



Society of Vascular and Interventional Neurology
7th Annual Meeting

ABSTRACT SUPPLEMENT

November 7 -9, 2014 | Westin Diplomat | Hollywood, Florida



Society of Vascular and Interventional Neurology

7th Annual Meeting

November 7-9, 2014

The Diplomat Resort and Spa • Hollywood, FL

Platform Session I

Friday, November 7, 2014 • 1:45 p.m. – 2:15 p.m.

Moderators: Thanh Nguyen, MD and Alicia Castonguay, PhD

1:45 p.m. – 1:55 p.m. Mario Martinez-Galdamez

Pendovascular treatment of intracranial aneurysms using the new Pipeline Flex Endovascular Device : a prospective multi-center study in 25 patients

1:55 p.m. - 2:05 p.m. Yamin Shwe

Clinical Presentations, Venous Drainage Patterns, and Treatment Outcomes in Carotid Cavernous Fistula

2:05 p.m. – 2:15 p.m. Siddhart Mehta

Safety and Efficacy of Intravenous Eptifibatide as Standalone Therapy for select Acute Ischemic Stroke Patients (SIESTA-I trial)

Platform Presentation embedded in 'Interesting Cases and Complications' Session

Saturday, November 8, 2014 • 8:00 a.m. – 8:30 a.m.

8:00 a.m. – 8:10 a.m. Ahsan Sattar

Successful Endovascular Reconstruction of Tortuous Cervical Internal Carotid Artery Dissection with Pipeline Stent

Platform Session II

Saturday, November 8, 2014 • 5:00 p.m. – 5:30 p.m.

Moderators: Robin Novakovic, MD and Vladimir Cortez, DO

5:00 p.m. - 5:10 p.m. Seby John

Feasibility of Intravenous Thrombolytic Therapy for Suspected Acute Ischemic Stroke on the Mobile Stroke Treatment Unit

5:10 p.m. - 5:20 p.m. Yahia M. Lodi

Primary thrombectomy within 3 hours of onset in acute ischemic stroke from occlusion of middle cerebral artery- a pilot study

5:20 p.m. - 5:30 p.m. Daniel Korya

Redefining the Gold Standard: Transcranial Doppler Detects More Intra and Extra-Cardiac Right-to-Left Shunts than Trans-Esophageal Echocardiogram

Friday, November 7, 1:45 - 1:55 pm

Pendovascular treatment of intracranial aneurysms using the new Pipeline Flex Endovascular Device: a prospective multi-center study in 25 patients

Mario Martinez-Galdamez¹, Santiago Ortega-Gutierrez²

¹*Hospital Clínico Universitario, Valladolid, Spain. Interventional Neuroradiology/Endovascular Neurosurgery Division. Department of Radiology., Valladolid, Spain,* ²*University of Iowa. Interventional Neuroradiology/Endovascular Neurosurgery Division. Department of Neurology and Anesthesia , Iowa City, IA, USA*

Introduction:

Clinical experience with Pipeline Endovascular Device (PED) has been widely described in the literature since obtained its European CE and FDA approvals in 2008 and 2011 respectively. The new generation of PED, so called Pipeline™ Flex Embolization Device has received the CE mark approval in March 2014. While the implant composition has not change, its new delivery system has some peculiarities. One of the main differences with the previous generation resides in a new delivery system that makes the device resheathable until deployed over 90% of its length. Herein, we present our preliminary experience using this device.

Methods:

Between May and June 2014, 6 patients with 6 aneurysms were treated with the use of Pipeline™ Flex.

Results:

All devices were placed properly, without technical difficulties. We successfully resheathed and repositioned the device in 2 cases. Minor and major intraprocedural or periprocedural events were noted.

Conclusions:

The PED Flex™ device allows more precise and controlled deployment than current PED device. Although this preliminary experience seems positive, multicenter larger series will be needed to confirm the safety and durability of this new device.

Keywords: Aneurysm Embolization, Flow diverter, Pipeline

Financial Disclosures: Mario Martínez-Galdámez is consultant and Proctor for Covidien

Grant Support: None.

Friday, November 7, 1:55 - 2:05 pm

Clinical Presentations, Venous Drainage Patterns, and Treatment Outcomes in Carotid Cavernous Fistula

Yamin Shwe¹, David Altschul²

Santiago Ortega-Gutierrez³, Alejandro Berenstein⁴, Johanna Fifi⁴

¹Mt. Sinai Beth Israel Medical Center, Department of Neurology, New York, NY, USA, ²Montefiore Medical Center, Department of Neurosurgery, New York, NY, USA, ³University of Iowa, Neurology and Neurosurgery, Iowa, IA, USA, ⁴Mt. Sinai Roosevelt Medical Center, Department of Neurology and Neurosurgery, New York, NY, USA

Introduction:

Carotid cavernous fistulas (CCFs) are abnormal shunts between the carotid arteries and the cavernous sinus. Clinical symptoms can be mild to severe depending on shunt location, and some are reversible with early endovascular treatment. The aim of this study is to correlate clinical presentation and venous drainage pattern and to compare clinical outcomes in endovascular management with conservative management.

Methods:

We performed a retrospective chart review of 46 adults and one infant (ages 5 months to 82 years) presenting with ocular and neurological symptoms between January 2004 and June 2014. All patients underwent a complete ophthalmological exam and DSA prior to treatment. Venous drainage patterns were categorized as anterior (superior and inferior ophthalmic vein), posterior (superior petrosal, inferior petrosal, sphenoparietal sinuses), superior (superficial middle cerebral vein), and inferior (pterygoid). Clinical symptoms were classified as orbital (chemosis, proptosis), cavernous (diplopia, ophthalmoplegia, cranial nerve palsies), ocular (increased intraocular pressure, decreased vision, eye pain), and cortical (headache, tinnitus, ataxia). Primary outcome was association between venous drainage pattern and clinical symptoms. Secondary outcome was clinical symptoms resolution at follow up. Variables were analyzed using χ^2 and Fisher exact test.

Results:

Out of 47 patients 7 (15%) received conservative management compared to 40 (85%) received endovascular treatment. Strong negative association was seen with orbital symptoms ($n=26$, $\chi^2=8.03$, $p<0.05$) with inferior drainage. Barrow Type A and D associated significantly with inferior drainage ($n=21$, $\chi^2=19.526$, $p<0.05$). Among posterior drainages, inferior petrosal drainage strongly associates with type A and D ($n=17$, $\chi^2=13.841$, $p<0.05$), and pterygoid plexus with type A ($n=5$, $\chi^2=17.411$, $p<0.05$). Good outcome was significantly associated endovascular treatment ($n=40$, $\chi^2=10.9638$, $p<0.05$).

Conclusions: Knowledge of venous drainage patterns among patients with specific clinical symptoms can be used to plan definitive treatment. Compared to medical management, endovascular treatment is associated with improved clinical outcomes in our case series. FCOI Disclosure: None.

Keywords: Angiogram, Carotid, Interventional Neuroradiology, cerebral arteriovenous malformations, cerebral sinus and venous thrombosis

Financial Disclosures: The authors had no disclosures.

Grant Support: None.

Friday, November 7, 2:05 - 2:15 pm

Safety and Efficacy of Intravenous Eptifibatide as Standalone Therapy for select Acute Ischemic Stroke Patients (SIESTA-I trial)

Siddhart Mehta, Javaad Ahmad, Mohammed Hussain, Jaskiran Brar, Harina Chahal, Mohammad Moussavi

JFK/Stroke and Neurovascular Center, Edison, NJ, USA

Introduction:

There is existence of data on the successful application of Eptifibatide in coronary interventions. There is minimal literature in the application of stroke treatment. Our objective was to report the results of an open labeled retrospective registry to evaluate the safety and efficacy of administering IV Eptifibatide as a standalone therapy for acute stroke in patients ineligible for IV r-tPa or neurointervention.

Methods:

All patients with acute ischemic events between 2010-13 were included that presented to our university affiliated comprehensive stroke center. Patients that received Eptifibatide as standalone therapy were reviewed. Eptifibatide was administered intravenously as a 135- μ g/kg single-dose bolus, then a 0.5- μ g/kg/min infusion. Charts were reviewed for all patients to assess for primary safety and efficacy endpoint. The primary safety endpoint was bleeding. Bleeding complications were classified as major (symptomatic intracranial hemorrhage and hemoglobin decrease by >5 mg/dl), minor (hemoglobin decrease 3-5 mg/dl) and insignificant as proposed by the TIMI score (Thrombolysis in Myocardial Infarction). The primary efficacy end point was neurological improvement/deterioration as defined by a change in discharge NIHSS by > 4 points compared to initial NIHSS respectively.

Results:

Of 2,329 total patients, 20 patients (mean age of 73, 50% male (n=10)) received Eptifibatide administered intravenously for a mean duration of 32.5 hours (range 17-67 hours). No major or minor bleeding was observed except for a patient who exhibited minor complication of knee hemarthroses. 9 patients demonstrated early neurological improvement with only 2 exhibiting neurological deterioration related to extension of ischemic core.

Conclusions:

Application of IV Eptifibatide in achieving recanalization and preventing extension may be a safe standalone therapy in acute ischemic stroke patients ineligible for other neurological interventions. Larger randomized trials are required to corroborate our findings.

Keywords: Acute stroke, Antiplatelet, Medical management, Stroke

Financial Disclosures: The authors had no disclosures.

Grant Support: None.

Saturday, November 8, 8:00-8:10 am

Successful Endovascular Reconstruction of Tortuous Cervical Internal Carotid Artery Dissection with Pipeline Stent

Ahsan Sattar¹, Kaiz Asif, Osama O. Zaidat, Brian-Fred Fitzsimmons

Medical College of Wisconsin , Milwaukee, WI, USA

Introduction:

Endovascular stent reconstruction of very tortuous cervical internal carotid artery (ICA) dissections remains a challenging procedure. The presence of a 360-degree loop in the ICA makes the use of traditional carotid stents especially arduous. The use of the Pipeline embolization device (PED), which is primarily approved for wide neck intracranial aneurysms, could be an alternative stent for use in such ICA dissection treatment. However, no such cases have ever been reported in the literature

Methods:

Case: 73-year-old Caucasian male presented with acute right middle cerebral artery (MCA) stroke symptoms. Computed Angiography (CTA) revealed occlusion in the cervical ICA most consistent with a dissection. He was initially managed medically with anti-thrombotic therapy and aggressive IV hydration; however he continued to decline neurologically with worsening left sided weakness. Therefore, the decision was made to attempt a revascularization procedure.

Results:

Angiographic Description: The right common carotid injection showed near-complete occlusion of the mid cervical segment of the right ICA, with severe luminal irregularity, intraluminal thrombus and pseudoaneurysm formation around a 360-degree turn, consistent with an acute carotid dissection. Two telescoping Pipeline embolization devices were successfully deployed to reconstruct the mid-cervical ICA, followed by mechanical thrombectomy of a right MCA thrombus. Post-treatment control angiography confirmed widely patent stents accurately placed across the dissected carotid segment, with stagnation in the previously identified pseudoaneurysm. The patient made an excellent neurologic recovery and was discharged home a few days later. An eighteen month follow-up angiogram revealed continued patency of the Pipeline stents, with no evidence of residual dissection, stenosis, or pseudoaneurysm.

Conclusions:

The Pipeline Embolization device is an alternative endovascular treatment option for highly-tortuous, symptomatic cervical ICA dissections failing medical therapy.

Keywords: Acute Ischemic Stroke Intervention, Carotid stenting and angioplasty, Pipeline, Revascularization, Flow diverter

Financial Disclosures: The authors had no disclosures.

Grant Support: None.

Saturday, November 8, 5:00 - 5:10 pm

Feasibility of Intravenous Thrombolytic Therapy for Suspected Acute Ischemic Stroke on the Mobile Stroke Treatment Unit

Seby John^{1,2}, Russell Cerejo^{1,2}, Ather Taqui^{1,2}, Ahmed Itrat^{1,2}, Muhammad S Hussain^{1,2}, Peter Rasmussen^{1,2}, Ken Uchino^{1,2}, Gabor Toth^{1,2}

¹*Cerebrovascular Center, Cleveland Clinic Foundation, Cleveland, OH, USA,* ²*Cleveland PHAST Study Group, Cleveland, OH, USA*

Introduction:

Although ~ 15-40% of patients in the United States with acute ischemic stroke symptoms arrive at the hospital within the time window for intravenous thrombolytic therapy, only ~ 2-5% of all strokes receive IV tPA. Our ambulance-based Mobile Stroke Treatment Unit (MSTU) has an on-site treatment team with a telestroke neurologist, and on-board nurse, laboratory and CT scanner. We assessed the utilization of IV tPA in patients potentially eligible for thrombolytic therapy in comparison with historical controls.

Methods:

Using our institutional database, we identified patients evaluated by the MSTU in July-August 2014. Demographics, stroke timelines and treatment times were collected. Treatment with IV tPA, and reasons for not administering IV tPA, were collected.

Results:

Complete data was available in 35 patients. This included 19 (54%) females, with mean age of 64 years. Twenty-seven (77%) patients did not receive IV tPA due to the following reasons: 1. Symptoms felt not to be due to acute ischemic stroke (n=8, 23%); 2. Arrival outside of treatment time window (n=9, 26%); 3. Intracerebral hemorrhage (n=2, 6%); 4. Minor or rapidly resolving symptoms (n=6, 17%); 5. Other-coagulopathy (n=2, 6%). Of the remaining 8 (23%) patients who were eligible, all were successfully administered IV tPA. For the patients who did not receive tPA due to time contraindication, all were outside the treatment window at the time of MSTU arrival.

Conclusions:

The MSTU administered IV tPA in 23% of all evaluated patients, which is significantly higher than previous reports. In addition, all (100%) eligible patients with symptoms suggestive of acute ischemic stroke, and without contraindications for thrombolysis, were successfully administered IV tPA. The ambulance-based mobile stroke unit has a great potential to markedly increase IV tPA utilization rates, and improve patient outcomes.

Keywords: Acute stroke, New innovation

Financial Disclosures: The authors had no disclosures.

Grant Support: None.

Saturday, November 8, 5:10-5:20 pm

Primary thrombectomy within 3 hours of onset in acute ischemic stroke from occlusion of middle cerebral artery- a pilot study.

Yahia M Lodi^{1,2,3}, Varun V Reddy^{1,2}, Ashok Devasenapathy^{1,2}, Karmel Shehadeh³, A Hourani³, Joe Chou³

¹Upstate Medical University/UHS-Wilson Medical University-Binghamton Campus-Neurosciences, Binghamton, NY, USA, ²UHS-Wilson Regional Medical Center, Johnson City, NY, USA, ³Binghamton University, Binghamton, NY, USA

Introduction:

Acute ischemic stroke (AIS) due to large artery occlusion (LAO) with high NIHSS (>10), especially in internal carotid artery terminus (ICA-T) are resistant to IV thrombolysis and thrombectomy is associated with better recanalization rates. IV thrombolysis in large clot burden (>8mm) (LCB) in the middle cerebral artery (MCA) is associated with poor recanalization and outcome. Thrombectomy in AIS with LAO within 3 hours is performed as secondary therapy after IV thrombolysis. Objectives: To evaluate the feasibility, safety and recanalization rate of primary thrombectomy within 3 hours in AIS with NIHSS >10 from occlusion of MCA with LCB. Additionally, we like to report the functional outcome

Methods:

Based on institutionally approved protocol patients with LAO (ICA-T, MCA, vertebral-basilar artery) with LCB within 3 hours were offered primary thrombectomy as an alternative to IV rtPA. Prospectively maintained stroke database, consecutive patients who underwent primary MCA thrombectomy within 3 hours from 2012 to 2014 were analyzed using SAS software. Outcomes were measured using modified Rankin Scale (mRS)

Results:

10 patients with MCA occlusion; mean age 65±15.87 years and mean NIHSS 16±5; chose primary thrombectomy after informed consent. Thrombectomy was performed using stent-retriever device in addition to intra-arterial rtPA (2-4 mg). Number of passes was 1.4±.7. Near complete (TICI2b) and complete (TICI3) recanalization was observed in all patients. Mean time to recanalization from symptoms onset was 160±37 minutes. Immediate post-thrombectomy, 24 hour and 30 day NIHSS score was 2.6±1.4, 1.9±3.7 and 0 respectively. There was no procedure related complication. Asymptomatic perfusion related hemorrhage developed in 3 patients. 30 day good outcome was observed in all cases (mRS0= 30%, mRS1=50%, mRS2=20%)

Conclusions:

Our pilot study demonstrates that primary thrombectomy in AIS due to MCA occlusion with LCB is not only feasible and safe, but associated with complete recanalization and good functional outcome. Larger randomized controlled studies are needed.

Keywords: Acute Ischemic Stroke Intervention, Mechanical thrombectomy, Endovascular therapy

Financial Disclosures: The authors had no disclosures.

Grant Support: None.

Saturday, November 8, 5:20-5:30 pm

Redefining the Gold Standard: Transcranial Doppler Detects More Intra and Extra-Cardiac Right-to-Left Shunts than Trans-Esophageal Echocardiogram

Daniel Korya¹, Saqib Chaudhry, Nile Khan, Ildiko Torok, Mohammad Moussavi, Jawad F Kirmani

JFK Medical Center/Stroke and Neurovascular Center, Edison, NJ, USA

Introduction:

Paradoxical embolism is first evaluated with a contrast trans-thoracic echocardiogram (cTTE) since contrast trans-esophageal echocardiogram (cTEE) is more invasive. A right-to-left shunt (RLS) is the usual culprit. An adequate valsalva is essential for detection, but is difficult with cTEE. The degree of RLS through a PFO depends on strain rate and duration of Valsalva. The goal of this study was to evaluate whether or not cTCD could be more effective at detecting RLS.

Methods:

A review and evaluation of medical records and imaging was done for 130 consecutive patients with embolic stroke during 2012-2013 at a university affiliated comprehensive stroke center. Patients had embolic stroke and a cTCD to be included. Patients who were positive for RLS on cTCD were compared with those who had RLS on cTEE. Statistical analysis was performed to determine significance and potential for future complications.

Results:

Of the 130 patients who had embolic stroke and cTCD, 35 were positive for a RLS based on the presence of microbubbles in the cerebral circulation, and 95 were negative. Of the 35 patients with positive cTCD, (n=16) also underwent cTEE; however, only 44% (n=7), of them had positive results for RLS. Conversely, 56% of the patients who were shown to have RLS on cTCD were missed on cTEE (without cardiac septal defects). Of the 95 patients who had negative cTCD, 19 of them also underwent cTEE and all were negative on cTEE.

Conclusions:

Using cTCD to detect microbubbles in cerebral arteries appears to be more reliable and accurate for discovering RLS of intra or extra-cardiac origin. For embolic ischemic strokes, we recommend using cTCD as a first-line study and suggest it should be the new "gold standard". Randomized, prospective studies should be conducted to validate this data.

Keywords: Ischemic stroke, TCD, Pathophysiology, Embolization, Atherosclerosis

Financial Disclosures: The authors had no disclosures.

Grant Support: None.



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Poster Presentations

Saturday, November 8, 2014 • 5:30pm – 7:00pm

Authors will be standing by their posters during the following hours:

Odd-Numbered Posters: 5:30pm – 6:15pm

Even-Numbered Posters: 6:15pm – 7:30pm

Poster #	Title	Presenting Author
Category: Aneurysms and Subarachnoid Hemorrhage		
1	Flow-Diversion Versus Conventional Treatment for Carotid Cavernous Aneurysms	Norman Ajiboye
2	Single Center Experience of Cerebral Aneurysm Coiling Using New Generation and Compaction Resistance Large Penumbra 400 coils`	Saritha Kundoor
3	Endovascular strategies in dissecting ruptured and symptomatic intracranial pseudo-aneurysm -a case series	Yahia Lodi
4	Treatment of Ruptured Intracranial Aneurysms with the Pipeline Embolization Device	Norman Ajiboye
5	Safety of Eptifibatide in Select Patients with Elective Cerebral Aneurysm Embolization	Siddhart Mehta
6	ED-based Rapid Brain-Attack Triage Algorithms in a Comprehensive System of Stroke Care Positively Impact Discharge Disposition for Sub-arachnoid Hemorrhage	Suman Nalluri
7	Safety of Reversible Parental Anti-Platelets in Patients with Aneurysmal Subarachnoid Hemorrhage	Siddhart Mehta
Category: Case Reports		
8	Acute Glaucoma Exacerbation Following Carotid Artery Stenting	Keith DeSousa
9	Treatment of Direct Carotid-Cavernous Fistulas with a Double Lumen Balloon	German Abdo
10	Isolated left Vein of Labbe Thrombosis in a Patient with Ipsilateral Aplastic Venous Anomaly	Mersedeh Bahr-hosseini
11	Permanent Deployment of Solitaire for Acute Basilar Occlusion	Keith DeSousa
12	CM-AVM Syndrome and Severe Hemophilia B in an Infant: Case Report and Staged Treatment	Karen Chen
13	Significance of Symptomatic Acute Ischemic Stroke (sAIS) following Malignant Glioma Resection	Deepak Gulati
14	Endovascular Retrieval of Mitral Valve Fragment from Middle Cerebral Artery	Miguel Litao
15	Status Penumbrosus: A New Concept	Saritha Kundoor
16	Cerebral Aneurysm and Spontaneous Subarachnoid Hemorrhage as Delayed Complication of Gamma Knife Radiosurgery For Trigeminal Neuralgia	Parsa J. Lotfi



Society of Vascular and Interventional Neurology

7th Annual Meeting

November 7-9, 2014

The Diplomat Resort and Spa • Hollywood, FL

Poster #	Title	Presenting Author
	Category: Subarachnoid Hemorrhage	
17	Treatment of Ruptured Aneurysm with Pipeline	Akram Shhadeh
	Category: Cerebrovascular Imaging	
18	Full Functional Independence Following Endovascular Treatment for Basilar Artery Occlusion Despite Extensive Bilateral Pontine Infarcts on DWI: Refuting a Self-Fulfilling Prophecy	Vikas Patel
19	Natural Course of Acute Ischemic Stroke (AIS) Patients with MRA/CTA-DWI Mismatch As Defined by DEFUSE Study	Rohini Bhole
20	TICI Quantified: Automated Cerebral Revascularization Grading in Acute Ischemic Stroke	Ahsan Sattar
21	CTA Collaterals Predict Infarct Volume and Clinical Outcome After Endovascular Therapy for Ischemic Stroke	Nitin Goyal
22	Eptifibatide Use is Safe After Full Dose IV tPA and Endovascular Treatment in Patients with Acute Ischemic Strokes	Siddhart Mehta
23	Bridging with Tirofiban in Patients with Recent Intracranial Stent Requiring Interruption of Oral Dual Anti-Platelet Therapy for Non-Emergent Surgical Procedures	Katleen Chester
24	Feasibility of Novel Methodology Using Barbiturates and Prolonged Hypothermia Combination Therapy in Treatment of Malignant Refractory Intracranial Pressure	Muhammad Hussaid
25	The Effect of Using Eptifibatide Drip in Conjunction with Endovascular Procedure on the Functional Outcome of Patients Presenting with Acute Ischemic Stroke	Gary Jain
26	Neurointerventional Stenting and Antiplatelet Function Testing "To Do Or Not To Do?"	Tareq Kass-Hout
27	General Anesthetic Use and Clopidogrel Resistance During Neurovascular Stenting Procedures	Yamin Shwe
28	Large Single Center Experience of Safety of Eptifibatide in Patients Undergoing Mechanical Thrombectomy and Thrombolysis for Acute Ischemic Stroke	Jawad Kirmani
	Category: Clinical Trial and Translational Research	
29	Factors Determining Consent in a Randomized Trial of Intra-Arterial Stem Cell Therapy for Sub-Acute Ischemic Stroke	Dileep Yavagal
30	Novel Endovascular Large Animal Stroke Model: Determinants of Infarct Volume and Neurodeficit Score	Dileep Yavagal
31	TARGET Intracranial Aneurysm Coiling Prospective Multicenter Registry: Initial Periprocedural Results in 150 Patients	Osama Zaidat
	Category: Interventional Neurology	
32	Primary Manual Aspiration Thrombectomy for Central Venous Sinus Thrombosis	Cynthia Kenmuir
33	Preoperative Endovascular Embolization Of Internal Maxillary Artery For Temporomandibular Joint Ankylosis Surgery	Yazan Alderazi



