



PROGRAM ADDENDUM – PART I As of 5-29-04

The program changes listed below were received after the ASNR 42nd Annual Meeting Proceedings Book went to press.

General Information

Page XVII Technical Exhibits – Booth 206: Amersham Health is now GE Healthcare.
Page XVIII

Page XX Speaker Ready Room opens at 6:30am Sunday, June 6 through Thursday, June 10 instead of 8:00am as noted in the Proceedings Book.

Page XVIII The Technical Exhibits are located in Exhibit Hall 4A instead of Hall 4C as noted in the Proceedings Book.

Monday, June 7

Session 12a

- Page 37 - Paper 47, Role of Diffusion Tensor Imaging in Neuronavigation Surgery of Brain Tumors Near Pyramidal Tracts, has been withdrawn.
- Page 39 – Paper 50, “Relationship between MR Imaging and Genetic Molecular Profiles in Oligoastrocytomas”, has been withdrawn.

Tuesday, June 8

Session 23a

- Page 77 – Paper 95, Apparent Diffusion Coefficient of Hippocampus in Mesial Temporal Lobe Epilepsy, has been withdrawn.
- Page 77 – Paper 96, Qualitative Evaluation of Glx (Glutamate + Glutamine) Ratios with Other Metabolites in Evaluation of Mesial Temporal Sclerosis, has been withdrawn.
- Page 79 – Paper 100, T2 Relaxometry in the Evaluation of Patients with Mesial Temporal Lobe Epilepsy, has been withdrawn.

Session 29a

- Page 108 – Paper 143, Intracranial Contrast-Enhanced MR Angiography at 3.0 T
The presenter will be co-author Tim Carroll, PhD

Session 29b

- Page 116 – Paper 157, Practical Visual Integration of Multifunctional Brain Tumor Images, has been withdrawn.

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Wednesday, June 9

Session 43A

- Page 149 – NeuroNews: Developing Research and Emerging Trends
The Abstracts for this session can be found at the end of this Addendum

Thursday, June 10

Session 54a

- Page 194 – Paper 245, An Unusual Case of Lumbar Epidural Cryptococcomas in a Patient with Sarcoidosis - The presenter will be co-author Rita G. Bhatiz, MD

Session 60d

- Page 249 – Paper 326 - Reassessment of the Reproducibility of Postprocessing of Computed Tomography Perfusion (CTP) Data, has been withdrawn.

Friday, June 11

Session 65b

- Page 268 – Paper 346 - Lack of Education and Intelligent Quotient Effects on Hippocampal Activity in a Functional MR Imaging Experiment, has been withdrawn.

Scientific Posters

Poster 148

- Page 371 - Blood Flow Improvement through Critical Stenoses during Intracranial Angioplasty Procedures with Adjunctive Abciximab Increases Procedural Safety, John J. Connors, III, Miami Cardiac and Vascular Institute, Miami, FL, has been added as a co-author.

The following Scientific Posters have been withdrawn:

Poster 38

- Page 311 - Imaging of Neurologic Manifestations of HIV

Poster 136

- Page 365 - Preliminary Experience and Early Follow-Up Using Matrix Coils at the Montreal Neurological Hospital

Poster 173

- Page 385 - Spinal Cord Subependymomas: Radiopathologic Correlations

Scientific Exhibits

eSE Pilot Project

The following Scientific Exhibits were accepted to participate in the electronic Scientific Exhibit (eSE) Pilot Project. They can be viewed on the Computer Assisted Exhibit computers only.

