathological groups. Serum IL-8 showed no difference between the 3 groups.

Conclusions: The data confirm that there is an increased level of EPC in MMD patients. The data indicate that VEGF and GM-CSF may not be the main mediators for EPC mobilization in MMD.

Reviewer's Comments: This study does not take into account whether there is a difference in circulating EPC in patients before and after revascularization surgery. EPC levels may one day be useful to predict either a hemorrhagic or ischemic outcome in MMD. The clinical and scientific implication from this study can be profound. Further understanding of this biology may lead to better pharmacologic treatment of not only MMD, but also for other ischemic states. (Reviewer-Bernard R. Bendok, MD).

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Keywords: Circulating Endothelial Progenitor Cells

Print Tag: Refer to original journal article

U-Clips for Venous Sinus Aneurysm Provide Immediate Resolution of Pulsatile Tinnitus

Novel Surgical Treatment of a Transverse-Sigmoid Sinus Aneurysm Presenting as Pulsatile Tinnitus: Technical Case Report.

Gologorsky Y, Meyer SA, et al:

Neurosurgery 2009; 64 (February): E393-394

Reconstruction of the transverse-sigmoid sinus aneurysm using U-clips is a novel method of treating pulsatile tinnitus.

Background: Transverse-sigmoid sinus aneurysms are a rare cause of pulsatile tinnitus. **Case Discussion:** The authors describe a 48-year-old patient with chronic right-sided pulsatile tinnitus caused by a transverse-sigmoid sinus aneurysm treated by surgical reconstruction of the sinus using U-clips. Angiography revealed a wide-necked venous aneurysm of the transverse-sigmoid sinus eroding into the mastoid bone. A retromastoid suboccipital craniectomy was performed to expose the aneurysm and the anatomy of the transverse-sigmoid junction. The dome was tamponaded and compressed. The neck was coagulated and the dome shrunk to a small remnant. The linear defect in the junction was then reconstructed with no. 18 U-clips and covered with Gelfoam. The patient awoke without tinnitus and no other neurologic deficits.

Conclusions: Previous publications have concentrated on endovascular approaches for repair of these aneurysms. In the otolaryngology literature, a technique involving a transmastoid approach to skeletonize the aneurysm with extraluminal placement of temporalis muscle, fascia, or bone wax for the obliteration of the aneurysms has been described. However, the authors mention the risk of strangulation of the sinus or intraluminal embolization of bone wax. In this approach, U-clips allowed for complete reconstruction of the sinus with minimal risk of intraluminal propagation of thrombogenic material. Repair of the sinus is often limited by its friable nature; however, U-clips require less manipulation and less tension on venous tissue. This technique also allows for faster closing of the sinus and decreasing blood loss. Postoperative angiography showed obliteration of the aneurysm with minimal stenosis in the region of the repair and good flow through the dominant right transverse-sigmoid junction. At 3-month follow-up, the patient denied tinnitus. Surgical reconstruction of transverse-sigmoid sinus aneurysms using U-clips is a new method of repair for venous aneurysms of the transverse and sigmoid sinuses. This technique allows greater control versus compressive techniques and avoids the need for antiplatelet agents as required for endovascular treatment.

Reviewer's Comments: Aneurysms at the transverse-sigmoid junction should be ruled out in the setting of pulsatile tinnitus. The authors describe a creative and effective way to deal with these aneurysms. Lessons learned from this case may have implications for repair of injured venous sinuses. (Reviewer-Bernard R. Bendok, MD).

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Keywords: Pulsatile Tinnitus

Print Tag: Refer to original journal article

Delayed Coil Migration After Balloon Modeling Can Lead to Stroke

Delayed Symptomatic Coil Migration After Initially Successful Balloon-Assisted Aneurysm Coiling: Technical Case Report.

Fiorella D, Kelly ME, et al:

Neurosurgery 2009; 64 (February): E391-E392

Although most migration of coils occurs immediately post-coiling, it is possible to have delayed migration with important sequelae.

Background: Balloon remodeling is an important adjunct that facilitates denser packing of wide-neck aneurysms with coils. It is well known that migration of coils after this procedure can occur immediately after coiling; however, delayed coil migration has been felt to be highly unlikely. **Case Discussion:** A 56-year-old patient with a Fisher Grade III, and Hunt and Hess Grade II subarachnoid hemorrhage was found to have a small A1-A2 junction aneurysm. The patient underwent embolization with balloon-assisted technique. Four coils were deployed. A small loop of coil extended into the lower medial quadrant of the A1-A2 complex at the aneurysm neck. The patient was started on aspirin and discharged after MRI/MRA showed no evidence of aneurysm filling or restricted diffusion. Eight days after coiling, the patient presented with right lower extremity paralysis. MRI revealed an acute stroke consistent with left anterior cerebral artery territory embolic infarction. Angiography showed interval migration of one of the coil loops into the A1-A2 junction. The patient was started on Plavix in addition to aspirin and discharged. No other neurological symptoms occurred during follow-up.