Society of Vascular and Interventional Neurology

7th Annual Meeting

November 7-9, 2014

The Diplomat Resort and Spa • Hollywood, FL

Poster #	Title	Presenting Author
Category: Interventional Neurology continued		
34	Dural Venous Sinus Stenting in Idiopathic Intracranial Hypertension	Michael Abraham
35	Proposal to Develop a SVIN Listserv	Ankur Garg
36	The Future Role of Interventional Neurology - A Survey of Neurology Department Chairmen, Program Directors and Clerkship Directors	John M. Leschke
37	Back Pain Management Utilizing Vertebral Augmentation in Multiple Myeloma Patients: A Practical Approach to the Reduction of Pain, Improvement of Functional Status, and Palliative Success	Chad Baarson
38	Preoperative Tumor Embolization Using Low Concentration of N-Butylcyanoacrylate (nBCA) and Ethiodol	Kunal Bhatia
Category: Intracerebral Hemorrhage		
39	Standardized Color-coded Algorithms and Order Sets for Inpatients with Intracerebral Hemorrhage Reduce Length of Stay in the Neuro Intensive Care Unit	Suman Nalluri
40	Poor Prognostic Impact of Intracranial Arterial Stenosis in Patients with Acute Vertebrobasilar Artery Occlusion (Category: Ischemic Stroke Endovascular Intervention)	Osama Zaidat
41	Standardized Color-coded Algorithms and Order Sets for Inpatients with Intracerebral Hemorrhage Reduce Length of Stay in a Comprehensive System of Stroke Care	Parita Bhuvra
Category: Ischemic Stroke Endovascular Intervention		
42	The Penumbra 5 MAX ACE Device Results in Better Patient Disposition	Karthikeyan Arcot
43	Systematic Review of the Safety of Stroke Thrombectomy Devices in the US: Analysis of the "Manufacturer and User Facility Device Experience" Database	Chandril Chugh
44	The Use of More than One Endovascular Device Leads to Worse Functional Outcome and Mortality in Acute Ischemic Stroke	Haitham Dababneh
45	Endovascular Therapy for Patients with Acute Ischemic Stroke and Isolated Aphasia with No Motor Deficits	Susruth Dharmadhikari
46	Optimization of Aspiration Efficacy to Reduce Distal Thromboemboli During Mechanical Thrombectomy in a Model System of Cerebrovascular Occlusion	Matthew Gounis
47	Deployable Stentriever: A Necessary Tool for Safety During Mechanical Thrombectomy?	Jawad Kirmani
48	Intra- or Extracranial ICA Occlusion Among Acute Ischemic Stroke Patients Predicts Longer Times to Recanalization Using Initial Direct Aspiration with Penumbra MAX Catheters	Kessarín Panichpisal
49	Profiling of Thrombi Extracted from Patients with Acute Ischemic Stroke: Preliminary Feasibility Study	Michelle Previtera
50	Endovascular Acute Stroke Intervention with Stent Clot Retrievers: Single Center Experience	Shuichi Suzuki



Society of Vascular and Interventional Neurology

7th Annual Meeting

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Poster #	Title	Presenting Author
	Category: Category: Ischemic Stroke Endovascular Intervention cont'd	
51	The Penumbra 5MAX ACE Catheter is an Efficient, Safe, and Cost Effective Mechanical Thrombectomy Device for Large Vessel Occlusions (LVO) in Acute Stroke	Gabriel Vidal
52	Rapidly Improving Symptoms and Withholding Intravenous Recombinant Tissue Plasminogen Activator (IV r-tPA) in Acute Ischemic Stroke within Community Hospitals: Is it time to Re-visit this?	Keyur Patel
53	Are Big Trials Always Right? Challenging IMS 3: Single Centered Study	Mohammad Moussavi
	Category: Category: Noval Approaches and Emerging Therapies	
54	Single Center Experience with Acute Ischemic Stroke Endovascular Intervention Through Access other than Common Femoral Artery	Dan-Victor Giurgiutiu
55	Safety and Effectiveness of Endovascular Therapy After 8 hours of Acute Anterior Circulation Stroke using Stent Retriever	Dan-Victor Giurgiutiu
56	Mobile Stroke Treatment Unit May Help with Early Triage of Patients with Suspected Large Vessel Occlusion	Russell Cerejo
57	A Novel Approach to Diagnose Reversible Cerebral Vasoconstriction Syndrome (RCVS): A Case Series	Tareq Kass-Hout
	Category: Predictors of Outcome	
58	Analysis of the SPAN-100 Index as a Predictor of Clinical Outcome in the Post-Marketing North American SOLITAIRE Stent-Retriever Acute Stroke Registry	Alicia Castonguay
59	Longer Procedural Times Are Independently Associated with Symptomatic Intracranial Hemorrhage in Large Vessels Occlusion Stroke Patients Undergoing Thrombectomy	Tareq Kass-Hout
60	Predictors of Infarct Growth Despite Full Reperfusion Following Endovascular Therapy for Acute Ischemic Stroke	Diogo Haussen
61	Validation of the Interventional Stroke Assessment Scale for Eligibility in Endovascular Therapy (ISAS-ET)	Haitham Dababneh
62	Hydration After IV tPA Predicts Outcome	Daniel Korya
63	Predictors of Good Outcome in the Elderly following Contemporary Endovascular Therapy for Acute Ischemic Stroke	Andrey Lima
64	Higher Total Cholesterol, HDL and LDL Levels Increase the Risk of Intracranial Hemorrhage After Endovascular Treatment for Ischemic Stroke	Mohammad Moussavi
65	Age is Not a Predictor of Outcome in Patients Who Underwent Stent Retriever Thrombectomy for Acute Ischemic Stroke from Middle Cerebral Artery Occlusion	Varun Reddy
66	Controlling for Hypotension or ASPECTS Eliminates the Association between General Anesthesia and Poor Outcome after ERT	Matthew Whalin
67	The Effectiveness of the Motor Component of the National Institute of	Hou Xiang Zheng



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The Diplomat Resort and Spa • Hollywood, FL

	Health Stroke Scale at Predicting the Functional Outcome at Discharge in Patient Receiving Endovascular Therapy	
Poster #	Title	Presenting Author
	Category: Systems of Stroke Care	
68	Weekly Trends of Acute Stroke Consults in a Regional Tele-stroke Network: Increased Stroke Risk on Monday?	Chandril Chugh
69	Diurnal Variations in Ischemic Stroke Admissions within a Multi-Hub and Spoke Regional Brain Attack Network	Ryan Gianatasio
70	Prospective Study of the Feasibility of Pre-hospital Paramedic-initiated Blood Draws in Acute Stroke Patients En-route to a Stroke Center to Help Reduce Door-to-Needle Times: Tarrant County Experience	Vallabh Janardhan
71	Barriers To Administering Intravenous Recombinant Tissue Plasminogen Activator (iv R-tpa) In Acute Ischemic Stroke: Real World Experience From Community Hospitals Within A Regional Brain Attack Network	Keyur Patel
72	Double-digit Overall Intravenous recombinant tissue plasminogen activator (IV r-tPA) treatment rates in Acute Ischemic Stroke can be achieved in Community hospitals within a Regional Tele-Stroke Network	Ryan Gianatasio
73	Trends in Utilization of EMS Mode of Arrival in a Comprehensive System of Stroke Care	Tanzila Shams
74	Primary Stroke Centers have shorter Length of Stay Trends for In-patients with Transient Ischemic Attacks within a Comprehensive System of Stroke Care	Tanzila Shams
	Category: Vascular Malformations	
75	Endovascular Treatment for Cribliform Plate Dural Arteriovenous Fistulas: Technical Difficulties and Complications Avoidance	Michel Piotin
76	IA Stroke Therapy Benefits Despite Lack of "Penumbra" on CT Perfusion (Category: Ischemic Stroke Therapies)	Akram Shhadeh

Poster 1

Flow-Diversion Versus Conventional Treatment for Carotid Cavernous Aneurysms

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Introduction:

Several endovascular treatment options are available for cavernous carotid aneurysms (CCA). We compared PED versus conventional endovascular treatment in terms of evolution of mass effect, complications, recurrence and retreatment rate.

Methods:

One hundred fifty-seven patients harboring 167 CCA were treated using PED placement, coiling, stent assisted coiling (SAC), and carotid vessel destruction (CVD). Procedural complications, angiographic results, and clinical outcomes were analyzed and compared.

Results:

There were no difference in age, gender, and mean aneurysm size between those treated with PED and those treated with conventional endovascular procedures. The patients treated with PED had a significantly lower proportion of small size aneurysms ($< 10\text{mm}$) and a shorter follow-up duration. Multivariate analysis revealed treatment other than PED (PED: $\text{OR}=0.03$; $p=0.002$) and size $>15\text{mm}$ ($\text{OR}=4.27$; $p=0.003$) to be predictors of none improvement in symptoms. The rate of complete occlusion was 81.36% (48/59) for PED, 42.25% (39/71) for SAC, 27.27% (6/22) for coiling and 73.33% (11/15) for CVD. Retreatment was needed in patients with aneurysm size $>15\text{ mm}$ ($\text{OR}=2.67$; $p=0.037$) and those who were not treated with PED (PED: $\text{OR} = 0.16$; $p=0.006$). The rate of major complications was 6.6% (11/167). Patients that were treated with PED or SAC had 3.84 lower odds to develop complications ($\text{OR}= 0.26$ $p< 0.05$).

Conclusions:

The use of PED should be encouraged, especially in symptomatic patients. We found PED to be associated with less need for future treatment, higher improvement in symptoms rate and lower rate of complications.

Keywords: Flow diverter, Pipeline, Endovascular therapy, Stent assisted

Financial Disclosures: The author had no disclosures.

Poster 2

Single Center Experience of Cerebral Aneurysm Coiling Using New Generation and Compaction Resistance Large Penumbra 400 coils.

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Introduction:

Intracranial aneurysms are significant health problem in United States with an estimated 1% to 6% of the adult population harboring cerebral aneurysms.

Methods:

Retrospective, single-center study which included 32 patients who are treated with pipeline /other stent assisted penumbra 400 coils and PC 400 coils alone of ruptured/unruptured intracranial aneurysms.

Results:

32 patients met the above inclusion criteria and were included in this study. 7/32 presented with ruptured aneurysm and 25/32 were unruptured. No procedural related complications of permanent stroke or death occurred were noted. The overall complete aneurysm occlusion rate was 81% (across all aneurysm sizes and locations) in the 21 patients who completed the 3-9 months follow-up. One death occurred in the ruptured group prior to discharge from the hospital. For the unruptured cases; 1/25 patient died due to unrelated causes at 4- months post-treatment. Primary coiling was the most common treatment modality in 14 cases with no recurrence in 82% of the cases with follow up at 6 months. For the 9/32 small (< 7mm), complete occlusion occurred in (100%) with no peri-procedural complications and, in the 4 patients who completed 3-9 month follow up no recurrence of aneurysm occurred.

Conclusions:

The use of the large compaction resistance coils is safe, with very low peri-procedural event rates of permanent stroke or death. However, complete occlusion rate is still limited across all aneurysm sizes and location, but higher occlusion was achieved in smaller aneurysms. Comparison to the standard smaller size coils is needed.

Keywords: Aneurysm, Aneurysm Embolization, Coiling, Angiogram

Financial Disclosures: The authors had no disclosures.

Poster 3

Endovascular strategies in dissecting ruptured and symptomatic intracranial pseudo-aneurysm -a case series

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Introduction:

The natural history of intracranial dissecting pseudo-aneurysm (IDSA) is not known. Published case series demonstrated non favorable outcome when IDSA was primarily treated with pipeline device. Objective of our study is to describe endovascular strategies used to treat our series of ruptured and symptomatic IDSA. Additionally, we like to report the clinical and radiographic outcome for our case series.

Methods:

Retrospective analysis of all IDSA that underwent endovascular repair from January 2008 to April 2014. Patient demographics including aneurysm morphology and endovascular treatment modalities including angiographic data were collected. Clinical outcome was measures using modified Rankin Scale score (mRS).

Results:

Eight patients with median age of 58 year old (range 38-71), 7 women and one man. Of 8 patients, 3 were ruptured and 5 symptomatic ; 6 spontaneous, one immediate post craniotomy and one suspected post motor vehicle accident. Five aneurysms were located in the internal carotid artery (ICA) petro-cavernous portion, one in ICA-supraclinoid, one in the right Vertebral artery (VA) and one in left VA-posterior inferior artery. Endovascular strategies utilized; 5 required stent-assisted coiling, one Stenting only and two primary coiling. Recurrence was observed in 6 of 8 ICA territories; 5 underwent recoiling, additional in one and one pipeline. One recurrent case underwent external to internal carotid artery bypass surgery and repair of aneurysm resulting in malignant stroke and death. Good outcome was observed in 7 cases (mRS 0 in 4, mRS 1 in 2, mRS 2 in 1).

Conclusions:

Most of the intracranial dissecting pseudoaneurysms could be treated successfully using current endovascular approach with good clinical outcome. However, the recurrence rate is extremely common; therefore a close early follow-up is necessary for all cases especially those are located at the petro-cavernous junction of the ICA. Further long-term follow-up study is required.

Keywords: Aneurysm, Endovascular therapy, Stent assisted

Financial Disclosures: The authors had no disclosures.

Poster 4

Treatment of Ruptured Intracranial Aneurysms with the Pipeline Embolization Device

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Introduction:

Background: The Pipeline Embolization Device (PED) has been used for treatment of unruptured aneurysms. Little is known about the use of the PED in ruptured aneurysms. Objective: To assess the safety and efficacy of the PED in ruptured intracranial aneurysms.

Methods:

This is a case series with prospective data collection on 20 patients with freshly ruptured aneurysms who were treated with PED (with or without adjunctive coiling) at 2 cerebrovascular centers. Patients were loaded with aspirin and clopidogrel or received an infusion of tirofiban intraoperatively.

Results:

Hunt and Hess grades were I in 7 patients (35%), II in 9 (45%), and III in 4 (20%). The median duration from hemorrhage to PED placement was 2 days. A single device was used in all but 1 patient (95%). The procedure was staged in 20%. There was only 1 complication (5%); this was a fatal intraoperative aneurysm dome rupture that occurred during adjunctive coil deployment. No infarcts or rehemorrhages occurred. No patient required an invasive procedure after PED placement. Follow-up angiography (mean, 5±4.5 months, range 2-12 months) showed 100% occlusion in 12 (92%) and incomplete occlusion in 1 patient (8%). At the latest follow-up, 19 patients achieved a favorable outcome (mRS 0-2).

Conclusions:

In our preliminary experience, treatment of ruptured aneurysms with the PED was associated with low complication rates, high occlusion rates, and favorable outcomes. These findings suggest that PED may be a safe and effective option for patients with favorable Hunt and Hess grades and aneurysms difficult-to-treat with conventional methods.

Keywords: Aneurysm, Flow diverter, Pipeline, Ruptured, Subarachnoid hemorrhage

Financial Disclosures: The author had no disclosures.

Safety of Eptifibatide in Select Patients with Elective Cerebral Aneurysm Embolization

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Introduction:

Literature has reported the application of oral Aspirin and/or Clopidogrel in significantly reducing thromboembolic complication after aneurysmal coiling. There is a lack of data on intravenous Eptifibatide use as the choice of antiplatelet agent in the setting of elective cerebral aneurysmal embolization. We report safety outcomes associated with use of intravenous Eptifibatide in elective embolization of cerebral aneurysms.

Methods:

Of all the patients that underwent elective cerebral aneurysmal embolization from 2010-13 at our university affiliated comprehensive stroke center, patients that received Eptifibatide after aneurysmal embolization were reviewed. Eptifibatide was administered intra-arterially as a 135- μ g/kg single-dose bolus, and then continued on intravenous infusion of 0.5- μ g/kg/min post-procedurally. Inclusion criteria included clinically assessed risk of clot formation or propagation based on angiographic characteristics. Charts were reviewed for all patients to assess for medical/procedural complications including symptomatic and asymptomatic hemorrhages, groin hematoma, epistaxis and gross hematuria.

Results:

A total of 19 patients (mean age 63, 21% male [n=4]) received Eptifibatide for a mean duration of 19 hours (range 4-29 hours). The aneurysmal size ranged from 2.4 to 22 mm and 89% [n=17] were located in anterior circulation. None of the patients demonstrated symptomatic/asymptomatic hemorrhage, groin hematoma, epistaxis or hematuria.

Conclusions:

IV Eptifibatide may represent another safe option for rapid and reversible antiplatelet therapy for reduction of thromboembolic complication associated with aneurysmal embolization in select patient population. Further larger prospective trials are needed to corroborate our findings.

Keywords: Antiplatelet, Aneurysm Embolization

Financial Disclosures: The authors had no disclosures.

Poster 6

ED-based Rapid Brain-Attack Triage Algorithms in a Comprehensive System of Stroke Care Positively Impact Discharge Disposition for Sub-arachnoid hemorrhage.

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Introduction:

Standardized rapid-triage algorithms in chest pain centers have impacted door-to-balloon times and discharge disposition in patients with heart attacks. With the advent of comprehensive systems of stroke care, there is limited data on similar algorithms in stroke centers on discharge disposition in hemorrhagic stroke patients with sub-arachnoid hemorrhage (SAH).

Methods:

Standardized color-coded ED-based rapid-triage algorithms (Fig: 1) and order sets for SAH were implemented in 2010 as part of a comprehensive system of stroke care across 9 hospitals (2 Comprehensive stroke centers and 7 Primary Stroke Centers). Patients with SAH were identified based on an in-patient hospital neuroscience discharge database using ICD-9 code (430). The discharge dispositions were analyzed and categorized as an “excellent” discharge disposition when they were discharged to home with self-care, or home with home health service. Fisher’s exact p -test was used to calculate 2-tailed p -values ($p < 0.05$ was considered significant).

Results:

A total of 17,138 consecutive in-patient hospital neuroscience discharges were evaluated over a 4-year period, of which 722 patients (60% Women; $n=436$) were diagnosed with SAH (Mean Age: 56 +- 16 SD years). Prior to launch of these algorithms, only 31.1% of SAH patients had an excellent discharge disposition (2009). In comparison following the launch, an excellent discharge disposition was noted in 45.3% of SAH patients (2010), 45.2% of SAH patients (2011), and 45.2% of SAH patients (2012) respectively (Fisher Exact t-statistic: 0.008; $p < 0.05$).

Conclusions:

Standardized ED-based color-coded algorithms and order sets for SAH is feasible in a comprehensive system of stroke care and significantly improves discharge disposition in sub-arachnoid hemorrhage patients.

Keywords: Cerebrovascular disease, Decision analysis, Health economic, Hemorrhage, SAH

Financial Disclosures: The authors had no disclosures.

Poster 7

Safety of reversible parental anti-platelets in patients with aneurysmal Subarachnoid Hemorrhage

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Introduction:

The International Subarachnoid Aneurysm Trial (ISAT) showed a greater likelihood of survival free 1 year disability in patients undergoing endovascular coiling who were started on antiplatelet agents after SAH compared to ones undergoing neurosurgical clipping. However, data on safety of acute parental antiplatelet agents after aneurysmal coiling is lacking. We report on the safety of IV Eptifibatide (rapidly reversible Glycoprotein IIb/IIIa inhibitor) on patients presenting with acute subarachnoid hemorrhage undergoing endovascular coiling for aneurysmal embolization.

Methods:

All the patients from 2009-13 who presented to our university affiliated comprehensive stroke center with aneurysmal subarachnoid hemorrhage and underwent endovascular coiling were included for the study. Patients that received IV Eptifibatide for various reasons including acute need for stent assist coiling after securing the ruptured aneurysm with endovascular coiling were reviewed. Eptifibatide was administered intra-arterially as a 135- $\mu\text{g}/\text{kg}$ single-dose bolus, and then continued on intravenous infusion of 0.5- $\mu\text{g}/\text{kg}/\text{min}$ post-procedurally. Charts were reviewed for all patients to assess for medical/procedural complications including symptomatic and asymptomatic intra- and extra-cranial hemorrhages, groin hematomas, epistaxis and gross hematuria.

Results:

Of the total of 93 patients treated with coil embolization during this period, 5 patients (mean age 56 years, 20% male [n=1]) received acute intra-procedural Eptifibatide followed by IV infusion for a mean duration of 77 hours (range 20-130 hours). Various reasons for use of Eptifibatide included: stent assist coiling [n=2], multiple stents for flow diversion [n=1], partial coil prolapse [n=1] and vascular lumen flow compromise [n=1]. None of the patients demonstrated symptomatic/asymptomatic hemorrhage, groin hematoma, epistaxis or hematuria.

Conclusions:

Our results may highlight safety of administering IV Eptifibatide to prevent thrombotic complications after endovascular coil embolization in select patients with aneurysmal subarachnoid hemorrhage. Multicenter prospective trials are warranted to corroborate our findings.

Keywords: Antiplatelet, Ruptured, SAH

Financial Disclosures: The authors had no disclosures.

Poster 8

Acute Glaucoma Exacerbation following Carotid Artery Stenting

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Introduction:

Acute worsening of glaucoma has been rarely reported following carotid endarterectomy (CEA). To date, there have been no reported cases of acute worsening of glaucoma following carotid artery stenting (CAS).

Methods:

A 66 year-old male with hypertension, diabetes, coronary artery disease, and left eye blindness due to diabetic retinopathy and vitreous hemorrhage presented with two episodes of transient right eye vision loss. He was found to have ipsilateral internal carotid artery (ICA) stenosis and underwent right CAS with proximal embolic protection. Prior to the procedure, ocular tonometry revealed intraocular pressures (IOP) of 19mmHg OU. A 2mm balloon was navigated into the right ICA for pre-stent angioplasty followed by stent deployment. A 5mm balloon was used for post-stent angioplasty. The carotid stenosis was near-resolved post-procedure. There were no intra-operative adverse events.