Exhibit 26 - Imaging of Glutamate In Vivo: Presymptomatic Huntington's Disease

Exhibit 32 - Inflammatory Myofibroblastic Tumor of the Intracranial, Head and Neck Region: CT and MR Findings in Four Cases

Exhibit 35 - Diffusion-Weighted Imaging Findings of Intracranial Tumors: Relationship between T2 and Diffusibility

Exhibit 37 - MR Appearance of Reconstructive Flaps and Grafts in the Cranial Base

Exhibit 45 - Many Faces of Meningioma

Exhibit 46 - Meningioma with Meningioangiomas: Regrowth after Partial Resection

Exhibit 59 - Diffusion-Weighted Imaging Findings of Intracranial Hemorrhage

Exhibit 63 - MR Imaging and MR Angiography of the Hypoglossal Artery

Exhibit 70 - Acinic Cell Carcinoma of the Head and Neck: Imaging Findings with Pathologic Correlation

Exhibit 71 - Spectrum of Metastatic Renal Cell Carcinoma to the Head and Neck

Exhibit 78 - Unusual Imaging Manifestations of Thyroid-Associated Orbitopathy and Its Mimics

Exhibit 86 - Endovascular Treatment of Dural Cavernous Sinus Fistulas Using Transvenous Occlusion in Forty-Five Patients

Exhibit 88 - Preliminary Experience on the Use of a New Generation of Intracranial Stents (Neuroform) for Cerebral Aneurysms

Exhibit 90 - Thermo Reversible Liquid Embolic Agent for the Treatment of Vascular Disease

Exhibit 92 - Indication for Endovascular Improvement of Lateral Sinus Circulation in Case of Idiopathic Intracranial Hypertension

Exhibit 100 - Congenital Malformations of the Ear in Pediatric Patients: CT and MR Imaging Evaluation

Exhibit 101 - Imaging Spectrum of Tuberous Sclerosis

Exhibit 104 - Neonatal Cranial Ultrasound: A Practical Review and Pictorial Essay

Scientific Exhibit Changes

Exhibit 79

- Page 433 - Intraorbital Vascular Anomalies: A Pictorial Review, is now Poster 100A.

Exhibit 98

- Page 443 - Holoprosencephaly: A Review of Cranial Cleavage and Diverticulation Disorders, has been withdrawn.

Computer Assisted Exhibits

All Computer Assisted Exhibits (CAE) can viewed from any CAE computer with the exception of the following:

View at Computer 20

CAE 29 - Computer Animation of Catheter Maneuvering in Selective Angiography of Cephalic Arteries

View at Computer 21

CAE 12 - Two- and Three-Dimensional Atlas of Brain Anatomy

CAE 13 - Three-Dimensional Atlas of Brain Anatomy and Vasculature

CAE 30 - Model-Based Optimal Path Guidance and Remote Operation System for Interventional Neuroradiology Procedures

Computer Assisted Exhibit Changes

CAE 2

- Page 451 - Feasibility for Population-Based MR Angiography Screening for Unruptured Intracranial Aneurysms: Initial Results from the Northern Manhattan Study, is now Scientific Poster 13A.

CAE 8

- Page 454 - Separate Quantification of Lactate and Lipid in Treatment-Naive High-Grade Gliomas Using Three-Dimensional MR Spectroscopy – The primary author has been changed to Soonmee Cha, University of California San Francisco, San Francisco, CA

**Wednesday Afternoon
1:00 PM - 2:30 PM
Ballroom 6 A**

**(43A) NeuroNews:
Developing Research
and Emerging Trends**

Moderator: Robert Koenigsberg, MD

Paper 43A-1 Starting at 1:00 PM, Ending at 1:09PM

The Use of Radiofrequency for the Palliative Treatment of Sacral Chordomas

Nassar, A. N.·Nohra, C.·Khoneisser, A.

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Beirut, LEBANON

Complete radical surgical resection of sacral chordomas is difficult to achieve in most of the cases due to the highly associated morbidity and the presence of adjacent important structures including the sciatic nerves.

In addition, chordomas are known to be radio-resistant. only 8% of patients show a disease free survival rate.

In spite of almost a 100 % recurrence rate, surgery is still used aimed at radical resection. However, in the presence of aggressive recurrences, palliative treatment should be proposed.

A single case report is published in the literature in the American Journal of Radiology in November 2002 describing the use of Radiofrequency in the treatment of sacral chordoma We present two cases of sacral chordomas which underwent repeated surgeries and radiotherapy to no avail. These patients underwent RadioFrequency for palliative control of mass effect and an attempt at pain relief. with immediate and excellent response. Patients were pain free in the 24 hours following the procedure. Total procedure time of around 1 hour, average. No complications occurred.