Conclusions: There are several advantages of balloon remodeling technique as an adjunct to coil embolization, including no requirement for dual antiplatelet therapy after treatment. This is especially important in the setting of subarachnoid hemorrhage (SAH). The mass created by coils during balloon remodeling is typically very stable, even in wide-necked aneurysms. In the context of SAH, a microstent was not considered for this patient. The treating physician should be aware of possible delayed migration of coil loops after endovascular treatment of intracranial aneurysms.

Reviewer's Comments: The authors report on a rare complication of delayed coil migration. They use soft finishing coils and complex shapes and avoid shorter 2 cm or 1 cm finishing coils to optimize stability. Delayed ischemic events in the distribution of a coiled aneurysm should prompt a re-evaluation of the aneurysm. In addition to coil migration, clots can form at the junction of the coil mass and the parent arteries. This may necessitate anticoagulation. (Reviewer-Bernard R. Bendok, MD).

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Keywords: Delayed Coil Migration

Print Tag: Refer to original journal article

Hypothermia at 35°C May Be Better Than at 33°C for Head Trauma

Effect of 35°C Hypothermia on Intracranial Pressure and Clinical Outcome in Patients With Severe Traumatic Brain Injury.

Tokutomi T, Miyagi T, et al:

J Trauma 2009; 66 (January): 166-173

Hypothermia at 35°C is as effective in controlling ICP as at 33°C, and is associated with less morbidity and mortality.

Background: Despite controlling intracranial pressure (ICP) in patients with severe traumatic brain injury, cooling patients to 33°C has not shown improved patient outcome. Perhaps increased oxygen debt and other complications negate the beneficial effects of hypothermia.

Objective: To determine if hypothermia at 35°C has the same effect on ICP as 33°C and whether it is associated with fewer complications.

Design: Single-institution retrospective case series with historical controls.

Methods: Patients with head injury from 2000 to 2005 meeting inclusion criteria were treated with hypothermia by surface cooling water-circulating blankets at 35°C for 48 to 72 hours after controlling ICP to <20 mm Hg. Inclusion criteria required Glasgow Coma Scale ≤5, age >15 years and <70 years, systolic BP ≥90 mm Hg, PaO₂ ≥60 mm Hg, O₂ saturation ≥90%, and no history of heart disease or coagulation disorders. These patients were compared to patients from 1994 to 1999 who were cooled to 33°C. ICP was monitored by intraparenchymal fiberoptic transducer. Patients received Mannitol for ICP >20 mm Hg. Patients were intubated, sedated, paralyzed, and mechanically ventilated to maintain PaCO₂ at 35 mm Hg. Glasgow Outcome Scale was determined at 6 months. Patients treated with hypothermia who subsequently became hypotensive or died soon after induction of hypothermia were not analyzed.

Results: 30 patients treated at 35°C were compared to 31 patients treated at 33°C. Mean ICP was controlled <20 mm Hg for both groups during hypothermia. Serum potassium was lower in the 33°C group. Mean C-reactive protein was higher in the 33°C group. Complications were more likely and mortality tended to be higher in the 33°C group (48% vs 27%), but the difference was not statistically significant.

Conclusions: Cooling patients to 35°C is equally effective and safer than cooling patients to 33°C in order to control ICP.

Reviewer's Comments: This paper revisits the concept of hypothermia to control ICP in patients with severe traumatic brain injury. By reducing the degree of hypothermia to 35°C, the authors maintain the same level of ICP control. A trial with more patients would be required to verify if 35°C is actually safer than 33°C since the differences noted in outcome were not statistically significant, even if the lab value differences were significant. The authors' methodology raises 2 concerns. The first is the use of historical time periods for comparison; as the authors state, bias may be present. The second is perhaps more important--the authors excluded from analysis patients treated with hypothermia who became hypotensive or who died shortly thereafter. These patients account for 25% of the intent to treat patients in both groups, and certainly biases the results. Hypothermia at 35°C may control ICP satisfactorily, but whether that lesser degree of hypothermia is safer than 33°C will require additional study. (Reviewer-N. Scott Litofsky, MD).

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Keywords: Hypothermia

Print Tag: Refer to original journal article

Persistent Hyperglycemia After Head Injury Associated With Poor Prognosis

Persistent Hyperglycemia in Severe Traumatic Brain Injury: An Independent Predictor of Outcome.