Results:

Acutely following the procedure, the patient developed worsening vision. Follow-up tonometry revealed increased IOP. On post-op day (POD) #1, the IOP increased to 29mmHg OD and 22mmHg OS. By POD #5, the IOP was 34mmHg OD and 35mmHg OS. By POD #9, the patient's vision was subjectively improved and IOP decreased to 30mmHg OD and 27mmHg OS. His blurry vision resolved completely thereafter. In outpatient follow-up on POD #24, tonometry revealed that IOP had decreased to 22mmHg OD and 18mmHg OS.

Conclusions:

We present a case of a patient with acute increase in bilateral IOP immediately following CAS, likely due to neovascular glaucoma as reported in previous cases after CEA. This case report is important because it identifies a potential complication of CAS that previously had been reportedly associated only with CEA.

Keywords: Carotid stenting and angioplasty, Carotid, Stenting, Endovascular, CEA

Financial Disclosures: The authors had no disclosures.

Poster 9

Treatment of Direct Carotid-Cavernous Fistulas with a Double Lumen Balloon

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Introduction:

Treatment of direct high-flow carotid-cavernous sinus fistulas (dCCF) can be challenging. We describe treatment of dCCFs with dual lumen balloons.

Methods:

We describe four cases of dCCF that were effectively closed with a double lumen balloon. In all four patients the affected carotid was catheterized with a 6F guide catheter. It was decided to use a double lumen balloon to characterize the carotid wall defect and decide the best treatment approach. The double lumen balloon was navigated proximally to the cavernous segment of the internal carotid artery (ICA). At this point the balloon was inflated to interrupt the arterial flow. A microcatheter injection was performed simultaneously through the balloon to characterize the carotid-wall tear. Two patients had a traumatic dCCF with a large ICA defect that required embolization with coils and liquid embolic material. One patient with a traumatic pseudoaneurysm of the carotid wall was treated with coils only. A fourth patient with a ruptured ICA cavernous aneurysm required balloon assisted coil (BAC) embolization of the aneurysm.

Results:

All dCCFs were successfully closed. The balloon was mainly used to characterize the carotid wall defect and decide the best treatment option. Two patients with traumatic dCCF had a large carotid wall defect and the balloon was used to protect the ICA lumen while coils and liquid embolic material were used to close the cavernous sinus and reconstruct the ICA. In two other patients the balloon was used for BAC of a ruptured cavernous segment aneurysm and a post-traumatic pseudoaneurysm of the carotid wall. Three patients underwent a diagnostic angiogram on follow up that demonstrated complete occlusion of the dCCF. One patient did not have a diagnostic angiogram. All patients had symptom resolution.

Conclusions:

Double lumen balloons can be used in the treatment of direct CCFs.

Keywords: Balloon assisted, Onyx, New technique, Embolization, Carotid

Financial Disclosures: The authors had no disclosures.

Poster 10

Isolated left Vein of Labbe' Thrombosis in a Patient with Ipsilateral Aplastic Venous Anomaly

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Introduction:

The vein of Labbe' (VOL) is part of the superficial cerebral venous system that drains the lateral surface of the temporal lobe and the region adjacent to the sylvian fissure into the transverse and sigmoid sinuses. Hence, VOL thrombosis manifests as hemorrhagic infarct of infero-lateral temporal lobe. Aplasia of the venous sinuses could be seen in general population. This normal variation becomes of great importance in the setting of ipsilateral cerebral venous thrombosis, as lack of knowledge of it could be a source of diagnostic pitfalls. This study is a case presentation of concomitant VOL thrombosis and aplasia of transverse and sigmoid sinuses and jugular vein.

Methods:

CT scan of the head, MRI of the brain, MR angiography, MR venography and cerebral angiogram were obtained.

Results:

CT scan and MRI of the brain demonstrated temporal lobe hemorrhage. MR venography identified absence of signal flow void within the left transverse and sigmoid sinuses and jugular vein. Aplasia of the left venous system was suggested by the absence of the osseous jugular foramina on the CT image. Cerebral angiogram confirmed the lack of normal outflow in the left venous system and demonstrated the occlusion of the left VOL.

Conclusions:

Aplasia of venous sinuses could compromise the diagnosis of VOL thrombosis and better knowledge of it could make the neuroimaging findings easier to interpret. Focal temporal lobe hemorrhage with the concomitant absence of osseous anatomy of a jugular foramen on CT images, and angiographic finding of focal flow reversal within distal portion of the aplastic sinus may further facilitate early diagnosis of VOL thrombosis in the context of aplastic venous anomaly. Furthermore, aplasia of venous sinuses could be considered as a potential risk factor for acute thrombosis in the ipsilateral venous system particularly small cortical veins.

Keywords: Cerebral sinus and venous thrombosis, Intracerebral Hemorrhage, Angiogram, Imaging

Financial Disclosures: The authors had no disclosures.

Poster 11

Permanent Deployment of Solitaire for Acute Basilar Occlusion

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Introduction:

Scarce reports exist of permanent deployment of Solitaire FR™ devices for arterial occlusion as it is primarily indicated for temporary deployment for thrombectomy. We present two cases where Solitaire FR™ device was electrolytically detached to re-establish flow in an occluded or stenotic basilar artery.

Methods:

Patient 1: A 47 year old female with basilar stenosis under medical management presented 10 days into admission with increased confusion, somnolence, and right hemiparesis (NIHSS=24). Digital Subtraction Angiography (DSA) showed an acute occlusion of the mid-basilar artery. A Transend-14-microwire was used to push through the occlusion, followed by a Marksman microcatheter. After balloon angioplasty, a 4x15mm Solitaire™ device was positioned in the basilar artery and electrolytically detached to maintain vessel patency. Patient 2: A 53 year old male presented with 12 hours of dizziness, dysarthria, and right hemiparesis (NIHSS=7). DSA showed 90% stenosis of the mid-basilar artery and one hypoplastic posterior communicating artery. After repeated balloon angioplasty, a 4x15mm Solitaire™ was deployed across the stenotic segment and electrolytically detached.

Results:

Patient 1: Good antegrade flow was restored in the basilar artery (TICI 3). Groin puncture to recanalization time was 204 minutes. She was found to have anti-phospholipid syndrome and was started on anticoagulation, in addition to dual antiplatelet regimen. Post-procedure clinical course was complicated by an asymptomatic, 4x3cm vermian/right medial cerebellar hemorrhage on post-op day (POD) #4 which was stable on subsequent imaging. She was discharged on POD#14 with NIHSS=4. Patient 2: There was a decrease in the degree of stenosis from 90% to 50% after stenting (TICI 2b). Groin puncture to recanalization was 303 minutes. He was discharged on POD#4 with NIHSS=2.

Conclusions:

We present two cases of permanent deployment of Solitaire FR™ devices which effectively restored flow in the posterior circulation. Long term effectiveness of this approach is unknown.

Keywords: Solitaire, Acute stroke, Stenting, Basilar, intra caranial stenosis

Financial Disclosures: The authors had no disclosures.

CM-AVM SYNDROME AND SEVERE HEMOPHILIA B IN AN INFANT: CASE REPORT AND STAGED TREATMENT

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Introduction:

Hemophilia B is an X-linked deficiency in factor IX affecting 1 in 25,000 males. Most patients with severe Hemophilia B (levels < 1%) manifest clinically at the time of circumcision; the remaining present by age two with sporadic or excessive hemorrhage. Early diagnosis and treatment are essential for prophylaxis and preoperative planning.

Methods:

We report a 5-month old male with a fast-flow intracranial arteriovenous malformation (AVM) in addition to a RASA 1 mutation and cutaneous capillary lesions, known as Capillary Malformation Arteriovenous Malformation Syndrome (CM-AVM). He developed symptomatic hydrocephalus at 3 months of age, and severe hemophilia B was incidentally discovered in his work up for treatment planning.

Results:

In consultation with a Pediatric Hematologist, a tunneled Broviac catheter was placed with perioperative factor IX concentrate dosing. Because patients with severe deficiency may produce antibodies to exogenous factor IX, kinetic post-treatment studies were performed to assess for factor inhibition. He then received his first embolization therapy with perioperative factor IX concentrate dosing followed by prolonged manual pressure at the puncture site without adverse event. A second treatment is scheduled. The treatment of a high flow AVM in a patient with CM-AVM and severe hemophilia B to our knowledge has not yet been reported.

Conclusions:

This case describes the feasibility and safety of endovascular embolization on a fast-flow intracranial AVM with perioperative Factor IX concentrate replacement.

Keywords: Pediatric intervention, Coagulation, Endovascular therapy, AVM embolization

Financial Disclosures: The authors had no disclosures.

Significance of Symptomatic Acute Ischemic Stroke (sAIS) following Malignant Glioma Resection

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Introduction:

Diffusion restriction changes are common after malignant glioma resection without causing any new neurological deficit. The significance and pathophysiology of postoperative acute ischemic stroke leading to new or worsened neurological deficit remains unclear as illustrated in our two cases.

Methods:

1st case is a 69 y/o F with left temporal Grade IV Glioblastoma s/p resection and chemoradiation about 2 years ago who underwent subtotal resection of recurrent left temporal mass. Patient experienced worsening aphasia during immediate postoperative period. MRI revealed multifocal diffusion restrictions in LMCA territory outside of surgical bed. CTA showed diffuse narrowing in Lt M2 branches with vessel paucity. 2nd case is a 37 y/o F who underwent resection of Grade III anaplastic astrocytoma in left subinsular region after she presented with new onset aphasia. The surgery was prolonged due to extensive dural adhesions. Aphasia gradually improved postoperatively. After 4 weeks, MRI showed new multifocal diffusion restriction within the temporal lobe outside of surgical bed along with paucity of M3 and M4.

Results:

In Case 1, we speculate AIS is either due to direct trauma from retraction or dissection of blood vessel, or cauterization itself. Radiation induced vasculopathy plays an additional role. In Case 2, we speculate AIS is secondary to vasospasm in presence of blood or tumor invasion of vessel wall. Direct intraoperative vascular injury is less likely to play a role after 4 weeks in spite of prolonged and extensive surgery.

Conclusions:

Recognition and understanding of mechanisms of sAIS complicating malignant glioma resection is of great importance to explain and prevent new postoperative neurological deficits. Location of tumor close to major blood vessels implies increased risk of sAIS. For future research, pattern recognition of stroke in these settings and pathological examination may be useful in elucidating the exact mechanism.

Keywords: Tumor, Acute stroke

Financial Disclosures: The authors had no disclosures.

Endovascular Retrieval of Mitral Valve Fragment from Middle Cerebral Artery

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Introduction:

The SOLITAIRE™ device is approved for thrombus retrieval in acute ischemic stroke. Its efficacy in recanalization vis-à-vis thrombus characteristics is an active area of research. We present a stroke intervention where the SOLITAIRE™ device was used to recanalize a middle cerebral artery (MCA) occluded by a fragment of cardiac valve in a patient that had undergone recent robotic mitral valve repair.

Methods:

A 51 year old man with severe mitral regurgitation underwent robotic mitral valve repair. While the patient was in the recovery room, he was noted to have dense left hemiplegia with an NIHSS of 27. He was neurologically intact at baseline before surgery and during the immediate post-operative period. CT angiogram showed a right M1 occlusion. CT perfusion showed a large area of potentially salvageable tissue and he was taken emergently for intervention. Digital subtraction angiography confirmed a right M1 occlusion. A 4 x 20mm SOLITAIRE™ device was deployed into the proximal M1 segment first. However, post-deployment angiogram did not show recanalization. A 6 x 20mm SOLITAIRE™ was subsequently deployed from the superior MCA division to the proximal M1 segment and a 2 x 8mm conical shaped whitish embolus was retrieved and sent for pathology.

Results:

Complete recanalization was achieved with a TIC1 score of 3. Groin puncture to recanalization time was 48 minutes. Pathologic examination of the embolus later confirmed it to be a portion of native cardiac valve. The follow-up CT showed small right caudate, lentiform nucleus, and insular infarcts. The patient had substantial recovery post-procedure and was discharged with only minor left nasolabial fold flattening and a mild left arm drift (NIHSS=2) 4 days later.

Conclusions:

This case illustrates the potential use of the SOLITAIRE™ device in achieving recanalization in cases of atypical embolus composition.

Keywords: Acute Ischemic Stroke Intervention, Solitaire, Acute stroke

Financial Disclosures: The authors had no disclosures.

STATUS PENUMBROSUS: A NEW CONCEPT

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Introduction:

It has been shown in clinical studies that patients who are beyond the 4.5-hour window after onset of stroke along with an ischemic penumbra on perfusion scans may benefit from endovascular treatment. The purpose of this case report was to define and describe the concept of Status Penumbrosus.

Methods:

Case Description: An 86 year old Caucasian male was admitted to the mental health facility after being found wandering on the streets. He was transferred to our hospital for further evaluation, at day 10 of his symptom onset. On examination he was found to have global aphasia and mild right hemiparesis. Computed tomography angiogram showed left M1 of Middle cerebral artery occlusion. Magnetic resonance imaging of the brain showed restricted diffusion on diffusion weighted imaging and reduced apparent diffusion coefficient in the watershed zone between left MCA and Anterior cerebral artery territories. Based on clinical and imaging data, the patient underwent endovascular treatment. Successful recanalization was obtained with stenting and angioplasty. Post-procedure, aphasia significantly improved and weakness completely resolved. This patient had good collateral flow on diagnostic angiogram which was the most likely reason for sustained ischemia without infarction and indicated that the symptoms were still reversible as we described the term that this patient was in a state of Status Penumbrosus.

Results:

Key preliminary features for this new concept and definition:

- Persistent, recurrent, or fluctuating focal neurological deficit due to ischemia for more than "24" hours.
- Documented Penumbra Tissue on physiological imaging.
- Documented small or no core infarction; leading to clinical imaging mismatch.
- Reversal of symptoms with successful reperfusion therapy.
- Clinical and imaging worsening if not treated.

Conclusions:

The advancements in imaging technology has moved us from a window period of 3-4.5 hours to a new concept in clinical medicine of unlimited ischemic brain twilight zone which we called as Status Penumbrosus.

Keywords: Stroke, Stenting

Financial Disclosures: The authors had no disclosures.

Cerebral Aneurysm and Spontaneous Subarachnoid Hemorrhage as Delayed Complication of Gamma Knife Radiosurgery For Trigeminal Neuralgia

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Introduction:

Radiation therapy is considered an effective treatment for many conditions. Though, irradiation can induce delayed vasculopathy, and radiation-induced intracranial aneurysms are not well understood. Additionally, local tissue scarring can limit operative treatments and healing. We present a case of delayed aneurysm formation and subarachnoid hemorrhage (SAH), ten years following Gamma Knife therapy for trigeminal neuralgia.

Methods:

Clinical case data was reviewed and summarized. Pubmed literature search was performed.

Results:

A 75 year old female presented with subacute delirium, gait difficulty, and right facial pain after long remission of trigeminal neuralgia. CT revealed SAH, and subsequent MRI/MRA did not clearly reveal a source. Diagnostic cerebral angiography confirmed an intracranial aneurysm, arising from the right superior cerebellar artery sidewall, retrospectively identifiable on MRI/MRA. While the neck:dome ratio was favorable for embolization, small parent artery diameter and distal location added high risk of thrombotic branch occlusion. Open surgical options were discussed and subsequently attempted. After prolonged dissection limited by pial scarring, proximal artery access could not be safely achieved for control; the procedure was ultimately aborted. Coil embolization was subsequently performed, and vessel thrombosis occurred, which was treated effectively with maceration and aspiration. Limited asymptomatic ischemic stroke occurred. Post-operatively, surgical wound dehiscence was encountered, leading to prolonged healing. Six month follow-up shows no reoccurrence and excellent clinical outcome.

Conclusions:

Despite successful aneurysm treatment, reoccurrence rates may be higher due to radiation related vasculopathy. When both endovascular and surgical options are viable, endovascular approaches may avoid local irradiation-induced changes that pose challenges for open techniques. It is unclear how vascular screening after radiation therapy should be approached, and which modality is best suited.

Keywords: Aneurysm Embolization, Thrombosis

Financial Disclosures: The authors had no disclosures.

Poster 17

Treatment of Ruptured Aneurysm with Pipeline

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Introduction:

The pipeline embolization device (PED) (ev3) is a self-expanding microcatheter-delivered cylindrical mesh device composed of 48 braided cobalt chromium and platinum strands.[1] The use of PED's in ruptured aneurysms not amenable to endovascular or surgical treatments is controversial in the presence of EVD's.

Methods:

1. 53 y/o woman with Fisher 4 SAH with hydrocephalus requiring EVD placement. DSA showed left VA fusiform aneurysm (5x9mm) incorporating PICA origin. Neuron Max was placed near the vertebral artery origin. Navien 5 french catheter was placed in distal V3 segment. Marksman microcatheter was placed across the aneurysm to the basilar artery. Contrast stagnation was demonstrated in the aneurysm post deployment. EVD removal at 2 weeks on Ticagrelor and Aspirin without tract bleed with good patient recovery. DSA at 6 months revealed complete resolution with patent PICA.
2. 60 y/o woman with Fisher 3 SAH with hydrocephalus requiring emergent EVD. DSA revealed right ICA perioptthalmic blister aneurysm (3.5 x 2mm). Two PEDs (4.75 mm x 16mm, 4.75 mm x 14mm) were deployed sequentially across the aneurysm and origin of the ophthalmic artery. Aneurysmal contrast stagnation was not achieved post deployment but was expected to occur post cessation of Heparin. Patient was maintained on Eptifibatide infusion. Day 5 CTOH revealed small SDH and right IVH. Eptifibatide dose was halved and serial CTs showed improvement in IVH and SDH. Patient switched to Ticagrelor 45mg BID and Aspirin 81mg daily. EVD was then removed with minimal track bleed. Angiogram at 2 weeks had significant aneurysmal stagnation with reduction of aneurysm size.

Results:

Ruptured aneurysms were safely secured without major complications despite EVD and antiplatelet therapy.

Conclusions:

PEDs can be safe and effective in treating ruptured aneurysms not amenable to other endovascular or surgical treatments. Prospective randomized clinical trials are needed to validate this claim.

Keywords: Pipeline, Aneurysm, Interventional neuroradiology, Ruptured, Endovascular therapy

Financial Disclosures: The authors had no disclosures.

Poster 18

Full Functional Independence Following Endovascular Treatment for Basilar Artery Occlusion Despite Extensive Bilateral Pontine Infarcts on DWI: Refuting a Self-Fulfilling Prophecy.

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Introduction:

Acute basilar artery occlusion (BAO) carries a high morbi-mortality. MRI has been increasingly utilized for treatment selection and outcome prediction. Patients with extensive brainstem changes on pre-treatment DWI are often excluded from endovascular therapy. Similar changes on post-treatment MRI are used to define goals of care and often to avoid aggressive supportive treatment as these patients are believed to invariably do poorly. We aim to demonstrate the feasibility of complete to near complete functional recovery following endovascular treatment in this setting.

Methods:

Retrospective endovascular database review for patients fulfilling the following criteria: (1) Complete BAO; (2) Extensive Bilateral Pontine DWI changes; (3) 90-day mRS 0-2. Descriptive analysis is provided.

Results:

Three out of total 40 patients met our inclusion criteria. All occlusions involved the proximal to mid basilar artery and presented with near to full locked-in syndrome +/- severe obtundation. All patients had post-treatment DWI and were treated with mechanical thrombectomy resulting in full (TICI 3) reperfusion (Figure 1-3). Patient #1 (18 year-old man with embolic BAO due to a PFO) also underwent pre-treatment MRI. Patients #2 (age 73) and #3 (age 56) had atherosclerotic occlusions that required adjunctive intracranial stenting and angioplasty, respectively. A significant degree of DWI reversibility was seen in case #1. The two youngest patients (#1 and 3) demonstrated signs of marked recovery within the first few days of treatment and achieved 90-day mRS of 0 and 1, respectively. Patient #2 had a long ICU course complicated by pneumonia and respiratory insufficiency requiring trach and PEG placement but eventually achieved a mRS of 2 at day-90.

Conclusions:

Extensive Bilateral Pontine DWI changes on BAO patients pre- or post-treatment MRI does not necessarily preclude a good functional recovery. We advise strong caution when considering these findings in the treatment decision algorithm.

Keywords: Acute Ischemic Stroke Intervention, Basilar, Clinical investigations, MRI, Decision analysis

Financial Disclosures: The authors had no disclosures.

Poster 19

Natural Course of Acute Ischemic Stroke (AIS) Patients with MRA/CTA-DWI Mismatch As Defined by DEFUSE Study

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Introduction

Occlusion location–ischemic lesion size mismatch in patients with mild ischemic strokes may identify those who could benefit from reperfusion therapy. We sought to evaluate the outcomes (early neurological deterioration (END), in hospital mortality, discharge mRS) in consecutive AIS patients with MRA/CTA-DWI mismatch who did not undergo intravenous or intra-arterial reperfusion therapies.

Methods

We evaluated consecutive AIS (< 24 hrs) patients presenting to a tertiary care stroke center with mild stroke severity (NIHSS < 10) who did not receive any reperfusion therapies over a three-month period. END by NINDS definition was either death or increase in NIHSS score by ≥ 4 points within 48 hours from hospital admission. CTA/MRA-DWI mismatch was defined according to previously reported DEFUSE criteria (Stroke. 2008;39:2491-2496). Patients with baseline mRS score of >1 were excluded.

Results

48 patients (mean age 63 ± 12 yrs, 71% men, median NIHSS score 3, IQR 1-4) fulfilled our inclusion criteria. END occurred in 4 patients (8%; 95%CI:3-20% by adjusted Wald method). MRA/CTA-DWI mismatch was identified in 11 cases (23%; 95%CI:13-37%). Median baseline NIHSS-score was similar in patients with and without MRA/CTA-DWI mismatch (2 vs 3 points; $p=0.241$ by Mann-Whitney U-test). MRA/CTA-DWI mismatch was not associated with END ($p=0.561$ by Fisher's exact test). The improvement in NIHSS-score during the first week of ictus was similar in patients with and without MRA/CTA-DWI mismatch ($p=0.828$ by Mann-Whitney U-test). Functional independence at hospital discharge (mRS-score of 0-1) did not differ in patients with and without MRA/CTA-DWI mismatch ($p=0.875$). Patients with END had lower rates of functional independence at hospital discharge (0% vs. 77%; $p=0.005$ by Fisher exact test).

Conclusions

Early outcomes in patients with and without MRA/CTA-DWI mismatch appear to be similar. A larger number of subjects is required to better understand reasons for early deterioration beyond the mismatch concept. Those who develop deterioration could be the target group for reperfusion therapy at an extended time window since these patients are least likely to reach functional independence.