The advantages offered by the Radiofrequency method which consist of short hospital stay (average 1 day), low cost, low morbidity and very low complication rate (none in our cases and in the reported case) when compared to palliative surgery, would indicate its use as a primary palliative method for the control of pain and mass effect.

Although we have very short follow up periods (14 months), the rapid and dramatic response to therapy in our patients' conditions supports the proposed suggestion. However, the reports in the literature are still few and multi central studies

for larger number of patients are still required.

The advantages offered are:

Short treatment time.

Low treatment cost.

Short inpatient stay.

Thus, cut healthcare costs.

Keywords: Radiofrequency, ablation, chordomas

Paper 43A-2 Starting at 1:09 PM, Ending at 1:18PM

Ferumoxtran-10 for Intraoperative Navigation

Neuwelt, E. A.·Hunt, M.

Oregon Health & Science University
Portland, OR.

Introduction:

Ferumoxtran is a paramagnetic, dextran-coated iron oxide particle that can be used as a MR contrast agent. Needing only to be give once, twenty-four hours prior to surgery, ferumoxtran can be used for sterotactic guidance as well as intraoperative MRI (IMRI), and remains long enough for postoperative MRI. Intraoperative MRI has advantages over conventional framed and frameless techniques. However, IMRI does have some drawbacks, especially related to interpretation of gadolinium-enhanced intraoperative imaging resulting from surgically induced blood-brain barrier injury, vascular changes and hemorrhage. Ultra-small paramagnetic iron (USPIO) particles like ferumoxtran-10 have a long plasma half-life and are trapped by reactive cells within the tumor. These trapped particles provide a method to demonstrate enhancing lesions without the artifact of repeat gadolinium administration in the face of blood-brain barrier and vascular injury, especially for IMRI and postoperative MRI.

Methods:

We present five patients who underwent surgery using conventional frameless sterotactic guidance as well as with IMRI with ferumoxtran-10 and a review of the literature.

Results:

Ultra-small paramagnetic iron particles represent a method to demonstrate enhancing intrinsic brain tumors without the drawbacks of intraoperative gadolinium enhancement. These lesions appear even on low-field strength IMRI. Ferumoxtran-10, administered preoperatively, provides a stable imaging marker, even after surgical manipulation of the brain.

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Conclusions:

Ferumoxtran-10 provides a way to lessen artifactual enhancement during IMRI related to the administration of gadolinium, and may be beneficial in postoperative MR imaging as well.

Keywords: image, guided, surgery

The authors of this work have indicated that they will be discussing/presenting an unapproved or investigative use of Combidex (ferumoxtran-10) made by Advanced Magnetics, Inc. for use as an imaging agent.

Paper 43A-3 Starting at 1:18 PM, Ending at 1:27PM

Very High-Resolution Contrast-Enhanced MRA of the Carotid Arteries Using Ferumoxytol in Humans

Meyer, J. R. • Mai, V. M. • Li, W. • Pierchala, L. • Tutton, S. • Ankenbrandt, W. • Edelman, R.

Northwestern University Medical School
Evanston, IL.

Purpose:

To study the feasibility of very high-resolution CE-3DMRA of the extracranial CA using ferumoxytol.

Methods and Subjects:

Ferumoxytol (Advanced Magnetics Inc., Boston, MA), an iron oxide blood pool contrast agent with a plasma half-life of 14 hours, was used to obtain very high-resolution MRA of the extracranial CA. Studies were performed with IRB approval and informed, written consent. A dosage of 4 mg/kg diluted to 7.5 mg/ml was infused at 2 cc/sec. All studies were performed on a 1.5 T system (GE Medical Systems, Milwaukee, WI) equipped with TwinSpeed gradients and a 4-channel neurovascular coil. A series of 8 subjects (3 volunteers and 5 patients, 4 male/4 female, average age of 56.6) were studied. First-pass imaging was performed using either a fluoroscopically-triggered 3D MRA or a temporally-resolved TRICKS acquisition. This was followed by an optimized very high-resolution 3DMRA sequence using the following parameters: TR/TE of 4.9 msec/1.4 msec, sampling BW of 83 kHz, FOV 26 cm, matrix size of 512x512, 1 NEX, and interpolated partition thickness of 0.8 mm. The in-plane spatial resolution was 0.5x0.5 mm. An axial 3D volume of 128 partitions covering the circle of Willis through the extracranial carotid bifurcation was acquired in approximately 5.5 min. In addition, a 3DMRA with lower in-plane resolution (256x256) as well as a pre-contrast axial 2D TOF MRA were acquired. Multiplanar and maximum intensity reconstructions were performed. Image quality was assessed on a 5-point scale; SNR and CNR were measured in the source images.

Results:

No adverse events occurred. Very high-resolution MR angiograms showed improved delineation of the CA compared with first-pass images, steady-state images acquired at 256x256, and 2D TOF MRA. Oblique multiplanar reconstructions eliminated venous overlap and provided excellent delineation of the carotid bifurcations.

Conclusion:

Current first-pass methods for CE-3DMRA of the CA suffer from limited spatial resolution. This problem can be overcome using nearly isotropic, very high-resolution MRA with ferumoxytol. The method has the potential to improve the accuracy and precision of measurements of carotid artery disease compared with current MRA methods.

Keywords: MRA, Contrast, Carotid

Paper 43A-4 Starting at 1:27 PM, Ending at 1:36PM

Superiority of Propeller FSE FLAIR to Conventional FSE FLAIR for 8 Channel Phased Array Brain Imaging in Clinical Practice

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¹NJ Neuroscience Institute - EIA, Edison, NJ, ²Barrow Neurological Institute, Phoenix, AZ, ³GE Medical Systems, Waukesha, WI.

PURPOSE:

To evaluate the performance of propeller FSE FLAIR with respect to FSE FLAIR using 8 channel phased array coils in the evaluation of patients presenting for brain imaging in clinical practice.

MATERIALS & METHODS:

Consecutive patients referred for MR imaging with symptoms suggesting neurological disease were evaluated with fast FSE FLAIR acquisitions performed with conventional and pre-commercial prototype propeller reconstruction techniques using commercially available 8 channel brain or neurovascular coils. Studies were compared with respect to ghosting and motion artifact by two blinded reviewers. A quantitative comparison of SNR was also performed. PROPELLER MRI [1] uses a novel approach to measure spatial frequencies. After each excitation (each shot), PROPELLER measures spatial frequencies along a strip, or blade, which goes through the central region of k-space (Fig 1a). This is usually done by using all the echoes from a single, central shot of a multi-shot FSE readout. For each subsequent shot, the blade is rotated, until all the necessary spatial frequencies to form a complete image are measured. As seen in Fig. 1b, the data from each blade (each TR) can be used to form an image which contains all of the low frequency information inside of that circle in Fig. 1a plus limited high frequency information. The data from these blades can be combined in k-space to form a complete image (Figs 1c,d). This re-sampling of the low spatial frequencies every shot is a

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key element of PROPELLER. Since the image formed from these data should look identical, one can look for inconsistencies from shot to shot, and correct the data accordingly. Reconstructions can be developed which can thus correct for in-plane motion (translation and rotation), correct for phase inconsistencies such as those introduced with diffusion lobes, and reject uncorrelated data (such as bulk through-plane motion).

RESULTS:

Studies obtained with propeller reconstructions were superior to those obtained with conventional reconstruction techniques with respect to ghosting, motion artifact and SNR.

CONCLUSION:

Propeller FSE techniques are superior to conventional techniques offering superior SNR as well as resistance to motion artifacts and ghosting. Propeller FSE will likely replace conventional acquisitions for routine use in the clinical setting.

REFERENCES:

1) Pipe JG: Motion correction with PROPELLER MRI: application to head motion and free-breathing cardiac imaging. *Magn Reson Med* 42:963-969, 1999.