Salim A, Hadjizacharia P, et al:

Am Surg 2009; 75 (January): 25-29

Persistent hyperglycemia is associated with increased mortality in patients with severe traumatic brain injury.

Background: Hyperglycemia on admission of patients with severe traumatic brain injury is a poor prognostic feature. The role of persistent hyperglycemia after head injury has not been defined.

Objective: To evaluate the role of persistently elevated blood glucose levels in patients with severe traumatic brain injury.

Design: Retrospective single-institution database review.

Methods: Trauma registry and SICU databases of University of Southern California Medical Center from 1998 to 2005 were abstracted for all blunt head trauma patients with severe traumatic brain injury (head abbreviated injury score [AIS] ≥ 3). Patients who died within 48 hours, those with severe extracranial injuries (AIS ≥ 3 for other anatomical regions), those with non-survival head injuries, and those without serial blood glucose measurements were excluded. Persistent hyperglycemia was defined as average serum glucose >150 mg/dL daily for the first week of hospital stay after injury. Insulin therapy was defined as early (days 1 to 3) or delayed (days 4 to 7). Clinical characteristics and outcome were compared between (1) those with or without persistent hyperglycemia, (2) those with or without insulin therapy, and (3) early or delayed insulin therapy.

Results: 834 patients met inclusion criteria. Overall, 105 (12.6%) developed persistent hyperglycemia. Patients with persistent hyperglycemia were older (49 versus 39 years), sicker (Injury Severity Score 26 vs 23), had more severe head injury (AIS >3 ; 84% vs 59%), and higher incidence of epidural hematoma (24% vs 14%), subdural hematoma (44% vs 29%), and subarachnoid hemorrhage (56% vs 40%). Patients with persistent hyperglycemia had less complications (8% vs 21%), but had higher mortality (64% vs 21%). In total, 260 patients (31.2%) received insulin therapy; these patients were older, sicker, had more severe head injury, more complications, and higher mortality than those who did not receive insulin therapy. Of the insulin-receiving patients, 76.5% received early insulin and 23.5% received delayed therapy. Early insulin patients had fewer complications, but greater mortality than delayed insulin patients. Best outcome was with no persistent hyperglycemia and no insulin therapy (15%) mortality. Persistent hyperglycemia was an independent risk factor for increased mortality.

Conclusions: Persistent hyperglycemia is associated with increased risk for mortality and morbidity after severe traumatic brain injury. The role of insulin in modifying these risks is unclear.

Reviewer's Comments: Hyperglycemia after severe brain injury occurs as a result of significant catecholamine release. In more severe injuries, the degree of hyperglycemia may be higher. The association of persistent hyperglycemia with increased mortality is therefore not surprising, nor is the failure of insulin to alter that relationship. Efforts to control hyperglycemia are still warranted, but the persistence of hyperglycemia likely represents a marker of significant brain injury and potentially poor prognosis. This information may be helpful in counseling family members about the potential outcome of their loved ones. (Reviewer-N. Scott Litofsky, MD).

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Keywords: Persistent Hyperglycemia

Print Tag: Refer to original journal article

Endovascular Procedures Safely Treat Acute Thromboembolic Stroke in Young Patients

Endovascular Intervention for Acute Thromboembolic Stroke in Young Patients: An Ideal Population for Aggressive Intervention?

Mocco J, Tawk RG, et al:

J Neurosurg 2009; 110 (January): 30-34

Endovascular procedures to treat acute thromboembolic stroke in young patients are relatively safe and may potentially improve outcomes.

Background: Stroke is a major cause of morbidity and mortality in the United States. Therapeutic modalities for acute thromboembolic stroke are scarce and endovascular revascularization has emerged as a promising alternative. Indeed, chemical thrombolysis, mechanical thrombectomy, balloon angioplasty, and intracranial stenting have all been correlated with good recanalization rates following acute stroke, which in turn seems to be associated with improved patient outcomes.

Objective: To further assess the potential of endovascular treatment in acute thromboembolic stroke in young patients.

Design/Methods: The authors retrospectively reviewed a prospectively maintained database of endovascular procedures over a 7-year period to identify, patients between the ages of 18 and 35 years that presented with acute thromboembolic stroke and were treated. Information regarding demographic factors, admission, and discharge NIH Stroke Scale (NIHSS) scores, lesion location, length of hospital stay, type of interventions attempted, initial and final Thrombolysis in Myocardial Infarction (TIMI) scores, duration of follow-up, and modified Rankin Scale (mRS) score at discharge and at last follow-up was recorded.