Keywords: Acute stroke, intra caranial stenosis, Ischemic stroke, Vascular imaging

Financial Disclosures: The authors had no disclosures.

TICI Quantified: Automated Cerebral Revascularization Grading in Acute Ischemic stroke

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Introduction:

Cerebral angiographic revascularization grading is the primary method for measuring the angiographic success of acute ischemic stroke (AIS) endovascular therapy. It is one of the strongest predictors for clinical outcome. Treatment in Cerebral Ischemia (mTICI) scale is the preferred grading scale for assessment of revascularization. Currently, mTICI grading is based on visual crude estimations by the operator which may introduce error and bias in to the evaluation. Here, we present an update on our on-going study to automatize mTICI and provide a more accurate and precise grading tool: Quantified TICI (qTICI).

Methods:

To map the MCA territory, a retrospective review of patients between the ages of 18-85 was performed from our Digital Subtraction Angiography database at the Medical College of Wisconsin. All consecutive cases with aplastic / hypoplastic ACA (to minimize contaminating blood flow from the ACA territory) are included in this study. Existing software is currently in use to estimate the territory/area of normal capillary blush and establish normal standardized blood flow values in this database/dictionary.

Results:

We have identified 19 consecutive patients with aplastic/hypoplastic ACA between the ages of 18-85, from our DSA database of over 3000 cases. Once normal capillary blush of the MCA territory has been established and automatized, we will use those normalized/standardized values per age to establish an Atlas/Dictionary to compare the capillary blush and blood flow of the pathological cases. A cohort of 20-25 patients who have stroke secondary to MCA occlusion will be assessed in phase II. Values of qTICI will be compared and validated using standard visual estimation of mTICI. Clinical correlation of qTICI with outcome will also be performed.

Conclusions:

The qTICI Grading Software once developed will have the potential to revolutionize the way clinicians and interventionalists grade revascularization post AIS endovascular therapy. The clinical implications of establishing automatized and quantified revascularization scale is critical in improving treatment safety and efficacy.

Keywords: Acute Ischemic Stroke Intervention, Acute stroke, Cerebral, Revascularization, TICI

Financial Disclosures: The authors had no disclosures.

CTA Collaterals Predict Infarct Volume and Clinical Outcome After Endovascular Therapy for Ischemic Stroke

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Introduction:

Acute Ischemic Stroke (AIS) due to Large Vessel Occlusion (LVO) has a poor prognosis. We hypothesized that good collateral patterns on pre-treatment CTA would predict smaller final infarct volume and favorable clinical outcome after endovascular therapy (EVT).

Methods:

The study was a retrospective chart review of the University of Tennessee AIS database from February 2011-13. All patients with CTA proven LVO treated with EVT were included. Blinded neuroradiologists assessed the pre-treatment CTA collaterals score (CS). Recanalization after EVT was defined by TICl score ≥ 2 . Favorable outcome was a Modified Rankin Score (mRS) ≤ 3 . Univariate predictors of outcome were determined with Chi Square and Student's T-tests. Stepwise multivariate regression analysis was performed to determine predictors of outcome.

Results:

Fifty patients with LVO were studied. The mean NIHSS was 17 (2-27); a total of 38 patients (73%) received IV-TPA. The recanalization rate for EVT was 86.6%. Good clinical outcome was achieved in 32% of patients. Univariate predictors of good outcome included good CS on presenting CTA ($p=0.043$) and successful recanalization ($p=0.02$). Multivariate analysis confirmed both good CS ($p=0.024$) and successful recanalization ($p=0.009$) as predictors of favorable outcome. Multivariate analysis demonstrated that lower presenting systolic blood pressure ($p < 0.0001$) and good CS ($p=0.0010$) in patients who had successful recanalization predicted smaller final infarct volume.

Conclusions:

Good CS predicts smaller infarct volumes and better clinical outcome in patients recanalized with EVT. These data supports the use of this technique in selecting patients for EVT. Poor CS should be considered as exclusion criteria for EVT as these patients have bad clinical outcomes despite recanalization.

Keywords: Acute Ischemic Stroke Intervention, Collateral, mRS, TICl, Angiogram

Financial Disclosures: Dr. Arthur has consulting agreements with Covidien, J&J, Stryker and Terumo-Microvention for per-hour teaching activities and receive research support from Terumo and Siemens.

Poster 22

Eptifibatide use is safe after Full Dose IV tPA and Endovascular Treatment in patients with acute Ischemic Strokes

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Introduction:

The safety of eptifibatide in combination with IV tPA for ischemic stroke has recently been demonstrated in the CLEAR-ER trial which used .6 mg/kg IV tPA plus eptifibatide (135 mcg/kg bolus and .75mcg/kg/min two-hour infusion) versus standard tPA (.9 mg/kg). Prior studies have also looked into the combination of intra-arterial (IA) tPA and eptifibatide at dosing and duration similar to cardiology literature. Our aim was to compare the safety and efficacy of eptifibatide after full dose IV tPA and endovascular treatment versus full dose IV tPA and endovascular treatment alone.

Methods:

A review of procedure notes for patients who underwent endovascular treatment for ischemic stroke from 2010-2013 at a university affiliated comprehensive stroke center was completed. Patients who received full dose IV tPA (.9 mg/kg) followed by endovascular treatment were compared with those who had the same treatment, but also received a bolus of 135 mcg/kg of eptifibatide followed by a .5 mcg/kg/min for 20 hours (based on IMPACT-II trial protocol). The initial and discharge NIH Stroke Scale as well as the discharge mRS (DCmRS) were evaluated. A DCmRS of 0 or 1 was considered a favorable outcome, and 2 or more was considered as unfavorable.

Results:

We evaluated 2,016 patients with ischemic stroke, of which 230 received IV tPA and 91 (55% female) underwent endovascular treatment, 44 of them also received eptifibatide. Of the 44 patients who received eptifibatide (bolus and 20 hour infusion), 18% (n=8) had a favorable outcome, and in the group that did not receive eptifibatide, 9% (n=4) had a favorable outcome (OR=2.389, 95% CI 0.6645 to 8.589, p= 0.2217).

Conclusions:

Eptifibatide in combination with full dose IV tPA and endovascular treatment did not increase morbidity in our patient population, and may have improved outcome. Further, larger trials need to be conducted for more definitive results.

Keywords: Acute Ischemic Stroke Intervention, Acute stroke

Financial Disclosures: The authors had no disclosures.

Bridging with Tirofiban in Patients with Recent Intracranial Stent Requiring Interruption of Oral Dual Anti-Platelet Therapy for Non-Emergent Surgical Procedures

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Introduction:

Interruption of dual antiplatelet therapy (DAP) for non-emergent surgeries poses a challenge in patients with recent placement of an intracranial stent. Clopidogrel should be held for at least 5 days prior to surgery which increases the risk for stent thrombosis during this time. We report 3 cases of patients with cerebral stents who were bridged with tirofiban during interruption of DAP prior to surgery.

Methods:

We conducted a retrospective chart review of 3 post-neurointerventional patients who received tirofiban during interruption of DAP treatment between January 2012 and September 2014. We reviewed the patient's primary diagnosis, neurointerventional procedure, type of early surgery, dosing and duration of tirofiban therapy, and platelet function tests. In addition, we reviewed for clinical or radiographic evidence of stent thrombosis, cerebral ischemia, or hemorrhagic complications.

Results:

Case #1 and Case #2 were both admitted with an acute occlusion of the basilar artery that was subsequently stented. In Case #1 clopidogrel was discontinued on post-intervention day 4 and held 11 days pending tracheostomy/PEG. Case #2 was managed with dual overlapping basilar stents. Clopidogrel was discontinued on post-intervention day 5 and held for 5 days pending tracheostomy/PEG. Case #3 was admitted for a SAH from a ruptured blister-type supraclinoid ICA aneurysm that was managed with stent-assisted coil embolization. Clopidogrel was stopped on post-intervention day 17 and held for 8 days pending ventriculoperitoneal shunt. In each case, tirofiban was initiated within 48 hours of clopidogrel discontinuation and stopped 6-12 hours prior to surgery. Infusion dosing ranged from 0.05 to 0.15 mcg/kg/min. In Case #3, tirofiban was resumed 6-12 hours following the surgical intervention and maintained for 6 hours post clopidogrel reloading. No patient experienced stent thrombosis, cerebral ischemia, or hemorrhagic complications.

Conclusions:

DAP bridging with tirofiban appears to be a safe and effective strategy in post-neurointerventional patients requiring non-emergent surgical procedures. Larger prospective studies are required to validate our findings.

Keywords: Antiplatelet, Medical management

Financial Disclosures: The authors had no disclosures.

Feasibility of Novel methodology using Barbiturates and Prolonged Hypothermia Combination Therapy in Treatment of Malignant Refractory Intracranial Pressure

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Introduction:

Little has been published on the effects of barbiturate coma with hypothermia induction to control intracranial pressure (ICP). Barbiturate coma induction has been used with therapeutic hypothermia without anti-shivering agents to treat malignant refractory elevated ICPs stemming from different etiologies. This method allowed for prolonged hypothermia induction in the absence of neuromuscular side effects of paralytics.

Methods:

We retrospectively analyzed data on consecutive patients presenting between 2013-14 to a university affiliated comprehensive stroke center with refractory malignant intracranial pressure secondary to subarachnoid hemorrhage, cerebral venous thrombosis and malignant ischemic stroke. The patients were concomitantly initiated on hypothermia (32 Celsius), pentobarbital with titration to achieve target of 2-6 bursts per minute on electroencephalogram. This combination therapy was individually tailored to continue until satisfactory control of ICPs was achieved.

Results:

Of the 140 patients admitted, 5 had refractory elevated ICP. The age range was 29-75 years, with reason for admission being aneurysmal subarachnoid hemorrhage in 4 patients of which 2 also had vasospasm related malignant ischemia. The 5th patient suffered refractory cerebovenous sinus thrombosis. ICPs on average were elevated and rising with a malignant waveform prior to initiating combination of pentobarbital and hypothermia, which was executed within 4 days of admission. GCS before treatment was 3 in 4 patients and 6 in the 5th. GCS after treatment was 14.5 on average for 4 patients and 3 in the 5th patient. On average barbiturate coma was continued for 6 days (range 3-16) and hypothermia for 10 days (range 3-23).

Conclusions:

The application of a combination approach in treating refractory malignant ICPs was shown to be very feasible and effective as demonstrated by effective prolonged hypothermia, favorable GCS outcomes and a good ICP control. The etiology of raised ICP's did not adversely affect outcomes with combination treatment. Further prospective multi-centered trials are warranted to reinforce our outcomes.

Keywords: ICH, Neuroprotection, Neuromonitoring

Financial Disclosures: The authors had no disclosures.

The Effect of Using Eptifibatide Drip in Conjunction with Endovascular Procedure on the Functional Outcome of Patients Presenting with Acute Ischemic Stroke

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Introduction:

Endovascular procedures are associated with intimal damage to the vasculature. Interventionists have adopted the use of intravenous anti-platelet agents to help prevent thrombosis. Eptifibatide drip has been utilized in advanced stroke treatment to improve recanalization in ischemic strokes. This study compares the outcome and mortality between individuals that received Eptifibatide drip and those who did not receive this treatment.

Methods:

This is a retrospective analysis of all patients (n= 111) who presented to our hospital with ischemic stroke and considered for advanced stroke therapy between January 2013 and July 2014. Statistical analysis was performed using GraphPad Prism. We divided the groups into two: A (Eptifibatide drip) and B (No-Eptifibatide drip). We compared the use of Eptifibatide drip effect on the functional outcome using modified Rankin Scale (mRS). mRS score of 2 or less defines a good functional outcome. All variables were included in the analysis.

Results:

59 patients included in this study had all the variables and received endovascular treatment. Results from group analysis including n, gender, mean age, mean NIHSS, Afib%, DM%, Prior Stroke % and mean total procedure time was as follows: A) 11, 54.5%, 62.3±24.7, 14.3±6.4, 18.2%, 27.3%, 45.5%, 2:10±1:05 B) 48, 62.5% female, 76.6±16.7, 18.6±7.9, 56.3%, 20.8%, 22.9%, 1:41±0:48. We found that patients who underwent endovascular procedures in group A experienced a better outcome as compared to patients in group B (95% CI, -0.682 - -0.302, P < 0.001). There was no difference in mortality between the two groups (95% CI, -0.105 – 0.275, P > 0.05).

Conclusions:

The use of Eptifibatide drip during endovascular procedures may results in a better functional outcome after the procedures as compared to other devices. We plan to further investigate the use of Eptifibatide drip in prospective study.

Keywords: Acute Ischemic Stroke Intervention, Endovascular, Endovascular therapy, Lytics

Financial Disclosures: The authors had no disclosures.

Poster 26

Neurointerventional Stenting and Antiplatelet Function Testing “To Do Or Not To Do?”

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Introduction:

Platelet Function testing in neurointerventional (NI) procedures is still controversial. We intended to compare clinical outcome between responders and non-responders to antiplatelet based on the results of the VerifyNow (VN) testing method.

Methods:

Retrospective single-center analysis of all consecutive patients from January 2007 through July 2013 who underwent NI stenting procedures and had a documented pre-procedural ASA and Clopidogrel VN. Patients were divided in two groups based on their responsiveness to antiplatelet. Baseline characteristics, good functional outcome measured by modified Rankin Scale mRS at 90 days, and combined procedural complication rate, defined as post-procedural stroke, in stent thrombosis, and intra-operative rupture were compared between the two groups.

Results:

Our cohort included 37 patients. Twenty-six patients were in the responders group (RG) and eleven patients were in the non-responder group (NRG). Baseline characteristics were similar between the two groups. Even though, the combined complication rate was similar between the two groups (2/11 (18%) NRG vs. 2/26 (7%) RG, $p=0.33$), the good functional outcome was significantly higher in the responder group NRG (8/10 (80%) NRG vs. 22/22 (100%) RG, $p=0.03$).

Conclusions:

Even though our study showed better overall functional outcome and decreased rates of post-operative stroke in the responsive group, this might not be completely explained by the anti-platelet responsiveness.

Keywords: Stent assisted

Financial Disclosures: The authors had no disclosures.

Poster 27

General Anesthetic Use and Clopidogrel Resistance During Neurovascular Stenting Procedures

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Introduction:

Our objective is to determine the effect of general anesthesia on clopidogrel resistance among patients undergoing intracranial stenting procedures. Clopidogrel resistance is associated with increased periprocedural thromboembolic complications in neurovascular stenting procedures. Clopidogrel is metabolized by cytochrome P450 system to an active drug that irreversibly binds to the platelet ADP receptor P2Y₁₂ and inhibits downstream platelet aggregation. General anesthetics are commonly used in intracranial stenting procedures and are known to inhibit cytochrome P450 monooxygenases. Therefore we hypothesized that the use of common general anesthetics would be associated with increased clopidogrel resistance.

Methods:

We conducted a retrospective chart review of 41 patients who underwent intracranial stenting and coiling procedures under general anesthesia from 2010-2013. We analyzed the 35/41 who had platelet assays performed within twenty-four hours both before and after the procedure (VerifyNow, Accumetrics, Inc., San Diego, CA, USA). P2Y₁₂ reaction unit (PRU) was used to measure platelet resistance, with values ≤ 178 indicating increased bleeding risk, 179-238 therapeutic, and ≥ 239 thrombogenic. Pre-procedural and post-procedural mean PRU values were compared using t tests to determine the effect of general anesthesia on clopidogrel resistance.

Results:

We found significantly increased post-procedure PRUs compared to pre-procedure PRUs. Mean PRU twenty-four hours before procedure was 214 ± 34 (95% CI 180-248) compared with 260 ± 25.24 (95% CI 235-285) twenty-four hours after the procedure ($p < 0.05$). Median time for pre-procedure PRU obtained was 6.23 hours (IQR 1.2-14.7) before the procedure. Median time for post-procedure PRU obtained was 16.3 hours (IQR 13-19.3). Out of 35 patients, 27 (77%) had increased PRUs post-procedure compared to pre-procedure.

Conclusions:

Clopidogrel resistance is increased following endovascular stenting procedures. We propose that this occurs through competitive interaction with CYP isoforms by general anesthetics. We are not aware of any prior studies demonstrating an association between general anesthetics and clopidogrel resistance. Further prospective studies are needed to further define this observation.

Keywords: Antiplatelet, Carotid stenting and angioplasty, Endovascular therapy, Intracranial Stenosis stenting and angioplasty, Platelet testing

Financial Disclosures: The authors had no disclosures.

Large Single Center Experience of Safety of Eptifibatide in Patients undergoing Mechanical Thrombectomy and Thrombolysis for Acute Ischemic Stroke

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Introduction:

Lack of achieving complete recanalization in acute strokes using only IV thrombolysis has led to the evolution of a multimodal acute ischemic stroke paradigm. There is limited data on safety of parenteral infusion of antiplatelet agents within the acute stroke treatment paradigm to maintain target vessel recanalization.

Methods:

Of the total patients with acute ischemic strokes presented between 2010-13 to our university affiliated comprehensive stroke center, patients that received IA and IV Eptifibatide were retrospectively classified into two groups: Group A underwent emergent intracranial stenting with IV and or IA r-tPa and/or mechanical thrombectomy. Group B underwent IV r-tPa/ IA r-tPa /IA Eptifibatide and/or mechanical thrombectomy with no intracranial stenting. Eptifibatide was administered intra-arterially as a 135- μ g/kg single-dose bolus, and then continued on intravenous infusion of 0.5- μ g/kg/min post-procedurally. Charts were reviewed for all patients to assess for complications including groin hematoma, asymptomatic and symptomatic hemorrhages, epistaxis and gross hematuria.

Results:

Of 2,016 patients with ischemic strokes, 326 patients received acute stroke treatment and 138 patients received IA and IV Eptifibatide. Group A (82 patients, mean age 68, 49% males [n=40]) and Group B (56 patients, mean age 73, 54% males [n=30]) received IV Eptifibatide infusion for a mean duration of 19 hours (range 0 to 364 hours). In Group A, 7.3% [n= 6] showed symptomatic ICH, 4.9% [n=4] asymptomatic ICH, 3.7% [n=3] groin hematomas, 2.4% [n=2] nose bleeds. In Group B, 7.1 % [n=4] had asymptomatic hemorrhages and 1.8% [n=1] showed gross hematuria.

Conclusions:

The complications of IV and IA Eptifibatide are not significantly higher than those associated with the existing acute ischemic stroke treatment paradigm. Larger, multi-centered prospective trials are warranted to corroborate our findings.

Keywords: Acute stroke, Antiplatelet, Thrombolytics, Mechanical thrombectomy

Financial Disclosures: The authors had no disclosures.

Factors Determining Consent in a Randomized Trial of Intra-Arterial Stem Cell Therapy for Sub-Acute Ischemic Stroke

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Introduction:

The consenting process for randomized clinical trials can be challenging. Stroke poses an additional difficulty since patients are often functionally disabled at the time of consent. We investigated the rate of consent among patient and legally authorized representatives (LAR) and factors determining consent in the first US intra-arterial autologous stem cell trial - RECOVER Stroke.

Methods:

In this trial, eligible patients were systematically identified at one week from the stroke ictus in participating centers. We performed a retrospective analysis of data from two out of eight actively recruiting centers in the trial. Recorded data included age, gender, race, NIHSS, lesion location, prior recanalization therapy and mode of consent (self-consent, LAR-consent).

Results:

Of the 44 patients approached for consent, 22 (50%) agreed to participate. Mean age of the approached patients was 65±17, and 59% were male. 34% self-consented while 66% were consented via LAR. A trend for higher rate of consent refusal for older patients was noted (mean age of consented patients was 61.4±12 vs. 68.5±12 on patients with declined consent; p=0.06). Males (59%; p=0.05) and patients with lower NIHSS (9.0±5.5 vs 11.6±6.9; p=0.17) were consented more often. The mode of consenting (self-consent vs. LAR-consent) had no impact consenting/refusal rates (p=0.75). Race and lesion location had no impact on consent refusal. The multivariate logistic regression analysis, revealed male gender as the only variable independently associated with better rates of overall consent (OR 7.2; 95%CI 1.6-31.5; p=0.008). Sensitivity analyses revealed that the only factor independently associated with overall LAR-consenting after multivariate regression was lower NIHSS (OR 0.9; 95%CI 0.8-1.08; p=0.06).

Conclusions:

There was a relatively high rate of consent among eligible patients in the first US intra-arterial trial of stem cell therapy for stroke. Approaching LAR for consent was not found to influence consenting rates. Male gender was significantly associated with higher chances of consenting.

Keywords: Stroke, Acute Ischemic Stroke Intervention, Stem cell therapy, Clinical trial

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Novel Endovascular Large Animal Stroke Model: Determinants of Infarct Volume and Neurodeficit Score.

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Introduction:

Large animal stroke models are crucial in enhancing the chances of successful human translation of novel stroke therapies per STAIR criteria. We previously reported the high feasibility of a novel reversible MCA occlusion (rMCAo) model in dogs. However, determinants of infarct volume and neurodeficits, critical to a successful stroke model, have not been defined.

Methods:

Under IACUC approval, with the dog under general anesthesia, in a SIEMENS dedicated animal biplane angiography suite, we performed a transfemoral endovascular rMCAo on one side by deploying a 2-2.5mm x 6-10cm ultrasoft platinum aneurysm coil WITHOUT detachment at the ICA bifurcation to occlude MCA flow. After a variable duration of occlusion, the coil was retrieved and the animal was survived. Blinded neurodeficit scoring and MRI brain was done at 48-72 hours post MCAo. Univariate and multivariate logistic regression was done.

Results:

From 2009-2014, 25 female dogs that underwent endovascular rMCAo were included in this study. The baseline characteristics were (means $\pm$ SD): Age 18.8 $\pm$ 8.5 (17) months, Weight 22.1 $\pm$ 3.9 (22) kg. The mean length of MCA occlusion was 110 $\pm$ 80 min. The mean infarct volume was 4.7 + 6.7cc on MRI. The mean total brain ipsilateral hemispheric volume was 32.1 $\pm$ 3.2cc. The mean percent MCA infarct volume was 14% $\pm$ 19%. The mean neurodeficit score was 3.5 $\pm$ 5.3 (neurodeficit scale 0-30). On univariate analysis, age and weight were significantly ($p < 0.05$) associated with infarct volume. Collaterals, position of occlusion and length of occlusion showed a trend but did not reach significance. On multivariate analysis, age and location of occlusion were found to be significantly associated with infarct volume ($p < 0.05$). The neurodeficit score was significantly associated with infarct volume.

Conclusions:

In this novel endovascular dog rMCAo model, age and duration of occlusion were the primary determinants of MCA infarct volume. This data, based on the largest number of animals published till date, could significantly guide further refinement of this model.

Keywords: MCA, Basic Sciences, Acute stroke, New technique

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TARGET Intracranial Aneurysm Coiling Prospective Multicenter Registry: Initial Periprocedural Results in 150 Patients

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Introduction:

To describe the periprocedural results of the TARGET Registry, an on-going, prospective, non-randomized, single-arm, multicenter, real-world study of patients with ruptured or unruptured intracranial aneurysms that are embolized with new generation TARGET Coils.