Keywords: PROPELLER, FLAIR, 8 channel

The authors of this work have indicated the following affiliations/disclosures: GE Medical Systems, Speaker, Employees

Paper 43A-5 Starting at 1:36 PM, Ending at 1:45PM

Neuroform Stent Assisted Coiling in the Management of a Ruptured Pericallosal-Callosomarginal Aneurysm

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Introduction

There are few reports describing the successful endovascular treatment of aneurysms arising at the bifurcation of the pericallosal and callosomarginal arteries. We present the case of a ruptured bilobed pericallosal aneurysm successfully treated with coil embolization through a Neuroform stent (Boston Scientific/Target, Fremont, CA.). We believe this is the first such case reported in the literature.

Materials and Methods

A 48 year-old male presented with subarachnoid hemorrhage following rupture of an aneurysm arising at the bifurcation of the pericallosal and callosomarginal arteries, Hunt and Hess Grade V. Past medical history is significant for malignant hypertension and previous surgical clipping of same aneurysm 2 years earlier. The patient was referred for angiography post imaging studies and ventriculostomy.

Results

Diagnostic angiography revealed a persistent left pericallosal-callosomarginal aneurysm with an adjacent surgical clip. An initial attempt was performed to embolize the aneurysm with a detachable coil. This was unsuccessful due to the wide neck. A 4 X 15 Neuroform stent was then uneventfully deployed across the aneurysm neck followed by successful coil embolization with six detachable coils. The bilobed aneurysm was subsequently completely packed, without angiographic residua.

Conclusion

This case demonstrates the successful use of the Neuroform stent to assist in wide-neck aneurysm coiling of a pericallosal-callosomarginal aneurysm. It is presented with a brief review of the technique and literature.

References

1. Menovsky T, van Rooij WJ, Sluzewski M, Wijnalda D. Coiling of ruptured pericallosal artery aneurysms. *Neurosurgery*. 50(1);2002:11-15.
2. Fiorella D, Albuquerque F, Hans P, McDougall C. Preliminary experience using the Neuroform stent for the treatment of cerebral aneurysms. *Neurosurgery*. 54(1);2004:6-17.
3. Howington J U, Hanel RA, Harrigan MR, et al. The Neuroform stent, the first microcatheter-delivered stent for use in intracranial circulation. *Neurosurgery*. 54(1);2004:2-5.

Keywords: Neuroform, Pericallosal, Coiling

Paper 43A-6 Starting at 1:45 PM, Ending at 1:54PM

Early Clinical Trial Experience with a New Self-Expanding Stent System (Wingspan™) in Treating Intracranial Vertebro-Basilar Atherosclerotic Disease

Chang, F.^{1,2}•Teng, M.^{2,2}•Bose, A.³•Luo, C.^{4,2}•Lirng, J.^{2,4}

¹Taipei Veterans General Hospital, Taipei, TAIWAN REPUBLIC OF CHINA, ²National Yang Ming University, School of Medicine, Taipei, TAIWAN REPUBLIC OF CHINA, ³Neurointerventional Service, New York University School of Medicine, New York, NY, ⁴Department of Radiology, Taipei Veterans General Hospital, Taipei, TAIWAN REPUBLIC OF CHINA.

Purpose

Medically refractory stenosis of intracranial arteries carries a high risk of stroke. Angioplasty and stenting of intracranial arteries by balloon expandable stents have been reported. However, these balloon mounted stents often have difficulty in accessing the tortuous intracranial circulation and can cause vascular injury during endovascular navigation and during high pressure balloon inflation for stent deployment. These risks are accentuated in the fragile vasculature of the vertebro-basilar system. We report our initial experience using the Boston Scientific self-expanding Wingspan™ Stent System

Materials & Methods

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Case 1. A 76-year-old male suffered recurrent right hemiparesis despite antiplatelet and anticoagulant therapy. Small pontine and occipital infarcts were evident on MRI. Angiography demonstrated a segmental stenosis compromising 75% of the vascular lumen in the mid-basilar artery. Angioplasty and stenting of the basilar artery stenosis was performed over a 0.014" Choice PT micro-guidewire. The diameter of the pre-stenotic basilar artery was measured to be 3mm, and predilatation of the stenotic segment was performed with a 2.5mm Gateway microballoon at 6 atm. The stenosis was reduced to 60% after a single inflation. Subsequently, a 3mm x 15mm self-expanding nitinol stent (Wingspan™) was deployed over the stenotic segment. Post-procedure control angiography demonstrated a residual stenosis of 36%. The patient was discharged home with no neurologic symptoms.