Results: 8 endovascular procedures for thromboembolic stroke were performed in 7 patients. The median NIHSS score at presentation was 13. All patients presented within 6 hours of stroke symptoms. Endovascular recanalization was performed using mechanical thrombectomy, intra-arterial thrombolysis, angioplasty, and/or stenting. TIMI Grade 0 or no flow was noted on initial angiogram in all 8 procedures. Following endovascular treatment, 5 cases achieved TIMI 3 or complete perfusion, 1 case was TIMI 2 or partial perfusion, and 2 remained TIMI 0 or absent perfusion. Of the latter 2, 1 case was complicated by a vessel perforation and was therefore aborted without recanalization, and the second, which was done when no mechanical thrombectomy was yet available, did not benefit from intraarterial reteplase. No deaths were noted. The median mRS score at discharge was 1.5. Overall, 62.5% of patients were independent at discharge with mRS scores 0-2. The mean length of hospital stay was 6.5 days. At a mean 29 months of follow-up, all patients were independent with mRS ≤ 2 .

Conclusions: Endovascular procedures to treat acute thromboembolic stroke in young patients are relatively safe and may potentially improve outcomes. Further research with a larger patient cohort is warranted.

Reviewer's Comments: Although characterized by a small patient population, this study shows good recanalization rates, with low complication rates and no mortality. The authors of this article suggest that endovascular management of young patients with thromboembolic stroke may be performed more aggressively with a better outcome, as this patient population has a healthier and more robust cerebral vasculature. This is especially true when considering their long life expectancy and the benefit of regaining functional independence early on and minimizing life-years lost after a stroke. Further validation of these results in a larger study is recommended. (Reviewer-Ziad A. Hage, MD).

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Keywords: Endovascular Intervention

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High FRI Correlates With Risk of EVD Challenge Failure, Can Predict Need for VPS

Prediction of Ventriculoperitoneal Shunt Dependency in Patients With Aneurysmal Subarachnoid Hemorrhage.

Chan M, Alaraj A, et al:

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In this study, a high FRI was strongly and linearly correlated with the risk of EVD challenge failure and therefore predicted the need for a VPS.

Background: Subarachnoid hemorrhage (SAH) following aneurysmal rupture often leads to obstructive hydrocephalus, which is managed acutely by external ventricular drain (EVD) insertion. Nonetheless, a sizable fraction of patients with such a scenario may become shunt-dependent, thus requiring a permanent shunt. Current methods to determine whether or not a patient will be in need of a ventriculoperitoneal shunt (VPS) involve empirical EVD challenge procedures.

Objective: To determine variables to help identify patients at high risk of challenge failure.

Methods: The medical records of 157 consecutive patients with spontaneous SAH admitted at the author's institution were reviewed over a 2-year period. Data regarding patient demographics, Fisher grade, Hunt and Hess grade at presentation, aneurysm location, and treatment option were recorded. CT scans were reviewed at admission as well as at the beginning and ending of the EVD challenge. Cerebrospinal fluid (CSF) levels of WBC, RBC, and protein, serum sodium levels, third ventricular diameter, and bicaudate diameter were recorded at admission as well as at the beginning and ending of challenge. According to the UIC protocol, the EVD challenge is attempted when CSF RBC <10000 cells/mL and no hydrocephalus, CSF leak, or collection subcutaneously are evident. A baseline CT is obtained, then the EVD is clamped for 48 hours while continuously monitoring the intracranial pressure (ICP) and the patient's neurological exam. The challenge is failed in case of headaches relieved by unclamping, CSF leakage from incision, altered mental status, ICP >20 cm H₂O for 30 minutes, or increased ventricular size on CT.

Results: Of 157 patients reviewed, 89 required EVD placement following aneurysmal SAH. Of the latter, 43% passed their EVD challenge and 48% failed it, thus needing VPS placement. A total of 9% underwent VPS placement without prior EVD challenge due to poor neurological grade and subcutaneous CSF collections. Seven parameters were noted to be significant risk factors for EVD challenge failure when comparing the fail and pass groups: mean third-ventricular diameter on admission and at start of challenge; mean bicaudate diameter at beginning of challenge; mean CSF protein levels at the time of challenge; mean Hunt and Hess grade on admission (all of which were higher in the fail group); sex (63.5% of failures were females); and aneurysm location (77.3% of failures had posterior circulation aneurysms). Moreover, increasing risk factor values were correlated with higher risk of EVD challenge failure. To predict EVD challenge failure, these parameters were combined using a discriminant function analysis to generate a failure risk index (FRI) value for each patient. The risk of failure increased with an increasing FRI.

Conclusions: A high FRI was strongly and linearly correlated with the risk of EVD challenge failure and can therefore predict the need for a VPS. Further validation of the FRI is needed.

Reviewer's Comments: The FRI seems to be a strong predictive factor of EVD challenge failure. It is calculated using a simple formula. A prospective study to validate it is warranted. (Reviewer-Ziad A. Hage, MD).

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