Methods:

Patients with de novo untreated ruptured or unruptured intracranial aneurysms were embolized with either TARGET 360° or Helical coils in 13 US centers. The primary outcome, packing density (PD), was assessed at immediate post-procedure. Analysis was per protocol. Secondary outcomes were modified Rankin Scale (mRS) at discharge and the influence of use of 100% 360° coils on clinical and angiographic outcomes. JMP statistical software was used for analysis.

Results:

150 patients were eligible for this per protocol analysis. 60 (40.0%) patients with ruptured and 90 (60.0%) with unruptured aneurysms were treated using TARGET 360°, Helical coils, or both. Mean age: 57.6±13.1 years; 73.3% female, 72.0% white. The majority were treated with TARGET 360° coils (62.7%), followed by mixed 360° and Helical Coils (36.6%), and Helical Coils (3.4%). **Primary outcome:** mean PD was 25.7 ± 16.3%. In-hospital mortality was 0.01% (2/150) and discharge good outcome (mRS 0-2) was 89.3% (134/150). Poor outcome occurred in 16.7% of ruptured aneurysms and 5.6% of unruptured aneurysms. Immediate near-complete occlusion rate was seen in 91.3%. In a multivariate analysis, maximum aneurysm size (p=0.0001) and use of stent (p=0.02) were found to be independent predictors of PD. PD was the main predictor of complete occlusion (p=0.05). Finally, predictors of discharge outcome included age, rupture presentation, aneurysm neck size, and occlusion grade.

Conclusions:

In the Target Registry, the mean PD was 25.7 ± 16.3% and was the main predictor of complete aneurysm occlusion. Poor outcome was 5.6% and 16.7% for unruptured and ruptured aneurysms, respectively. Predictor of outcome at discharge included age, rupture status, aneurysm occlusion, and aneurysm neck size.

Keywords: Aneurysm, Aneurysm Embolization, Coiling

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Primary Manual Aspiration Thrombectomy for Central Venous Sinus Thrombosis

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Introduction:

Central venous sinus thrombosis (CVST) can typically be managed with systemic anticoagulation but in a subset of medically refractory patients, mechanical thrombectomy has been pursued to more efficiently alleviate thrombus burden using a variety of endovenous techniques. Here we report on the use of manual aspiration thrombectomy (MAT) as the first line treatment modality in medically refractory patients.

Methods:

A retrospective analysis of patients at one large academic center presenting from July 2013 to June 2014 with CVST treated with MAT was conducted.

Results:

Over 12 months, 10 patients were treated with endovascular therapy for CVST. These patients included 7 women and 3 men, mean age 49 (range 25-84). On average, headache onset preceded presentation by 8 days (0-30). NIHSS on admission averaged 6.5 (0-19). Recanalization was attempted using MAT for 9 patients and MAT plus AngioJet rheolytic catheter for 1 patient. Full recanalization was achieved in 6 patients, partial recanalization in 3 patients and the sinus remained occluded in 1 patient. Although no patients developed new hemorrhage post-recanalization, 1 had worsening of existing hemorrhage and 2 had worsening of previous infarct. At 3mo post-thrombectomy, 8 patients had a favorable outcome defined as MRS 0-2. Two patients died after withdrawal of care. All patients were discharged on anticoagulation. The 2 patients with poor outcome had longer procedure duration (150 vs 140min, $p=0.008$), larger infarcts (55 vs 8.5 cc, $p=0.001$), longer hospital stays (12 vs 7 days, $p=0.003$, and longer ICU stays (10.5 vs 2.75 days, $p=0.003$). A longer duration of preceding symptoms was observed in patients with 3mo MRS of 0-2.

Conclusions:

Manual aspiration thrombectomy was a successful method of recanalization and led to positive outcome in 80% of patients. Further investigation is needed to determine which patients may benefit most from mechanical thrombectomy for the treatment of CVST.

Keywords: Cerebral sinus thrombosis therapy, Mechanical thrombectomy, Cerebral sinus and venous thrombosis, Endovascular therapy, Recanalization

Financial Disclosures: The authors had no disclosures.

Preoperative Endovascular Embolization Of Internal Maxillary Artery For Temporomandibular Joint Ankylosis Surgery

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Introduction:

Temporomandibular joint (TMJ) ankylosis causes disability through impaired digestion, mastication, speech and appearance. Surgical treatment increases range of motion with resultant functional improvement. However, substantial perioperative blood loss can occur, up to two liters, if the internal maxillary artery (IMAX) is injured as it traverses the ankylotic mass. Achieving hemostasis is difficult due to limited proximal IMAX access and poor visualization. Our aim is to investigate the technical feasibility and preliminary safety of preoperative IMAX embolization in patients undergoing TMJ ankylosis surgery.

Methods:

This is a retrospective study using hospital chart review. The patients were admitted to the hospital between January 1st, 2013 and June 30th, 2014. To be included in the study patients must have had TMJ surgery as well as preoperative embolization. Patients were excluded if they had not undergone preoperative embolization. We searched neurointerventional suite case logs to obtain the list of patients.

Results:

Two patients met study criteria. Both patients were women, aged 28 and 51 years old, and had severely restricted mouth opening. Embolization was carried out under general anesthesia with nasal intubation on the same day of TMJ surgery. Both patients underwent bilateral IMAX embolization using pushable coils (Vortex, Boston Scientific) of distal IMAX followed by n-butyl-cyanoacrylate (TRUFILL®, Cordis) embolization from coil mass up to proximal IMAX. There were no complications from the embolization procedures. Both patients had normal neurological examinations. TMJ surgery occurred with minimal operative blood loss; 300ml for each surgery. Maximum post-operative mouth opening was 35 and 34 respectively. One patient had a post operative TMJ wound infection that was managed with antibiotics.

Conclusions:

Preoperative IMAX embolization prior to TMJ ankylosis surgery is technically feasible with encouraging preliminary safety. There were no complications from the embolization procedures and surgeries occurred with low volumes of blood loss.

Keywords: Embolization, New technique

Financial Disclosures: The authors had no disclosures.

Dural Venous Sinus Stenting In Idiopathic Intracranial Hypertension.

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Introduction:

Idiopathic intracranial hypertension (IIH) is a complex disease that is difficult to manage due to side effects and complications of medical and surgical management. A subset of patients with dural sinus stenosis have shown benefit from a relatively novel technique with endovascular dural venous sinus stenting (DVSS). It is hypothesized that stenting relieves the stenosis, thereby normalizing the venous pressure gradient, promoting cerebrospinal fluid (CSF) drainage, ultimately leading to normal intracranial pressure (ICP).

Methods:

A retrospective study of a prospective series was performed to identify IIH patients with dural sinus stenosis on noninvasive neuroimaging treated with DVSS. Outcome measurements included pre- and post-intervention dural venous sinus pressure gradients, optical coherence tomography (OCT), and improvement in clinical symptoms including visual disturbances, headaches, and tinnitus.

Results:

Seventeen patients (15 female) were identified who underwent endovascular DVSS. Mean age was 29.47 years. All patients had pre-procedural lumbar punctures with an average opening pressure of 38.1 cmH₂O (26-55). Average pre- and post-intervention pressure gradients were 23.06 mmHg and 1.18 mmHg, respectively. Pressure gradient change was found to be statistically significant with unpaired t test ($p < 0.0001$). Fifteen (88%) noted improvement in headache and fourteen (82%) had visual improvement. All patients had improvement in their main symptom related to IIH. Of eleven patients who had follow up OCT, eight improved and three remained stable. Overall, OCT improvement correlated with improved visual acuity. One patient underwent repeated stenting due to intimal hyperplasia.

Conclusions:

Our series of patients with dural sinus stenosis treated with endovascular DVSS demonstrated improvement in vision and OCT. Use of OCT in outcomes in IIH is an effective method to objectively assess efficacy of stenting. DVSS is a safe, effective treatment for patients with IIH and dural sinus stenosis.

Keywords: Stenting, Intracranial Stenosis stenting and angioplasty

Financial Disclosures: The authors had no disclosures.

Proposal to develop a SVIN Listserv

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Introduction:

Listserv is an e-mailing list manager which allows a subscriber to send an email to other subscribers to that list. Being simple, effective, and secure, Listservs have been utilized by several healthcare associations as a means of discussion between its members. The American Academy of Neurology currently has greater than 20 Listservs meant for discussion among members of subspecialty interests, including a Listserv for Endovascular and Interventional Neurology.

Methods:

However, the AAN Endovascular and Interventional Neurology Listserv does not truly represent a "Neurointervention" Listserv, given the highly specialized as well as interdisciplinary nature of the Neurointerventional field, and therefore, the interest in utilizing that Listserv has remained low.

Results:

The objective of this report is to propose the development of a SVIN Listserv which will allow its members to:

1. Discuss management of complex cases
2. Share rare anatomical and pathological findings
3. Share individual tricks and techniques
4. Express views on controversial issues
5. Express their experience with latest neurointerventional tools
6. Express views on any newly published data
7. Discuss fellowship and job opportunities
8. Develop camaraderie
9. Develop research collaborations SVIN will reserve the right to suspend or terminate access to the Listserv for users who violate the Listserv rules.

In general, following Listserv rules/guidelines should be observed:

1. The content should be relevant to the members of SVIN
2. The discussions should be meant to stimulate conversation, not to create contention
3. All posts should strictly comply with HIPAA and federal privacy laws
4. No copyrighted material should be posted without permission

Conclusions:

SVIN would reserve the rights to add/modify these rules and guidelines. A small committee can be created to randomly check Listserv posts for ensuring compliance with rules, assessing need for addition or modification of rules, and taking actions in cases of non-compliance.

To address the liability from posts on the Listserv, a disclaimer should be added.

Keywords: Neurointerventional education, Cerebrovascular disease

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The Future Role of Interventional Neurology - A Survey of Neurology Department Chairmen, Program Directors and Clerkship Directors.

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Introduction:

Interventional Neurology otherwise known as Endovascular Surgical Neuroradiology (ESN)) is a relatively new specialty for Neurology trained physicians supported by the American Academy of Neurology (AAN). How Interventional Neurology trained Neurologists are perceived in the neurology community, the professional opportunities available to them and the perceived challenges Neurology departments face in hiring them remain unknown.

Methods:

Neurology chairmen, program directors as well as clerkship directors of all departments having a Neurology residency program in the United States were surveyed using an online questionnaire.

Results:

There were 82 programs with ACGME accredited residency programs identified for the survey. 81 Chairmen responded to the survey. 73.8% of respondents felt that Interventional Neurology was as important as any other subspecialty in Neurology. 78.67% of responders were in favor of hiring Interventional Neurology trained physicians from the Neurology background. 89.2% of responders thought that neurologists yield the same level of quality of service and outcome as those performed by other ESN trained physicians from other backgrounds. 55 neurology program directors responded to the survey. 17 clerkship directors responded to the survey. 94.4% thought neurologists should be neuro-interventionalists. 95.7% thought that the presence of an interventional neurologist at their institution attracts more neurology residency applicants. 86% regarded exposure to neurointerventional services as critical and core educational background for neurology residents in addition to 93% who thought it would improve how their residents manage patients. 63.27% thought that medical students did not receive sufficient exposure to endovascular and interventional neurology.

Conclusions:

Enthusiasm amongst neurology department chairmen, program directors and clerkship directors for the subspecialty of Interventional Neurology is high. Neurologists are expected to play a leading role in the field of Interventional Neurology as well as medical student and resident education.

Keywords: Interventional neuroradiology

Financial Disclosures: The authors had no disclosures.

Poster 37

Back pain management utilizing vertebral augmentation in multiple myeloma patients: a practical approach to the reduction of pain, improvement of functional status, and palliative success

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Introduction:

Vertebral augmentation has recently gained momentum as a minimally invasive treatment of vertebral compression fractures in patients with multiple myeloma. Our study evaluates the utility of MR STIR imaging findings relative to fluoroscopic exam in the efficacy of treating vertebral compression fractures due to multiple myeloma.

Methods:

Twenty-five consecutive MM patients from a single center with vertebral compression fractures refractory to conservative treatment were treated with kyphoplasty. After a thorough review of pre-procedure magnetic resonance imaging (MRI), fluoroscopic examination of the spine was performed. Demographic, clinical, and procedural data on patients were retrospectively analyzed. Primary measure of outcome was pain relief and functional status, utilizing pre and post-procedure Visual Analog Scale (VAS) and Oswestry Disability Index (ODI). Paired-Samples T test was used for comparison of pre and post measurement of outcome.

Results:

Twenty-five patients with refractory back pain representing 52 levels of vertebral compression by MRI were evaluated for potential kyphoplasty. After fluoroscopic assisted palpation of the spine eliciting a moderate to severe pain-response, the twenty-five patients represented 28 treated vertebral levels. A review of the MRI findings of the treated levels showed the absence of traditional MR signal finding of marrow edema; and had little utility in guiding therapy at the time of exam. The mean pre and post-procedure VAS were 6.8 and 1.3 ($p=0.001$), respectively. Mean pre and post-procedure ODI were 51.4 and 29.8, ($p=0.001$), respectively.

Conclusions:

Solely relying on MRI alone to determine who may benefit from vertebral augmentation is not sufficient, and often may preclude a patient's potential to gain significant benefit if treatment is withheld due to the absence of traditional MR STIR imaging findings of bone marrow edema. Symptomatic levels may be missed due to the presence of multilevel, heterogeneous MR signal abnormalities in multiple myeloma, but by using a clinical-based approach and utilizing the fluoroscopic exam, excellent results may be achieved.

Keywords: Vertebral, Balloon assisted

Financial Disclosures: The authors had no disclosures.

Preoperative Tumor Embolization Using Low Concentration of N-Butylcyanoacrylate (nBCA) and Ethiodol

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Introduction:

Embolization of cranial and spinal tumors using N-Butylcyanoacrylate (nBCA), as a liquid embolic agent, has been used effectively in reducing perisurgical blood loss. Using a low concentration of nBCA allows homogenous and deeper penetration into the tumor vascular bed. However, safety and outcome of using a low concentration of nBCA has not been well studied in the past. We aimed to evaluate the efficacy and procedure related complications associated with preoperative embolization of tumors by using a low concentration of nBCA.

Methods:

A retrospective review was performed on all patients who underwent preoperative tumor embolization using various concentrations of nBCA and ethiodol (20-50%), between 2011-2014, at our hospital. A total of 14 patients were identified of which low concentration ($\leq 20\%$) nBCA was used in 6 patients. Location, histopathologic diagnosis of lesion, concentration of nBCA used, perisurgical blood loss and rate of procedure related complications were studied in all patients.

Results:

A mixture of low concentration of nBCA and ethiodal ($\leq 20\%$) was used in 6 patients with a total of 9 arterial feeders embolized. The cases included two meningiomas, one carotid body paraganglioma, one nasopharyngeal angiofibroma, one metastatic renal cell carcinoma of thoracic vertebral body and one parasagittal metastatic leiomyosarcoma. Tumor embolization was performed by superselective injection of nBCA using Prowler 10 or 14 microcatheters with adequate embolization of the lesions achieved in all the 6 cases. No persistent vascularity was identified in at least 50% of the cases. No technical or clinical complication related to the embolization procedure was observed. All the cases underwent successful postembolization surgical resection with an average surgical blood loss of 440 mL.

Conclusions:

Preoperative tumor embolization using a mixture of low concentration of nBCA and ethiodal ($\leq 20\%$) is a safe and effective technique allowing better tumor penetration and facilitate successful surgical resection with minimal blood loss.

Keywords: Tumor embolization, nBCA

Financial Disclosures: The authors had no disclosures.

Poster 39

Standardized Color-coded Algorithms and Order Sets for Inpatients with Intracerebral Hemorrhage reduce Length of Stay in the Neuro Intensive Care Unit.

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Introduction:

With the advent of regional stroke systems of care, there is a growing concern of insufficient neuro intensive care (ICU) bed capacity for stroke patients with non-traumatic Intracerebral hemorrhage (ICH) in the limited number of certified comprehensive stroke centers. The average neuro-ICU Length of Stay (LOS) can potentially be reduced using standardized algorithms and order sets by streamlining inpatient workflows for ICH and optimizing neuro-ICU bed capacity.

Methods:

Standardized color-coded algorithms for neuro-ICU workflows for ICH (Fig: 1) along with evidence-based stroke order sets were implemented in 2010 as part of a comprehensive system of stroke care across 9 hospitals (2 Comprehensive Stroke Centers and 7 Primary Stroke Centers). Patients with ICH were identified based on an in-patient hospital neuroscience discharge database using ICD-9 codes (431.0, 432.9). The mean LOS data in the neuro-ICU was analyzed. Fisher's exact *p*-test was used to calculate 2-tailed *p*-values (*p*< 0.05 was considered significant).

Results:

A total of 17,138 consecutive in-patient hospital neuroscience discharges were evaluated over a 4-year period, of which 1293 patients (49% Male; n=641) were diagnosed with ICH (Mean Age: 66 +- 16 SD years). The mean LOS in the neuro-ICU among all ICH patients across all years in the study was 5.97 +- 6.83 SD days). The mean LOS decreased from 2009-2010 (7.02 +- 5.45 SD days) compared to 2010-2011 (5.00+- 5.87) (*p*< 0.0001), 2011-2012 (6.03 +- 6.34 SD days) (*p*=0.035) and 2012-2013 (6.34 +- 6.78SD days) (*p*=0.68).

Conclusions:

Utilization of standardized color-coded algorithms and evidence-based stroke order sets for ICH patients in the neuro-ICU is associated with a reduced mean length of stay, thereby optimizing neuro-ICU bed capacity within a comprehensive system of stroke care.

Keywords: Cerebrovascular disease, Decision analysis, Hemorrhage, Intracerebral Hemorrhage, Health economic

Financial Disclosures: The authors had no disclosures.

Poor prognostic impact of intracranial arterial stenosis in patients with acute vertebrobasilar artery occlusion

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Introduction:

The prognosis of vertebrobasilar artery (VBA) occlusion in acute ischemic stroke (AIS) is dismal. With recent progress of mechanical thrombectomy devices, revascularization rate further increased and clinical outcome was more ameliorated. In Asian countries, intracranial arterial stenosis (ICAS) is a common etiology in acute large intracranial artery occlusion. This may influence clinical outcomes after endovascular treatment using stentriever and/or aspiration techniques. We compared endovascular and clinical outcomes between ICAS and angiographically-defined embolism (ADE) groups.

Methods:

Among consecutive patients with AIS admitted into two Korean university hospitals from Jan-2010 to July-2014, 46 patients met the inclusion criteria: 1) posterior circulation AIS within 12 hours of symptoms onset. 2) The VBA occlusion was treated with Penumbra or Stent-retriever. 3) Assertiveness of ICAS is feasible. ICAS was defined as fixed focal stenosis (>50%) at the occlusion site, which could be seen at any point during the procedure on angiography. ADE was diagnosed if no focal stenosis was seen after any recanalization. Procedural characteristics and clinical outcomes were compared between ICAS and ADE groups.

Results:

Demographics were similar between groups. Trend for lower baseline NIHSS in ICAS versus ADE group was seen (14 vs 20, $p=0.103$). Procedure time was longer in ICAS group (96 vs 60 min, $p=0.003$). The rate of successful revascularization did not differ between groups. Discharge NIHSS tended to be higher (18 vs 6, $p=0.086$) and poor outcome (mRS 4-6 at 3 months) was more frequent in the ICAS group (74% vs 44%, $p=0.072$). On multivariable analysis, ICAS (9.951 [1.364-72.583], $p=0.023$) and high baseline NIHSS score (1.115 [1.010-1.230], 0.031) were independent predictors of poor outcome.

Conclusions:

Presumed underlying arterial stenosis in acute vertebrobasilar stroke was associated with longer procedure time and worse clinical outcome. Suspicion of ICAS on triage imaging in this population may warrant different endovascular approaches to achieve faster and safer recanalization.

Keywords: Ischemic stroke, Endovascular therapy

Financial Disclosures: The authors had no disclosures.

Poster 41

Standardized Color-coded Algorithms and Order Sets for Inpatients with Intracerebral Hemorrhage reduce Length of Stay in a Comprehensive System of Stroke Care.

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Introduction:

With the advent of regional stroke systems of care, there is a growing concern of insufficient bed capacity for stroke patients with non-traumatic Intracerebral hemorrhage (ICH) in the limited number of certified comprehensive stroke centers. The average Length of Stay (LOS) can potentially be reduced using standardized algorithms and order sets by streamlining inpatient workflows for ICH and thereby optimizing bed capacity.

Methods:

Standardized color-coded algorithms for in-patient workflows for ICH (Fig:1) along with evidence-based stroke order sets were implemented in 2010 as part of a comprehensive system of stroke care across 9 hospitals. Patients with ICH were identified based on in-patient hospital neuroscience discharge database using ICD-9 codes (431.0, 432.9). Average LOS data was analyzed. Unpaired t test was used to calculate *p*-values (*p* < 0.05 was considered significant).

Results:

Consecutive in-patient hospital neuroscience discharges were evaluated over a 5-year period, of which 1398 were diagnosed with ICH. The number of ICH patients discharged in 2010 (n=337) and 2012 (n=335) increased by 59.7% when compared to 2008 (n=211). The mean LOS in all ICH patients across all years in the study was 8.18 +- 1.58 SD days. The mean LOS decreased from 2008 (8.55 +- 2.97 SD days) and 2010 (8.57 +- 0.28 SD days) compared to 2012 (7.47 +- 0.71 SD days), (*p* < 0.0001 and *p* < 0.0001 respectively).

Conclusions:

Utilization of standardized color-coded algorithms and evidence-based stroke order sets for ICH patients is associated with decreased mean LOS by 1 day, thereby optimizing bed capacity at stroke centers within a comprehensive system of stroke care.

Keywords: Hemorrhage, Health economic, Intracerebral Hemorrhage, Medical management

Financial Disclosures: The authors had no disclosures.

Poster 42

The Penumbra 5 MAX ACE Device Results in Better Patient Disposition

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Introduction:

The neurointerventionist has many options when performing endovascular procedures. Penumbra 5MAX ACE is a new generation device which eases navigation and enhances aspiration without the use of a separator. This paper compares outcome in patients who underwent endovascular procedures using both 5MAX ACE (ACE) to other devices (Non-ACE).

Methods:

This is a retrospective analysis of all patients (n= 111) who presented to our hospital with ischemic stroke and considered for advanced stroke therapy (IV tPA and/or endovascular treatment) between January 2013 and July 2014. Statistical analysis was performed using GraphPad Prism. We divided patient into two groups: A (ACE) and B (non-ACE). We compared good disposition between patients who underwent endovascular therapy using both 5MAX ACE and other devices. Good disposition was defined as patient discharged to home or inpatient rehabilitation. All variables were included in the analysis.

Results:

59 patients that had all the variables and received endovascular treatment were included in this study. Results from group analysis including n, gender, mean age, Afib%, DM%, and prior stroke % were as follows: A) 40, 62.5% female, 75.6±18.2, 55%, 17.5%, 22.5%, B) 19, 57.9% female, 70.5±20.8, 36.8%, 31.6%, 36.8%. Notably, the mean NIHSS and recanalization rate (TICI score of IIb or higher) were 19.1±7.1 (group A) and 15.1±6.8 9 (group B) and 82.5% (group A) and 80% (group B) respectively. We found that patients who underwent endovascular procedures in group A experienced a better disposition as compared to group B (95% CI, 0.158-0.486, P < 0.001).

Conclusions:

Penumbra 5MAX ACE devices used in endovascular procedures may result in a better disposition as compared to other devices.

Keywords: Acute Ischemic Stroke Intervention, Endovascular therapy, Endovascular, Penumbra MAX

Financial Disclosures: The authors had no disclosures.

Systematic Review of the Safety of Stroke Thrombectomy Devices in the US: Analysis of the “Manufacturer and User Facility Device Experience” Database

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Introduction:

Background: Each year, the Food and Drug Administration (FDA) receives medical device reports (MDRs) of suspected device-associated safety issues from end users. However there is limited data on MDRs related to existing stroke thrombectomy devices FDA-approved in the United States (US).

Methods:

A systematic review of the U.S. FDA Manufacturer and User Facility Device Experience (MAUDE) database was performed from 1st January, 1994 to 31st July, 2014. Keywords included device names such as Concentric retriever, Penumbra Separator, Penumbra Reperfusion 5Max, Solitaire FR, and TREVO. The MDRs were grouped into four categories: “Mortality”, “Injury” including stroke or vessel injury (dissection, perforation, vasospasm and vessel rupture), “Device malfunction” including difficult deployment, fracture leaks, and “Others” including operator related MDRs, and tension while retrieving clot.

Results:

A total of 5113 search results were reviewed, out of which 673 MDRs pertaining to the existing stroke thrombectomy devices were analyzed (Table 1). Earlier generation devices such as Concentric retriever had 31 MDRs (Mortality=7, Injury=3, Device Malfunction=21), Penumbra Separator had 427 MDRs (Mortality=47, Injury=158, Device Malfunction=213), and Penumbra 5MAX Reperfusion Catheter had 101 MDRs (Mortality=1, Injury=20, Device Malfunction=78). Newer generation stent-retrievers such as Solitaire FR had 79 MDRs (Mortality=11, Injury=8, Device Malfunction=55), and TREVO (PRO, PROVUE, XP PROVUE) had 35 MDRs (Mortality=8, Injury=17, Device Malfunction=9).

Conclusions:

This systematic review identifies the common safety issues associated with current stroke thrombectomy devices and will aid in the development of better and safer newer generation thrombectomy devices for stroke patients in the future.

Keywords: Acute Ischemic Stroke Intervention, Endovascular therapy, Interventional neuroradiology

Financial Disclosures: The authors had no disclosures.

Poster 44

The Use of More than One Endovascular Device Leads to Worse Functional Outcome and Mortality in Acute Ischemic Stroke

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Introduction:

Neurointerventionalists are sometimes obliged to employ multiple devices during endovascular procedures due to incomplete recanalization, limitation on the number of passes per device or device failure. We investigate the benefits of additional devices in treating strokes.

Methods:

This is a retrospective analysis of all patients (n= 111) who presented to our hospital with ischemic stroke and considered for advanced stroke therapy between January 2013 and July 2014. Statistical analysis was performed using GraphPad Prism. We compared the effect of using additional devices (group A) to one advanced therapy alone (group B) on the functional outcome and mortality using modified Rankin Scale (mRS). mRS score of 2 or less defines a good functional outcome and an mRS of 6 defines mortality. All variables were included in the analysis.

Results:

59 patients were included in this study. Results from group analysis including n, gender, mean age, mean NIHSS, Afib%, DM%, Prior Stroke %, mortality % and mean total procedure time were as follows: A) 23, 65.2% Female, 79.4±17.4, 19±7.2, 47.8%, 26.1%, 13.0%, 21.7%, 2:13±0:55 B) 36, 58.3% Female, 70.5±19.5, 17±7.2, 50%, 19.4%, 36.1%, 2.8%, 1:31±0:44. We found that patients in group B experienced a better outcome (95% CI, -0.480 - -0.096, P < 0.001) and lower mortality (95% CI, 0.096 – 0.480, P < 0.001) as compared to group A.

Conclusions:

The use of more than one device during endovascular procedures in patients presenting with acute stroke may results in a worse functional outcome and mortality.

Keywords: Acute Ischemic Stroke Intervention, Endovascular, Endovascular therapy, Penumbra MAX

Financial Disclosures: The authors had no disclosures.

Poster 45

Endovascular therapy for patients with acute ischemic stroke and isolated aphasia with no motor deficits

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Introduction:

Background: Aphasia following acute ischemic stroke is highly disabling. Endovascular therapy for patients with acute ischemic stroke presenting predominantly with aphasia and a low initial NIHSS (< 8) has not been well established.

Methods:

We analyzed the outcome of patients who presented with pure aphasia due to acute ischemic stroke with M2 occlusion from 2011 through 2014.

Results:

From 2011-2014, we performed endovascular therapy on three patients who presented predominantly with aphasia with a low baseline NIHSS (< 4) and underwent endovascular therapy for M2 occlusion. such patients at our comprehensive stroke center. The mean age at presentation was 57 years. The mean time from symptom onset was 4.5 hours. All the three patients had a baseline NIHSS of less than 8 (mean 7.5) with global aphasia and left M2 occlusion. Successful thrombectomy was performed in all the three patients using thromboaspiration catheter in one and stentriever in two cases obtaining thrombolysis in cerebral infarction (TICI) 2b-3 reperfusion. At discharge there was significant improvement in speech in all the patients with a mean discharge NIHSS of 2. At three months follow up in one patient, the mRS was 1 with minimal word substitution as the only deficit. Two remaining patients will have three-month follow-up before November 1st.2014.

Conclusions:

Endovascular therapy in patients with acute ischemic stroke with M2 occlusion may have a favorable risk benefit ratio given the extreme disability from aphasia.

Keywords: Acute stroke, Endovascular, Endovascular therapy, Mechanical thrombectomy, Stroke

Financial Disclosures: The authors had no disclosures.

Optimization of Aspiration Efficacy to Reduce Distal Thromboemboli During Mechanical Thrombectomy in a Model System of Cerebrovascular Occlusion

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Introduction:

Improved recanalization rate has been achieved by the latest thrombectomy systems in the acute ischemic stroke treatment. However, arterial recanalization doesn't necessarily lead to brain tissue reperfusion. Lack of tissue reperfusion can happen as a result of clot fragmentation, which can cause distal embolization in the previously unaffected area or blockage of collateral flow to the potentially salvageable tissue. The purpose of this study is to determine the catheterization strategies that reduce the risk of distal embolization during mechanical thrombectomy.

Methods:

Solitaire thrombectomy was modified using the three most common access catheter set-ups in an in-vitro model of MCA occlusion, namely 1) an 8Fr balloon guide catheter (BGC), 2) a 5Fr distal access catheter at the proximal aspect of the clot in the MCA (Solumbra), or 3) a 6Fr guide catheter with the tip at the cervical ICA (GC). MCA occlusions were formed using hard fragment-prone clots (HFC=8) and soft elastic clots (SEC, n=8). Results from mechanical thrombectomy were compared to those from direct aspiration using the Penumbra 5MAX catheter. The primary endpoint is the risk of the embolic shower as indicated by the number and size of the clot fragments.

Results:

Solumbra and BGC were the most efficient methods for reducing HFC and SEC fragments, respectively ($p < 0.05$). BGC reduced total SEC fragments by at least 2-fold compared to the other techniques. Using GC significantly increased the risk of HFC formation ($>1000\mu\text{m}$). A non-statistically significant benefit of direct aspiration was observed in several subgroups of emboli with size between 50-1000 μm . However, direct aspiration significantly increased the risk of SEC fragmentation ($< 50\mu\text{m}$) by at least 2-fold, compared with the mechanical thrombectomy techniques.

Conclusions:

The chance of distal embolization can be minimized by reducing the occlusion-catheter tip distance as observed in the Solumbra group or use of large bore catheter such as BGC.

Keywords: Acute Ischemic Stroke Intervention, Balloon guide catheter, Endovascular, Mechanical thrombectomy, Recanalization

Financial Disclosures: The authors had no disclosures.

Poster 47

Deployable Stentriever: A necessary tool for safety during mechanical thrombectomy?

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Introduction:

Revascularization therapy for acute ischemic stroke is often unpredictable. Patients may have tortuous, atherosclerotic or damaged vessels that may only be revealed after entering the vessel. Attempting to retrieve a stent after it is expanded in a heavily compromised vessel may lead to vessel rupture or injury. The Solitaire AB (ev3 Inc, Plymouth, MN) was a self-expanding stent that offered a unique feature of being able to be detached. Our aim was to report our experience with mechanical thrombectomy devices and evaluate the essential role deployable stentriever could play in the treatment of select patients.

Methods:

We performed a thorough review of records, procedure notes and videos of mechanical thrombectomies for ischemic stroke performed at a university affiliated comprehensive stroke center from 2010-2013. The different devices used were identified and specific device features were evaluated to complete a benefit analysis.

Results:

Of 380 endovascular procedures performed for acute ischemic stroke, 130 of them were mechanical thrombectomies. Of these, 12 involved the use of the Solitaire AB device, where deployment was deemed necessary for safety reason. There were no procedural complications noted (symptomatic, asymptomatic intracerebral hemorrhages, vessel dissections, extension of ischemic stroke, worsening of NIHSS >4). Complete revascularization was achieved in 75% (n=9).

Conclusions:

Deployable self-expanding stents fill a specific need that has not been filled likely due to the unfounded fear of thrombotic complications. With the use of adequate hydration and anti-platelet agents, patients are unlikely to suffer complications with this device. The 6 patients described in this report would have likely suffered worse outcome had it not been for the unique feature of this device.

Keywords: Acute Ischemic Stroke Intervention, Stentriever, Mechanical thrombectomy, Stenting, Cerebrovascular disease

Financial Disclosures: The authors had no disclosures.

Intra- or Extracranial ICA Occlusion Among Acute Ischemic Stroke Patients Predicts Longer Times to Recanalization Using Initial Direct Aspiration with Penumbra MAX Catheters

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Introduction:

High suction efficiency of Penumbra MAX catheters enables direct aspiration without the use of a separator, hastening time to recanalization and limiting complications. We sought to analyze factors contributing to longer recanalization times with the use of Penumbra MAX catheters.

Methods:

Acute stroke patients undergoing interventional therapy from January to September 2014, at Pomona Valley Hospital, were included. Demographic and clinical data including age, baseline and discharge National Institutes of Health Stroke scale score (NIHSS), discharge modified Rankin scale (mRS), times from femoral access to recanalization, initial and final thrombolysis in cerebral ischemia (TICI) scores, occurrence of intracranial hemorrhage (ICH), and mortality were collected. Medians (for continuous) and frequencies (for ordinal) variables were calculated; chi square test was used to compare patients above and below median procedure times against other factors.

Results:

Of 24 patients identified, five did not undergo intracranial thrombectomy (n=2, no occlusion found; n=3, unable to reach target vessel due to proximal occlusion); in addition, no recanalization was achieved in two, yielding a recanalization (TICI 2B-3) rate of 77% (17/22). Median age was 75.5 years, and median baseline and discharge NIHSS were 20 and 9. Median procedure recanalization time was 55 minutes. Nine of these 24 patients (38%) had a favorable outcome of mRS 3 or less at hospital discharge. All patients with intra- or extracranial internal carotid artery (ICA) occlusion had recanalization times over 55 minutes, $p=0.03$. There were no symptomatic ICH and two mortalities. These patients had the longest recanalization times (97 and 123 minutes), and ICA origin occlusion, requiring proximal stent before intracranial thrombectomy.

Conclusions:

Our analysis echoes others' findings that Penumbra MAX catheters enable faster recanalization times. Patients with ICA occlusions are the main outliers with longer recanalization times, and such patients perhaps should be treated initially with separators or stent-retrievers rather than direct aspiration.

Keywords: Acute Ischemic Stroke Intervention, Mechanical thrombectomy, Recanalization

Financial Disclosures: The authors had no disclosures.

Profiling of Thrombi Extracted from Patients with Acute Ischemic Stroke: Preliminary Feasibility Study

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Introduction:

Cytokine profiles of peripheral blood and cerebrospinal fluid (CSF) have been used to predict stroke outcomes. Yet, the cytokine profiles of some patients do not match the predicted outcomes. Since the source of cytokines in the blood and CSF is unknown and systemic, we hypothesize that cytokine profiles from a resource that is local to the stroke site are a more accurate method for predicting stroke outcomes. Specifically, we postulate that thrombi extracted from patients who underwent mechanical thrombectomies are a better source than blood for cytokine profiling.

Methods:

All samples were collected with the consent of the donor. We first determined the feasibility of attaining and preserving thrombi. Six thrombi were collected from stroke patients that underwent anterior circulation intracranial thrombectomies with clot lengths >8mm as measured on thin sliced CT protocol. Thrombi were placed in a lysis buffer containing protease inhibitors. Thrombi were stored at 4°C in the clinic for a maximum of 6-8 hrs. Thrombi were then frozen at -80°C for long-term preservation. Thrombi will be subjected to ELISAs and Western blots to determine their cytokine profile and profiles will be correlated to stroke outcomes.

Results:

Of a total of 136 mechanical thrombectomy patients during this time six patients met the study criteria and consented to participate in the study underwent clot retrieval and immediate preservation, mean age was 76 (range 69-84, 5 males). There were two patients with right internal carotid T occlusion, three left middle cerebral artery (MCA) occlusions, and one patient with right MCA occlusion.

Conclusions:

It is feasible to extract thrombi and immediately preserve using buffers with protease inhibitors for cytokine profiling. Next, we will determine if cytokine profiles of thrombi and other inflammatory factors can be evaluated for future development of intra-arterial treatment options.

Keywords: Thrombosis, Coagulation

Financial Disclosures: The authors had no disclosures.

Endovascular Acute Stroke Intervention with Stent Clot Retrievers: Single Center Experience

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Introduction:

Since stent clot retrievers were approved by FDA and introduced into practice, the technique and clinical results of acute stroke interventions have drastically been changed. The results of IMS III trial, in which legendary devices (MERCI and the early generation of PENUMBRA system) were mainly utilized appears less practically applicable to the today's stroke intervention. We present our single center experience of applying stent clot retrievers to acute stroke intervention.

Methods:

Since March of 2012, total of 63 acute stroke cases have been treated with stent clot retrievers exclusively. Clinical demographics, angiographic results of TIC score, post procedure CT findings, and 3 – 12 months clinical outcome (50/63 78%) of modified Rankin Scale (mRS) were retrospectively reviewed.

Results:

The mean age 68 yo (24 – 86 yo), 32/31(male/female), median NIHSS 17 (6 – 25). Thirty nine patients received full dose of IV tPA. Occlusion site were Terminus ICA 15 (24 %), Tandem Proximal ICA and M1 3 (5%), M1 27 (42%), M2 6(10%), and Basilar A. 12 (19%). Angiographic outcomes were TIC I 34 (54%), TIC IIb 19 (30%), TIC IIa 7 (11%), TIC I 3 (5%). Symptomatic intracranial hemorrhagic complication was observed in 5 cases (8%). Clinical outcome of mRS were 0 & I 14 (28%), II 7 (14%), III 9 (18%), IV 9 (18%), V 3 (6%), VI (death) 10 (20%).

Conclusions:

Our single center experiences of stent clot retriever for acute stroke intervention are similar to the previous study results of SWIFT and TREVO2 trials. The new devices such as stent clot retrievers have been safely and effectively utilized for acute stroke intervention.

Keywords: Acute Ischemic Stroke Intervention, Stent retriever, Endovascular, Intervention

Financial Disclosures: The authors had no disclosures.

Poster 51

The Penumbra 5MAX ACE catheter is an efficient, safe, and cost effective mechanical thrombectomy device for large vessel occlusions (LVO) in acute stroke

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Introduction:

Recent literature suggests reperfusion of LVO in acute stroke improves patient outcomes. The purpose of this study was to assess the efficacy and safety of the novel Penumbra 5MAX ACE catheter and compare its cost against the stent retrievers.

Methods:

In this retrospective, single center case review study, data were captured on patients treated with the recently introduced 5MAX ACE as first-line therapy over an 11-month period. Successful reperfusion was defined by TICl scores of 2b-3. Symptomatic hemorrhage (sICH) was defined as parenchymal hematoma type 2 associated with a worsening NIHSS of 4 points or more. Good functional outcome was measured as mRS $\leq$ 2 at discharge. Groin puncture to reperfusion time (when TICl 2b-3 were achieved) was also documented.

Results:

A total of 31 patients were studied (mean age: 66.3 years; mean NIHSS: 19.4). TICl 2b-3 was achieved in 26/31 (84%) of the cases, while TICl 3 was achieved in 19/31 (61%). Average groin to TICl 2b-3 reperfusion was 40 minutes. Good functional outcome was achieved in 19/31 (61%) patients; 2/31 (6%) patients died. Two patients had sICH. The average cost for the 5MAX ACE frontline case inclusive of all adjunctive devices was \$6,997 per patient vs. the cost of using stent-retriever recommended devices of \$9,620 per patient, a 27% saving. Average cost when using ADAPT* alone with TICl 2b-3 achieved (20/31, 68% of attempts) was \$4,916, a saving of 49% while still maintaining a high success rate.

Conclusions:

These findings support using the 5MAX ACE as first-line therapy for acute ischemic strokes caused by LVO. Direct aspiration with a large bore catheter first is the most cost effective approach to treatment of LVO and yields excellent reperfusion rates in a short amount of time. This in turn leads to great functional outcomes and minimal complications. **J NeuroIntervent Surg* 2013-010713

Keywords: Endovascular therapy, Mechanical thrombectomy, Penumbra MAX, TICl

Financial Disclosures: honoraria for speaking - both authors

Rapidly improving symptoms and withholding Intravenous recombinant tissue plasminogen activator (IV r-tPA) in Acute Ischemic Stroke within Community hospitals: Is it time to re-visit this?

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Introduction:

National averages for intravenous thrombolysis (IV r-tPA) treatment rates remain around 4% and has only slightly increased to 7% in hospitals using the Get with the Guidelines – Stroke Program. One of the common reasons for excluding patients from receiving IV r-tPA in the real world within community hospitals is patients' with rapidly improving symptoms. The functional outcome and discharge disposition of these stroke patients with rapidly improving symptoms is not well described.

Methods:

All acute stroke consults within the regional Tele-stroke network of 122 hospitals were prospectively collected in a Tele-stroke registry from January 1st, 2012 to April 30th, 2014. For purposes of analyses, IV r-tPA eligible patient was defined as acute ischemic stroke patients who presented within 4.5 hours from LKN and who were screened for IV r-tPA exclusion criteria. Demographic variables, IV r-tPA usage, discharge status, inpatient mortality and rates of symptomatic hemorrhage were obtained from the registry.

Results:

A total of 3,505 consecutive acute stroke consults were performed, of which 2,550 were acute ischemic stroke consults. Delay in presentation to emergency department excluded 53.27% (1486/2550) of patients and 7.21% were TIA (184/2550) patients. A total of 880 patients with ischemic stroke (34.50%, 880/2550) were admitted within 4.5 hours from LKN, and of these 63.52% (559/880) patients received IV r-tPA. Median age was 65 years (range 16-103 years) and median NIHSS was 8 (range 0-31). Rapid clinical improvement (49/321 patients, 15.3%) was one of the main reasons to exclude stroke patients from IV r-tPA. 72% of these patients were discharged home compared to 28% being discharged to a rehabilitation facility or long term care facility.

Conclusions:

Acute ischemic stroke patients with rapidly improving symptoms can be at a risk for further neurological deterioration during their hospital stay. Treatment with intravenous thrombolysis could be considered in patients with rapidly improving symptoms.

Keywords: Stroke, Acute Ischemic Stroke Intervention, Fibrinolytics, Lytics, NIHSS

Financial Disclosures: The authors had no disclosures.

Are Big Trials Always Right? Challenging IMS 3: Single Centered Study

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Introduction:

The utility of a multimodal endovascular treatment paradigm for acute stroke has been investigated by recent trials. We present our single center experience of this endovascular treatment paradigm of acute ischemic stroke patients using newer generation devices with an overall faster door to catheter time and pre-analysis of collateral vessels for patient selection.

Methods:

Data on 23 ischemic stroke patients who underwent endovascular treatment from mid-January 2013 to mid-July 2014 was analyzed. An ASPECTS score >7 and collateral score based on CTA aided decision-making. Primary end point analyzed was stratified as NIHSS improvement: Supra-optimal (defined as NIHSS difference of 10 or more pre and post recanalization and improvement to 0-5). Secondary endpoints measured were optimal (NIHSS difference of 8 or more). Additional data including administration of IV tPA and TICI were recorded.

Results:

Of the 23 patients (Average age 76, 56% female) undergoing acute stroke intervention all patients achieved TICI 3 or 2b except for 3 with TICI 2a. 5 (22%) achieved primary end point (supra optimal) of which 3 did not receive IV tPA. 3 (13%) achieved secondary end point (optimal). An additional 5 patients (22%) achieved secondary end point of moderate improvement (TICI 2a-3) of which 3 received IV tPA with only 4 (17%) patients showing no improvement (TICI 2a-3) of which 3 received IV tPA and no patients showing worsening outcome immediately post procedure. The average NIHSS improvement seen in all patients immediately on the table in the endovascular procedure room, was 5.74.

Conclusions:

A more robust multimodal treatment paradigm entailing faster door to catheter time, new generation endovascular devices with or without IV tPA, enhanced vascular imaging providing meaningful collateral data is needed for successful clinical outcomes in acute ischemic stroke. Further multi-centered, prospective trials are warranted to reinforce our findings.

Keywords: Acute Ischemic Stroke Intervention, Endovascular therapy, Cerebral blood flow, Recanalization, Stent retriever

Financial Disclosures: The authors had no disclosures.

Poster 54

Single center experience with acute ischemic stroke endovascular intervention through access other than common femoral artery

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Introduction:

Acute ischemic stroke patients with a persistent occlusion despite IV tPA, or IV tPA ineligible, are at risk of increased infarct size, and significant long term disability. We reviewed our institutional experience with acute ischemic stroke patients with vascular tortuosity or occlusion preventing reperfusion via femoral access.

Methods:

Retrospective review of a prospectively acquired database from consecutive patients selecting patients who underwent acute stroke intervention via access other than femoral since starting in 2012, to remain within the institutional stentriever era. Treatment selection was based on the presence of a small core and large penumbra area based on CT, CTP, MRI, and NIHSS.

Results:

We obtained non- femoral access in 5 patients out 385: age 56 to 88, 1 woman, one left and 4 right MCA, NIHSS mean 15 (12-18). Radial access was elective for one 500 lb patient, with a 57 minute procedure time, with a 63 minute average procedure time for all infarct interventions. In the other four cases femoral approach failed because of tortuous arch (one case), or femoral/aortic occlusion (3), with an average procedure time of 163 (range 111 to 176) minutes. Radial access was first attempted in all patients, successful in 2, brachial in 2, and axillary 1. A RIM catheter was used in 3 cases. Long 6F NeuronMAX or Cook sheaths were tracked over an Amplatz wire. Stentriever assisted aspiration obtained reperfusion of TICl grade 2a (1), 2b (3), 3 (1). Three month mRS was 1 (1 case), 3 (1), 4 (2), 6 (1), correlating to younger age and lower procedure time.

Conclusions:

In the absence of common femoral access acute ischemic stroke endovascular treatment can be successfully provided via non-femoral access with good reperfusion. Evaluation of arch anatomy and aortic continuity may prevent procedure prolongation and poor outcomes.

Keywords: Acute Ischemic Stroke Intervention, Access catheters, Mechanical thrombectomy

Financial Disclosures: The authors had no disclosures.

Safety and Effectiveness of Endovascular Therapy After 8 hours of Acute Anterior Circulation Stroke using Stent Retriever

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Introduction:

Late presenting strokes (including wake-up strokes (WUS)) are common but treatment is often not considered due being outside of traditional time window. Stent retrievers have shown great outcome in recent studies. However, this new technology in late presenting strokes has not been studied. Intra-arterial (IA) reperfusion therapies with stent retriever along with multimodal imaging techniques may provide an opportunity to extend the time window in witness onset beyond 8 hours.

Methods:

Retrospective review of patients who underwent endovascular recanalization using stent retriever device ≥ 8 hours after acute ischemic stroke symptom onset, including WUS and report safety and effectiveness among this cohort of patients.

Results:

We identified 45 patients (mean age 68; mean baseline NIHSS 17, male gender 46%, WUS 32%). Occlusion locations were as follows: M1-74%, ICA terminus-16% and ICA origin (tandem occlusion)-10%. Successful recanalization (TICI 2b) was achieved in 70%. The rate of 90 day favorable outcome (modified Rankin score (mRS) ≤ 2) was 43%. Rate of symptomatic hemorrhage (PH) was 7% and the 3 month mortality rate was 22%. Multivariate logistic regression model identified only successful recanalization (OR 2.9, p 0.001, CI 1.59-5.44) Final infarct volume (OR 0.98, 95% CI 0.98-0.99, $P < 0.001$) and age (OR 0.96, p 0.03, CI 0.93-0.99) as predictors of favorable outcome.

Conclusions:

Endovascular therapy with stent retrievers can be instituted with acceptable safety beyond 8 hours from TLSW using multimodal imaging.

Keywords: Acute Ischemic Stroke Intervention, Endovascular therapy

Financial Disclosures: The authors had no disclosures.

Mobile Stroke Treatment Unit May Help with Early Triage of Patients with Suspected Large Vessel Occlusion

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Introduction:

Selection and early-triage of patients with suspected large vessel occlusion (LVO) to interventional centers may be associated with good outcomes owing to faster recanalization rates. Mobile Stroke Treatment Unit (MSTU), an on-site treatment team with a stroke neurologist, laboratory and CT scanner, which has reduced treatment times for IV tPA, may be a useful tool for intra-arterial therapy (IAT). We put forth our early experience using MSTU and IAT.

Methods:

Using the MSTU database at our institution we identified patients that were evaluated since July 2014 and underwent IAT. We compared these patients to historical ischemic stroke controls, which were patients, evaluated at our institutions 6 months prior to initiation of the MSTU. Clinical data, therapeutics and time points were collected for these patients.

Results:

Of the 35 patients that were successfully evaluated in the MSTU, one patient underwent IAT along with IV tPA. Due to suspicion of LVO the patient was directly triaged to a center with IAT capabilities bypassing the smaller non-IAT hospital based on the patient's residence. We identified 3 historical controls that presented to the same non-IAT hospital and were subsequently transferred to IAT capable centers due to suspicion of LVO, of which 2 underwent IAT. Average transport time between the hospitals in the pre-MSTU era was 20 minutes. We found 84-minute reduction in time from dispatch to arrival at IAT centers with the MSTU compared to historical controls, while CT to groin puncture time was reduced by 150-minutes.

Conclusions:

MSTU may help in early triage and shortening times to IAT for ischemic stroke, which may translate into faster vessel recanalization and better outcomes.

Keywords: Acute Ischemic Stroke Intervention, Cerebrovascular disease, Intra-arterial therapy, Endovascular therapy

Financial Disclosures: The authors had no disclosures.

A Novel Approach to Diagnose Reversible Cerebral Vasoconstriction Syndrome (RCVS): A Case Series

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Introduction:

Reversible cerebral vasoconstriction syndrome (RCVS) is classically diagnosed based on the presence of severe thunderclap headache, focal neurological symptoms and the radiographic findings of reversible diffuse segmental cerebral vasoconstriction. We present a diagnostic test that may assist in the clinical diagnosis and facilitate treatment.

Methods:

From October 1, 2010 to August 1, 2013 we identified consecutive patients who presented with a presumptive diagnosis of RCVS and underwent cerebral diagnostic angiography with intra-arterial (IA) vasodilator therapy. Medical records including clinical presentation, radiographic and angiographic images were all reviewed.

Results:

We identified a total of 7 patients (four females, age range 22-56; mean 45 years) who met our inclusion criteria. Four patients received a combination of Milrinone and Nicardipine infusion either in the internal carotid arteries (ICA) or in the left vertebral artery (VA); the remaining patients received IA therapy solely with either Nicardipine or Milrinone. Five patients had a positive angiographic response, defined as significant improvement or resolution of the blood vessels irregularities. All five patients had a definite discharge diagnosis of RCVS. The remaining two patients had a negative angiographic response and based on their clinical and radiographic course had a final diagnosis of intracranial atherosclerotic disease (ICAD).

Conclusions:

Our small case series suggest that IA administration of vasodilators is safe and may aid in distinguishing vasodilator responsive syndromes such as RCVS from other causes. Further study is required with long term clinical outcome to determine the utility of this diagnostic test.

Keywords: ICH

Financial Disclosures: The authors had no disclosures.

Analysis of the SPAN-100 Index as a Predictor of Clinical Outcome in the Post-Marketing North American SOLITAIRE Stent-Retriever Acute Stroke Registry

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Introduction:

In light of the negative results of three randomized trials for endovascular acute ischemic stroke therapy, proper patient selection has become a critical area of focus for endovascular therapy(ET). The Stroke Prognostication using Age and NIH-Stroke-Scale (SPAN) index, a score that combines age and NIHSS, demonstrated that SPAN-100 positive patients did not benefit from IV-tPA. Here, we sought to evaluate the predictive value of SPAN-index in a real-life cohort of patients undergoing ET.

Methods:

Using data from the investigator-initiated, multicenter North American Solitaire Stent-Retriever Acute Stroke (NASA) Registry, the SPAN-index was calculated for each patient (age plus NIHSS). SPAN-100 positive (SPAN ≥ 100) patients were identified and compared to SPAN-100 negative (SPAN < 100) patients. Successful recanalization was defined as Thrombolysis in Myocardial Infarction (TIMI) ≥ 2 . Good clinical outcome was defined as 90-day mRS ≤ 2 .

Results:

308/354 NASA Registry patients had available baseline NIHSS scores and 90-day mRS scores. 68/354(22.1%) patients were SPAN-100 positive. Mean age of SPAN-100 positive patients was 83.9 ± 5.6 years versus 62.8 ± 13.3 years in the SPAN-100 negative cohort ($p < 0.0001$). No difference was seen in the rate of successful reperfusion (TIMI ≥ 2) among the groups ($p = 0.9$). Only 26.5% (18/68) of patients in the SPAN-100 positive cohort had a 90-day mRS ≤ 2 versus 47.1% (113/240) of those SPAN-100 negative ($p = 0.002$). Mortality was 50.0% (34/68) and 24.6% (59/240) in SPAN-100 positive and SPAN-100 negative, respectively. In a multivariate analysis, SPAN-100 positive was shown as an independent predictor of clinical outcome, with 2.5 times greater likelihood of worse outcome versus those with SPAN-100 negative (OR 2.5; 95% CI 1.3-5.1; $p = 0.006$).

Conclusions:

Analysis of the NASA Registry demonstrated that SPAN-100 positive is significantly associated with worse clinical outcome and higher mortality rate at 90-days compared to SPAN-100 negative patients. SPAN-100 was shown as an independent predictor of clinical outcome and may be a useful tool in the selection of patients for ET.

Keywords: Endovascular therapy, Acute Ischemic Stroke Intervention, Ischemic stroke, Scale

Financial Disclosures: The author has no disclosures.

Longer Procedural Times Are Independently Associated with Symptomatic Intracranial Hemorrhage in Large Vessels Occlusion Stroke Patients Undergoing Thrombectomy

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Introduction:

Time to reperfusion is an essential factor in determination of outcomes in acute ischemic stroke. We sought to establish the effect of the procedural time on the clinical and radiographic outcomes of AIS patients undergoing intra-arterial therapy.

Methods:

Retrospective review of endovascularly treated large vessel AIS in a large academic center. Data from all consecutive patients who underwent mechanical thrombectomy from September 2010 to September 2012 were analyzed. The variable of interest was procedural time (defined as time from groin puncture to end of procedure). Outcome measures included the rates of symptomatic intracerebral hemorrhage, final infarct volume, 90-day mortality, and independent functional outcomes at 90 days.

Results:

The entire cohort included 242 patients with a mean age of 65.5+/- 14.2 and median baseline NIHSS 20. Of the patients 49.38% were females. The median ASPECTS score was 8. The mean procedure time was significantly shorter in patients with good outcome (86.73 vs. 73.13 respectively, P-value: 0.0228). However, after controlling for ASPECTS score, type of retrieval device, TICl score, volume of infarct, interval from symptoms onset to puncture, and co-morbidities, this association did not prove to be significant (P-value = 0.7101). Patients with SICH had significantly higher mean procedure time than patients without SICH (79.65 vs. 104.5 respectively; P-value: 0.0319) which remained significant when controlling to the previous factors (OR = 0.974 with a 95 % CI of (0.957, 0.991). There was no correlation between the volume of infarction and the procedure time ($r = 0.10996$, P-value: 0.0984). There was no association between procedure time and 90-day mortality (77.8 vs. 88.2 minutes in survivals vs. deaths respectively; P-value: 0.0958).

Conclusions:

Our data support an association between the risk of SICH and a longer procedure time while no definite association between procedural times and the final infarction volume or long-term functional outcomes was found after adjustment for multiple imbalances.

Keywords: Acute stroke

Financial Disclosures: The authors had no disclosures.

Predictors of Infarct Growth Despite Full Reperfusion Following Endovascular Therapy for Acute Ischemic Stroke

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Introduction:

Introduction We aim to explore the predictors of infarct core expansion despite full reperfusion after intra-arterial therapy (IAT).

Methods:

Methods We retrospectively reviewed 199/405 consecutive patients that underwent IAT for anterior circulation large vessel occlusion acute ischemic stroke (AIS) in two tertiary centers (2008-2013/2010-2013). Sixty patients selected by MRI or CT perfusion presenting < 24 hours of onset with mTICI3 or TICI2c reperfusion were included. Infarct growth volume was dichotomized in ≤ 11 cc vs. > 11 cc.

Results:

Results Mean age was 67.0 ± 13.7 years, 56% were male. Mean NIHSS was 16.2 ± 6.1 , time from onset to puncture 6.8 ± 3.1 hs, procedure length 1.3 ± 0.6 hs. MRI was used for core analysis in 43% of patients. Mean infarct core was 17.1 ± 19.1 cc. Three of 21 (14%) patients treated with stent retrievers had infarct growth vs. fourteen of 39 (36%) with Merci or Penumbra thromboaspiration (predating Max generation). Eight of 21 (38%) patients with IV t-PA had infarct growth versus 25/39 (64%) without. The absolute infarct growth was 30.6 ± 74.5 cc, and final infarct volume 47.7 ± 77.7 cc. Thirty-five percent of patients had growth > 11 cc. Forty percent of patients had mRS ≤ 2 at 3 months. Multivariate logistic regression indicated that race affected infarct growth; due to small subgroup numbers post-hoc analysis could not be performed. Use of IV t-PA and stent retrievers were associated with infarct growth ≤ 11 cc.

Conclusions:

Conclusion Infarct growth despite full reperfusion is relatively frequent and may explain poor clinical outcomes in this scenario. Ethnicity was found to influence infarct growth. Use of IV t-PA and stent retrievers were associated with less infarct core expansion. It remains unknown if these results apply for procedures performed with newer thromboaspiration technology.

Keywords: Stent retriever, Ischemic stroke, Endovascular therapy

Financial Disclosures: The authors had no disclosures.

Poster 61

Validation of the Interventional Stroke Assessment Scale for Eligibility in Endovascular Therapy (ISAS-ET)

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Introduction:

Despite innovations in endovascular stroke treatment, less than 55% of patients have shown good outcomes in multiple randomized clinical trials. In this study we are validating the Interventional Stroke Assessment Scale-for-Eligibility in Endovascular Therapy (ISAS-ET).

Methods:

This is a retrospective analysis of all patients (n= 111) who presented to our hospital with ischemic stroke and received advanced stroke treatment between January 2013 and July 2014. Statistical analysis was performed using GraphPad-Prism. The scoring system was developed with a score range (0-8), where a high score predicts a better outcome. Patients received 2, 1, 0 points for collateral scores of 3-4, 2, 0-1 respectively; patients received 2, 1, 0 points for NIHSS scores of 0-10, 11-20 and over 21 respectively; age < 65 received 1 point; absence of AFib received 1 point; time of onset < 3 hours received 1 point; no prior stroke or disability received 1 point. A modified rankin scale (mRS) of 2 or less represented a good functional outcome. Mortality was defined as a mRS score of 6 and good disposition was defined as patient discharged to home or inpatient rehabilitation.

Results:

Results for 59 patients included in this study are as follows: 61% female, mean age 74.0 ± 19.1 , mean NIHSS 17.8 ± 7.2 , 49.1% AFib and 10.1% mortality. We found a significant correlation between the ISAS-ET score and outcome (95% CI, 3.36-4.24, $P < 0.001$), mortality (95% CI, 3.93-4.82, $P < 0.001$) as well as good disposition (95% CI, 3.68-4.56, $P < 0.001$). Of this group, 94% of the patients with an ISAS-ET score of 1, 2 or 3 had a poor outcome regardless of intervention. Conversely, 86% of the patients with a score of 7 or more had a good outcome.

Conclusions:

The ISAS-ET scale appears to be appropriate in this single center study at predicting outcome using parameters prior to intervention. This data may help determine the urgency of transfer for intervention in hospitals without endovascular capabilities while helping determine which patients will benefit significantly from intervention.

Keywords: Acute Ischemic Stroke Intervention, Stroke, Endovascular therapy, TICl

Financial Disclosures: The authors had no disclosures.

Hydration After IV tPA Predicts Outcome

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Introduction:

Dehydration is a potentially precipitating factor in patients at risk for stroke. Early animal models and studies on dehydration were linked to the development of hypercoagulation and thrombus formation. Other researchers have looked deeper into the enzymatic reactions occurring in the coagulation cascade and discovered the role of dehydration in catalyzing thrombus formation. We evaluated the effect of hydration on outcome after IV tPA.

Methods:

We reviewed laboratory findings, clinical exam and overall hydration status of 188 patients who received IV tPA for acute ischemic stroke during a 3-year period at a comprehensive stroke center. SPSS 22 was used for descriptive statistics, frequencies, Spearman's rho correlation. Higher BUN/Creatinine ratio and serum osmolarity were used as markers for dehydration and compared with the NIH Stroke Scale at admission, 24-hours and discharge as well as the modified Rankin Scale at discharge (DCmRS).

Results:

Of the patients evaluated, 162 met study criteria (52.7% female), with the mean age of 73.4 (SD= 13.6). Patients with higher initial and later serum osmolarity had higher initial, 24-hour and DCNIHSS as well as higher DCmRS ($r=.196$, $r=.207$, $r=.247$, $r=.411$; $p<.01$). The initial BUN/Creatinine ratio correlated well with the ratio before discharge ($r=.450$; $p=.0001$). Patients with elevated BUN/Creatinine ratios were significantly more likely to have higher initial NIHSS, 24-hour NIHSS, DCNIHSS and DCmRS ($r= .235$, $.216$, $.324$, $.431$; $p<.01$).

Conclusions:

Dehydrated patients with acute ischemic stroke who received IV tPA had significantly worse clinical presentations and outcome. In practice, tPA is stored in a lyophilized form, after mixture, it may be deactivated by environments causing self-agglutination, even without peptide bonds breakage. Hydration status may thus play a role in optimal function of tPA. Patients who receive IV tPA should be well hydrated for better outcome. Our data needs to be validated in larger, prospective trials.

Keywords: Acute stroke, Medical management, Thrombolytics, NIHSS, Pathophysiology

Financial Disclosures: The authors had no disclosures.

Predictors of Good Outcome in the Elderly following Contemporary Endovascular Therapy for Acute Ischemic Stroke

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Introduction:

Acute ischemic stroke (AIS) in Octogenarians encompasses approximately one third of all acute strokes. Available data is discouraging regarding endovascular thrombectomy in this population. We aim to evaluate predictors of good outcome in contemporary series of Octogenarians.

Methods:

We performed a retrospective analysis of our Interventional database for consecutive elderly patients treated for large vessel occlusion during a four year period (September 2010-2014). One hundred and two patients were identified. Five patients were excluded due to the lack of 90-day outcome and six patients had posterior circulation occlusion, leaving nine-seven patients for the analysis. Good clinical outcome was defined by mRS ≤ 2 at 90 days.

Results:

Mean age was 84.7 ± 4.1 and 32 (33%) patients were male. Mean NIHSS was 19.3 ± 5.8 and 70% had good ASPECTS (≥ 7). Mean time from last-known normal to reperfusion was 6.2 ± 2.7 hours and mean procedural time 1.5 ± 0.8 hours. Twenty-six patients (27%) had good outcome. The demographic, imaging and procedural characteristics of the patients with good and poor outcome were similar, with few exceptions. The baseline NIHSS was lower in the individuals with good outcome (15.8 ± 5.6 vs. 20.1 ± 5.0 ; $p=0.02$). The group with good outcome more commonly had good ASPECTS (88 vs. 63%; $p=0.02$), more frequently had tandem cervical/intracranial occlusions (19 vs. 6%; $p=0.05$), and general anesthesia was less commonly used (23 vs. 43%; $p=0.09$). The patients that underwent treatment with Merci less frequently achieved good outcomes (7 vs. 23%; $p=0.09$) while patients treated with stent retrievers had a tendency for better outcomes (69 vs. 52%; $p=0.10$). Asymptomatic hemorrhages were more common in the patients with worse outcomes (15 vs. 36%; $p=0.05$). Multivariate regression analysis revealed that good ASPECTS (OR 6.3; 95%CI 1.0-38.7; $p=0.04$) and baseline NIHSS (OR 0.8; 95%CI 0.7-0.9; $p=0.03$) were independently associated with good outcome.

Conclusions:

Careful clinical and radiologic selection of Octogenarians for endovascular therapy is critical. The impact of newer device technology remains to be established.

Keywords: Mechanical thrombectomy, Endovascular therapy, Acute Ischemic Stroke Intervention, Stent retriever, Intra-arterial therapy

Financial Disclosures: The authors had no disclosures.

Higher Total Cholesterol, HDL and LDL Levels Increase the Risk of Intracranial Hemorrhage After Endovascular Treatment for Ischemic Stroke

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Introduction:

Recent evidence has highlighted an inverse relationship between lipids (HDL/LDL) and ischemic versus hemorrhagic stroke. Our goal was to determine if serum lipids had a role in increasing the risk of large intracranial hemorrhage after treatment with IV tPA and IA therapy.

Methods:

Patients receiving IV tPA for ischemic stroke at a major university affiliated comprehensive stroke center were evaluated over a 3-year period. The procedure notes of patients who underwent IA after IV tPA were reviewed for complications. SPSS 22 was used to determine Spearman's rho correlations between serum lipids and likelihood of complications as well as other baseline parameters, and descriptive statistics with standard deviations to determine the population characteristics.

Results:

Of the 188 patients evaluated, 68 also underwent intra-arterial (IA) treatment with either IA tPA or thrombectomy and met study criteria. There were 31 males and 37 females with a mean age of 73.4 (SD=14.8). The mean NIHSS was 15.9 at admission and 7.7 at discharge (SD= 6.4 and 5.5, respectively). There were 6 instances of large intracranial hemorrhages (3 symptomatic). Patients with large ICH were significantly more likely to have higher levels of total cholesterol, HDL and LDL ($r=.373$, $r=.323$ and $r=.347$, respectively; $p<.01$).

Conclusions:

Patients with low HDL and high LDL levels are prescribed statins for secondary stroke prevention as well as acute management. In most stroke centers, patients with ischemic stroke who have unfavorable lipid profiles are automatically given a statin prior to discharge. Evidence has shown elevated LDL to be a risk factor for ischemic stroke, but once a patient has an ischemic stroke elevated HDL levels may put them at risk for hemorrhagic stroke. Our data suggests that patients with elevated HDL are at increased risk of hemorrhage after intra-arterial therapy. Larger, prospective trials need to be conducted for more definite conclusions.

Keywords: Acute stroke, Acute Ischemic Stroke Intervention, Cerebral protection, Intracerebral Hemorrhage, Ischemic and hemorrhagic stroke

Financial Disclosures: The authors had no disclosures.

Age is not a predictor of outcome in patients who underwent stent retriever thrombectomy for acute ischemic stroke from middle cerebral artery occlusion.

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Introduction:

Outcome of acute ischemic stroke (AIS) in patients ≥ 80 years is not clearly defined especially those with large artery stroke and high NIHSS. Lack of data led to exclusion of these patients from stent retriever thrombectomy (SRT).

Objective: To evaluate predictors of outcome in patients ≥ 80 years compared to those < 80 years who underwent SRT for AIS due to middle cerebral artery (MCA) occlusion with large clot burden (>8 mm) (LCB).

Methods:

Consecutive AIS patients with NIHSS ≥ 10 from MCA occlusion with LCB who underwent SRT were enrolled from 2012 to 2014. Outcome was measured using modified Rankin Scale (mRS) at 30 days. Data was analyzed using SAS software.

Results:

21 patients with mean age of 70.60 ± 14 years old with mean NIHSS 16 ± 15 underwent SRT for MCA occlusion. Complete (TICI3) and near complete (TICI2b) recanalization was observed in 90.5% and 9.5% respectively. Time to recanalization from stroke onset was 230 ± 160 minutes. Presenting NIHSS of 16.76 dropped to 7, 5 and 2 at immediate, 24 hours and 30 days post SRT respectively. Good outcome (mRS ≤ 2) was observed in 76% and poor outcome in 24%. In univariate analysis recanalization time, immediate and 24 hours post SRT NIHSS were predictors of outcome ($p = 0.0039$, 0.003 and 0.043 respectively). In multivariate stepwise regression analysis recanalization time ($p = 0.03$) and immediate post SRT NIHSS ($p = 0.003$) were the only predictors of outcome. Patient's age and presenting NIHSS was not a predictor of outcome despite patients ≥ 80 years old having higher presenting NIHSS ($p = 0.006$). There were no difference in time to recanalization (67 ± 16 , 60.23 ± 22.38 , $p = 0.42$) and recanalization rates in the two groups.

Conclusions:

Patients ≥ 80 years has similar chance of recanalization and clinical outcome compared to age < 80 years. Therefore, SRT should be offered to all eligible patients irrespective of patient age. Further studies are warranted.

Keywords: Acute Ischemic Stroke Intervention, Mechanical thrombectomy, Decision analysis

Financial Disclosures: The authors had no disclosures.

Controlling for Hypotension or ASPECTS Eliminates the Association between General Anesthesia and Poor Outcome after ERT

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Introduction:

Previous retrospective studies of endovascular reperfusion therapy (ERT) for stroke noted an association between general anesthesia (GA) and poor outcomes, perhaps due to hypotension during the induction and maintenance of GA. These studies used the NIH stroke scale (NIHSS) to control for stroke severity. We incorporated the Alberta Stroke Program Early CT Score (ASPECTS) and hypotension into our risk model to determine if this reduced the strength of association between GA and poor outcomes.

Methods:

We retrospectively reviewed our institutional database of 379 patients treated for anterior circulation strokes from September 2010 until October 2013. Binary logistic regression was performed using variables identified in univariate analysis to determine the independent predictors of a poor neurologic outcome at 90 days (defined as modified Rankin Score > 2). We then performed a regression on the subgroup of patients for whom ASPECTS were available. Finally, we analyzed the effect of intra-procedure hemodynamics in patients for whom blood pressure data were available.

Results:

GA carried an OR for poor outcome of 1.62 (n=379, p=0.036) in a model controlling for age, reperfusion, and NIHSS. In the subset of patients for whom ASPECTS were available, adding ASPECTS > 7 to the model led to an OR for GA of 1.32 with p=0.361 (n=229). Adding lowest MAP > 70 to the regression model also led to p>0.05 for GA even without controlling for ASPECTS (OR=1.40, n=369).

Conclusions:

Future studies of the effect of anesthesia on outcomes after ERT should incorporate an imaging measure of stroke severity such as ASPECTS. Hypotension during the induction or maintenance of GA may contribute to worse outcomes and account for some of the risks of GA observed in earlier studies. Future prospective trials should be designed to determine if aggressive treatment of hypotension during ERT can improve outcomes.

Keywords: Anesthesia, Acute Ischemic Stroke Intervention, ASPECTS, Blood pressure management in acute stroke, Sedation

Financial Disclosures: The authors had no disclosures.

Poster 67

The Effectiveness of the Motor Component of the National Institute of Health Stroke Scale at Predicting the Functional Outcome at Discharge in Patient Receiving Endovascular Therapy

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Introduction:

The National Institute of Health (NIH) developed a standardized scale to evaluate the severity of a stroke at presentation. Predicting patient outcome after a vascular event can be very challenging. The objective of this analysis was to study the effect of the motor component of the NIH Stroke Scale (NIHSS) on a patient's functional outcome at discharge looking at a multicenter group to further validate our observation.

Methods:

This is a retrospective analysis of all patients (n= 161) that presented to the hospitals with ischemic stroke and received mechanical thrombectomy between January 2009 and July 2014 and had all the components of NIHSS baseline documented at presentation. Statistical analysis was performed using GraphPad Prism to independently evaluate the relationship between the NIHSS components and patient functional outcome at discharge using modified rankin scale (mRS). mRS of 2 or less represented a good functional outcome. All variables were included in the analysis.

Results:

112 patients that had all variables and their NIHSS breakdown components documented were included. Group analysis including gender, mean age, mean NIHSS, Afib%, DM%, Prior Stroke % and mortality at discharge were as follows: Female 52.7%, 72.1±16.3, 15.2±7.2, 34.8%, 27.7%, 25.9% and 12.5%. All Motor components of NIHSS in order left arm, left leg, right arm, right leg had a significant correlation with poor patient outcome at discharge (95%CI -3.932- -0.9607, P< 0.001); (95%CI, -3.843- -0.8714, P< 0.001); (95%CI, -3.584- -0.6125, P< 0.01); (95%CI, -3.539- -0.5678, P< 0.01). A higher motor score at presentation correlated with a worse outcome at discharge. NIHSS was significantly correlated with poor functional outcome (95% CI 9.881 -13.423 P< 0.001).

Conclusions:

Admission motor grade may serve as a good predictor of disability and mortality in patients undergoing mechanical thrombectomy with acute ischemic stroke. Further prospective study to validate such an observation is warranted.

Keywords: Acute Ischemic Stroke Intervention, Endovascular, Endovascular therapy, mRS

Financial Disclosures: The authors had no disclosures.

Weekly Trends of Acute Stroke Consults in a Regional Tele-stroke Network: Increased Stroke Risk on Monday?

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Introduction:

Understanding the weekly trends in acute stroke consults within a large regional Tele-stroke network will aid in appropriate budgeting for staffing needs as well as improve our understanding of any increased acute stroke risk during particular days of the week similar to acute myocardial infarction (*Circulation* 1994; 90:87-93).

Methods:

Standardized color-coded algorithms in the emergency room (ER) for rapid triage of acute strokes, as well as evidence-based stroke order sets, were implemented in 2010 within a regional Tele-stroke network of 122 hospitals. All acute stroke consults within the regional Tele-stroke network were prospectively collected in a Tele-stroke registry from January 1, 2012. For purposes of analyses, number of acute stroke consults was categorized into low peak (< 550 consults), medium peak (550-650 consults), and high peak (>650 consults). Z test was used to calculate *p* values (*p* less than equal to 0.05 was considered significant).

Results:

A total of 4,028 consecutive acute stroke consults were performed over a 2 ½ -year period (94.5% via Tele-phone, n=3807; and 0.9 % via Tele-camera, n=39), of which 2053 patients (Mean Age: 65 +/- 18 SD years) were women (52.4%). The total number of Tele-stroke consults has increased from 2012 (n=916) to 2013 (n=1598), with continued growth in 2014 (actual to date=1514; annualized n=2268). The highest peak day of the week for acute stroke consults was Monday (16.2%; 654/4028) (*p*=0.00016) and the lowest peak days were Sunday (13.2%; 534/4028) and Tuesday (13.5%; 544/4028) (*p*=0.0018).

Conclusions:

Weekly variations do occur in acute stroke consults within a regional Tele-stroke network and should be considered as part of staffing models for Tele-stroke networks. Further prospective studies need to evaluate the role of increased stroke risk on Mondays

Keywords: Stroke, Medical management, Acute stroke

Financial Disclosures: The authors had no disclosures.

Diurnal Variations in Ischemic Stroke Admissions within a Multi-Hub and Spoke Regional Brain Attack Network.

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Introduction:

Improved quality metrics in ischemic stroke, with faster door-to-needle times and increased treatment rates, requires the emergency rooms (ER), stroke units and neuro-critical care units within regional brain attack networks to be adequately staffed 24/7. Understanding the diurnal variations in ischemic stroke admissions will aid in appropriate budgeting by hospital administration to meet the staffing needs of stroke teams.

Methods:

Patients with a primary or secondary diagnosis of ischemic stroke were identified based on an in-patient hospital neuroscience discharge database using ICD-9 codes within a multi-hub and spoke regional brain attack network (2 comprehensive stroke centers and 7 primary stroke centers). The diurnal variations in ischemic stroke admissions were recorded based on the time of ER registration using a 24-hour format and categorized as 3-hour increments in a 24-hour time period (Fig: 1). For purposes of analyses, day shift was a 12-hour shift from 6am-6pm, and night shift was from 6pm-6am. Z test was used to calculate 2-tailed p -values ($p < 0.05$ was consider significant).

Results:

A total of 17,138 consecutive in-patient hospital neuroscience discharges were evaluated over a 4-year period, of which 6,271 patients were diagnosed with ischemic stroke. A sizeable number of ischemic stroke admissions occurred during the night shift (42.2%; 2648/6271), with the rest occurring during the day shift (57.8%; 3623/6271) ($p < 0.00001$). The peak time window for ischemic stroke admissions was from noon to 6pm (37.9%; 2382/6271) ($p < 0.00001$).

Conclusions:

Diurnal variations do occur in ischemic stroke admissions within a regional brain attack network and should be considered as part of staffing models for stroke centers within regional brain attack networks.

Keywords: Acute stroke, Health economic, Medical management, NIHSS, Treatment

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Poster 70

Prospective Study of the Feasibility of Pre-hospital Paramedic-initiated Blood Draws in Acute Stroke Patients En-route to a Stroke Center to Help Reduce Door-to-Needle Times: Tarrant County Experience

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Introduction:

Pre-hospital electro-cardiograms (EKG) performed by emergency medical services (EMS) have historically helped reduce door-to-balloon times in patients with heart attacks at chest pain centers. Pre-hospital EMS-initiated laboratory blood draws in ambulance can potentially help stroke centers reduce door-to-needle (D2N) times in brain attack patients.

Methods:

IRB approval was obtained. Standardized laboratory blood draw kits including four tubes (1 Blue top, 1 Light green top, 1 Dark green top, 1 Lavender top) were developed. Kits were distributed to paramedics from a single study-approved EMS agency to assess the feasibility of EMS-initiated blood draws. All acute stroke patients transported by the study-approved EMS agency to the study site (only certified comprehensive stroke center in Tarrant County, Texas) were enrolled in the study from January 1st, 2013 to June 30th, 2014. Study was categorized into early EMS education phase (Phase 1: first 6 months) and late phase (Phase 2: last 1-year). Demographic factors, whether intravenous thrombolysis (IV r-tPA) was administered, and the D2N times were analyzed. Unpaired t-test was used to calculate 2-tailed *p*-values (*p*< 0.05 was considered significant).

Results:

Total 1,353 consecutive acute stroke patients were evaluated at the study site over 1½ -year period, of which 91 acute stroke patients (53.8% Women; n=49/91) were transported by study-approved EMS agency (Mean Age: 70.7 ± 16.67 SD years) and were included in the study. All patients enrolled in the study successfully underwent paramedic-initiated blood draws. IV r-tPA was given in 11 of the 91 patients who met eligibility criteria. The mean D2N time in Phase 1 of the study was 70.6 ± 24.57 SD minutes compared to a mean D2N time of 47.3 ± 11.7 SD minutes in Phase 2 of the study (*p*=0.0101).

Conclusions:

Pre-hospital paramedic-initiated laboratory blood draws in brain-attack patients' en-route to a stroke center is feasible and is associated with a reduction in the door-to-needle times.

Keywords: Acute stroke, Clinical trial, Decision analysis, Health economic, New technique

Financial Disclosures: The authors had no disclosures.

Poster 71

Barriers To Administering Intravenous Recombinant Tissue Plasminogen Activator (iv Rtpa) In Acute Ischemic Stroke: Real World Experience From Community Hospitals Within A Regional Brain Attack Network

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Introduction:

The national average for IV rtPA treatment rate remains around 4% and has only slightly increased to 7% in hospitals using the Get with the Guidelines Stroke Program. The reasons for excluding patients from receiving IV rtPA in the real world within community hospitals outside of controlled clinical trials is not well described.

Methods:

All acute stroke consults within the regional Telestroke network of 122 hospitals were prospectively collected in a Telestroke registry from January 1st, 2012 to April 30th, 2014. For purposes of analyses, IV rtPA eligible patient was defined as acute ischemic stroke patients who presented within 4.5 hours from LKN and who were screened for IV rtPA exclusion criteria.

Results:

A total of 3,505 consecutive acute stroke consults were performed, of which 2,550 were acute ischemic stroke consults. Delay in presentation to emergency department excluded 53.27% (1486/2550) of patients and 7.21% were TIA (184/2550) patients. A total of 880 patients with ischemic stroke (34.50%, 880/2550) were admitted within 4.5 hours from LKN, and of these 63.52% (559/880) patients received IV rtPA. Median age was 65 years (range 16-103 years) and median NIHSS was 8 (range 0-31). IV rtPA was not administered in 36.48% (321/880) of these patients. The major reasons for exclusion in this group of patients (LKN < 4.5 hours) were stroke mimickers (23.4%), rapid clinical improvement (15.3%) or mild stroke (15%). Multiple contraindications to thrombolysis were present in 10% of these patients. Currently being on anticoagulation (9.7%), history of intracranial hemorrhage (4.0%), recent history of stroke (3.1%) and low platelet count (3.1%) were some of the other major reasons for exclusion. No patients were excluded because of difficulty in controlling high blood pressure.

Conclusions:

Understanding the barriers to administering IV rtPA in community hospitals within a regional brain attack network are helpful in increasing the IV rtPA utilization rates in the real world.

Keywords: Acute Ischemic Stroke Intervention, Lytics, Decision analysis, Health economic, TPA

Financial Disclosures: The authors had no disclosures.

Poster 72

Double-digit Overall Intravenous recombinant tissue plasminogen activator (IV r-tPA) treatment rates in Acute Ischemic Stroke can be achieved in Community hospitals within a Regional Tele-Stroke Network

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Introduction:

National average for IV r-tPA treatment rate remains ~4% and has increased to 7% in hospitals using the Get with the Guidelines – Stroke Program. Use of IV r-tPA at primary and comprehensive stroke centers is a core performance metric that significantly impacts patient outcomes after acute ischemic stroke. The feasibility of further increasing IV r-tPA treatment rates in community hospitals is not known.

Methods:

Acute ischemic stroke patients were categorized based on standardized color-coded algorithms in the emergency room (ER) for rapid triage based on time of last known normal (LKN). These were implemented in 2010 within a regional Tele-stroke network of 122 hospitals. All acute stroke consults within the regional Tele-stroke network were prospectively collected in a Tele-stroke registry from 1/1/2012 to 1/1/2014. For purposes of analyses, overall IV r-tPA rate was defined as number of acute ischemic stroke consults who received IV r-tPA within 4.5 hours from LKN (numerator) divided by total number of acute ischemic stroke consults (denominator: green, yellow and blue pathways) multiplied by 100.

Results:

Of the 4,028 total consecutive acute stroke consults over a 2 ½ -year period, 2,831 were acute ischemic stroke consults. 34.4 % (974/2,831) were ischemic stroke patients who presented within 4.5 hours from LKN (Green pathway), 15.1% (426/2,831) of the patients presented within 12 hours from LKN (Yellow Pathway), and 50.5% (1431/2,831) presented beyond 12 hours from LKN (Blue Pathway). Overall IV r-tPA treatment rate was 22.71% (643/2,831). Among the IV r-tPA eligible patients, administered IV r-tPA treatment rate was 66.02% (643/974).

Conclusions:

Double-digit overall IV r-tPA treatment rates are feasible in community hospitals within a regional Tele-stroke network. Continued community and EMS education is needed to raise awareness among the public about the treatment options for brain attacks within the therapeutic time window.

Keywords: Ischemic stroke, Acute Ischemic Stroke Intervention, Treatment, TPA, Lytics

Financial Disclosures: The authors had no disclosures.

Trends in Utilization of EMS Mode of Arrival in a Comprehensive System of Stroke Care

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Introduction:

Understanding trends in annual mode of arrival of stroke patients sets the stage for hyperacute triage, resource allocations via care paths, and delivery of efficient care throughout the remainder of hospitalization within a comprehensive systems of stroke care. We sought to evaluate trends in utilization of EMS transport services each consecutive year from 2009 to 2013.

Methods:

From 2009 to 2013, n=16,757 (94%) out of 17,741 consecutive cerebrovascular (Ischemic stroke, hemorrhage, and TIA) patients had documented known Mode of Arrival (MOA) within the Texas Stroke Institute Hospital Registry. Modes of arrival were divided into EMS (including ambulance, helicopter, and fire rescue) and NonEMS groups (including automobile, police, walk-ins, and other). We compared the trends in utilization of EMS transport methods as well as NonEMS transport methods. Utilization values for EMS and NonEMS groups were plotted each consecutive year in linear curves, and correlation coefficient (R²) values were calculated for goodness of fit.

Results:

Each year since developing the comprehensive system of stroke care, EMS transport services are increasingly utilized, 51% (n=1256) in 2009, 54% (n=1819) in 2010, 52% (n=1783) in 2011, 56% (n=2037) in 2012, and 60% (n=2324) in 2013 (R² = 0.90).

Conclusions:

As utilization of EMS transport services are increasing each year within the established comprehensive stroke systems of care, appropriately supervised EMS transport services may play a key role in efficiency growth, goal directed hyperacute management of stroke, and expedient delivery of therapeutics prior to hospital arrival.

Keywords: Acute stroke, Care, Health economic, Lytics

Financial Disclosures: The authors had no disclosures.

Poster 74

Primary Stroke Centers have shorter Length of Stay Trends for In-patients with Transient Ischemic Attacks within a Comprehensive System of Stroke Care

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Introduction:

With the systemization of stroke care, we explore whether Transient Ischemic Attack (TIA) patients are more efficiently managed at Primary stroke center (PSC) compared to Comprehensive stroke center (CSC) with regards to average Length of Stay (LOS). Factors associated with prolonged LOS in TIA patients are also not well understood.

Methods:

Patients with TIA's were identified based on inpatient hospital neuroscience discharge database using ICD-9 codes (435.8, 435.9) within a comprehensive system of stroke care across 9 hospitals (2 CSC's and 7 PSC's). Average LOS was analyzed as short LOS (0-2 days) and prolonged LOS (> than 2 days). Impact of demographic factors (age, gender) and facility factors (acute care, post-acute care) on LOS were analyzed. Fisher's exact p -test was used to calculate 2-tailed p -values ($p < 0.05$ was considered significant).

Results:

17,138 total consecutive inpatient hospital neuroscience discharges were evaluated over 5 years, of which 2938 (42% Male; $n=1242$) were diagnosed with TIA's (Mean Age: 69 years $\pm$ 13 SD). Average LOS in all TIA patients was 2.5 days (SD: $\pm$ 2.3 years). 2/3 (66%; $n=1938$) of TIA patients had short LOS compared to 1/3 (34%; $n=1000$) with prolonged LOS. Factors associated with prolonged LOS include: a) advanced age (> 80 years) associated with 34% (340/1000) prolonged LOS v 22% (424/1938) short LOS ($p < 0.0001$); b) 40% (436/1088) of all TIAs managed at a CSC have prolonged LOS compared to 30% (564/1850) of all TIAs at a PSC have prolonged LOS ($p < 0.0001$); c) 29% (290/1000) of TIA patients with prolonged LOS needed rehabilitation services post-acute care compared to 4% (84/1938) of TIA patients with shorter LOS ($p < 0.0001$). Gender did not have any relationship with prolonged LOS.

Conclusions:

TIAs are more efficiently managed at PSCs compared to CSCs with shorter length of stay, thereby optimizing bed capacity at stroke centers within a comprehensive system of stroke care.

Keywords: Medical management, TIA, Stroke, Health economic

Financial Disclosures: The authors had no disclosures.

Endovascular Treatment for Cribliform Plate Dural Arteriovenous Fistulas: Technical Difficulties and Complications Avoidance

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Introduction:

Cribliform plate dural arteriovenous fistula (dAVF) was a rare pathology, which the treatment of choice was surgical. Technological advances of micro-catheters and embolic agent these last years permitted the endovascular approach to propose new alternatives. We presented our experience in the treatment of cribliform plate dAVF.

Methods:

All patients treated endovascularly for a cribliform plate dAVF between 2008 and 2013 were included. We retrospectively analyzed demographic, clinical and angiographic data focusing on the type of treatment chosen.

Results:

Ten patients (M/F: 4/6, 51-73 year-old) were treated by endovascular approach. Complementary surgical exclusion of the fistula was necessary in 2 cases. Seven were discovered incidentally, 2 by bleeding and 1 by seizure. One or more ethmoidal arteries (EA) fed the fistula (bilateral supply in 80%) associated to the middle meningeal artery (MMA) in 30%. Thirteen embolization sessions were done (11 EA approaches, 2 treatments by the MMA and 2 venous approaches). Embolization of the fistula by an anterior EA was the technique of choice; the catheterism of the ophthalmic artery of impossible in 2 cases and the embolic agent did not penetrate in 4 cases. The embolization by MMA was successful in 1 case but the tortuosity of this artery avoided good penetration of the embolic agent. Venous approach was successful in all cases but this technique was reserved to fistulas with superficial and short venous drainage.

Conclusions:

Endovascular treatment of cribliform plate dAVF is secure and effective with success rate of 80% without complication. The embolization by EA is the method of choice. Branches of the MMA are often tortuous and avoid the penetration of the embolic agent. Venous approach is effective but has to be reserved after failure of the arterial approach and for cases with superficial and short cortical venous drainage.

Keywords: Endovascular therapy, Cerebrovascular disease, Embolization

Financial Disclosures: The authors had no disclosures.

IA Stroke Therapy Benefits Despite Lack of “Penumbra” on CT Perfusion

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Introduction:

There is a convergence of data showing that both CBF and CBV thresholds demonstrate high correlation with DWI score, while CBF, time-to-maximum (T-max), and mean-transit-time thresholds correlate with penumbral tissue. This led multiple stroke centers to adopt CTP as primary modality to assess penumbra and eligibility for IA stroke therapy even within the 8 hours time window.

Methods:

Case1: A 26 year old male with LMCA stroke (NIHSS 22). Intravenous tPA was given without improvement and CTA showed occluded L MCA and CTP had a matched deficit. The patient was taken for IA thrombectomy and had complete recanalization 4 hours from time of onset. Six day follow up CT showed a small stroke. Three months follow up exam with mild expressive aphasia and mild right arm weakness (NIHSS 1 and mRS 1). Case2: A 44 year old female with R MCA stroke (NIHSS 17). Intravenous tPA was given without improvement. CTA showed occluded right MCA and CTP with matched deficit. Intra-arterial tPA and thrombectomy resulted in complete recanalization after 4 hours from time of onset. Six weeks follow up CT showed a small stroke. Three months follow up exam with minimal deficit (NIHSS 2 and mRS 2).

Results:

In the two young patients who underwent IA stroke treatment within 8 hours despite matched ischemic lesions on perfusion CT there was significant improvement in outcome after recanalization without any hemorrhagic complications.

Conclusions:

Young patients presenting within 8 hours after onset of ischemic stroke deserve a chance of IA therapy despite matched lesion on CTP. Computed tomography perfusion imaging in acute stroke requires further validation

Keywords: Acute Ischemic Stroke Intervention, Endovascular therapy, CT perfusion, Interventional neuroradiology, Intra-arterial therapy

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