Case 2. A 73-year-old male suffered transient ischemic attacks and recurrent dizziness in recent months. Angiography showed 80% stenosis in the left distal vertebral artery measuring 4mm in pre-stenotic luminal diameter. Over a 0.014" Transcend micro-guidewire the stenosis was predilated with a 3.5mm Gateway microballoon to 6 atm which resulted in a residual stenosis of 42%. Subsequently, a 4mm x 20mm Wingspan™ stent was deployed. Control angiography revealed a residual stenosis of 25%. The patient was discharged home free of neurologic symptoms.

Results

Both patients showed successful angioplasty and stenting of intracranial vertebro-basilar stenosis without complication. The residual stenosis after angioplasty was further reduced acutely by the positive remodeling force of the self-expanding Wingspan™ stent.

Conclusion

In the treatment of intracranial vertebro-basilar stenosis, the Wingspan™ self-expanding stent and micro-catheter based delivery system demonstrated good trackability and could navigate tortuous intracranial vasculature without difficulty. Under-sizing the angioplasty balloon with respect to the normal diameter of the parent vessel during predilatation of the stenotic lesion avoided unnecessary vascular injury to the parent vessel lumen such as dissection or rupture. The positive remodeling force of a self-expanding nitinol stent can further dilate a residual stenosis after angioplasty. Early experience suggests that angioplasty and stenting of intracranial arterial stenosis with the Wingspan™ self-expanding stent may be a safe and feasible option for stroke prevention. Enrollment and long-term follow-up is ongoing.

Keywords: Stent, Basivertebral stenosis,

Paper 43A-7 Starting at 1:54 PM, Ending at 2:03PM

A New Generation of Self-Expanding Nitinol Intracranial Stent System in Symptomatic, High Grade Intracranial Atherosclerotic Stenosis: Strategy for Pre-dilation of the Lesions and Stent Deployment to Minimize Vessel Trauma

Hartmann, M.¹·Ringleb, P.·Bose, A.¹·Berez, A.²·Sit, S.³

¹University of Heidelberg Medical School, Heidelberg, GERMANY, ²New York University School of Medicine, New York, NY, ³Boston Scientific Neurovascular, San Leandro, CA.

The Wingspan™ (WST) is a new generation of self-expanding stents specifically designed for the treatment of intracranial (IC) atherosclerotic disease. It is made of ultra-thin nitinol, low profile and highly flexible. The WST Stent System is consisted of a 3.5F delivery catheter with inner through-lumen with the stent pre-loaded for deployment. The system also contained a Gateway™ PTA balloon catheter with the intended use of pre-dilating the lesions, followed by WST self-deployment with sufficient radial force to remodel severely stenosed vessels without the need for post-dilation. To minimize trauma, the size of the PTA balloon is under-sized to 80% of parent vessel diameter with slow inflation to no more than nominal pressure. Described herein are initial experiences with the WST system in patients with severe symptomatic stenosis who have failed antithrombotic therapy. Major entry criteria are recurrent stroke attributed to target lesions 2 - 4.5mm in diameter with stenosis >50% and <14 mm in length, failed medical therapy, and a Modified Rankin score (MRS) of < 3.

Three patients with symptomatic atherosclerotic stenosis, mean age 69 years, with vessel sizes ranged from 2.0-3.6mm, lesion lengths from 1.9 to 6.8mm in the petrous ICA, Carotid-T and M1 were treated. The degree of stenosis according to the WASID method was reduced from a median of 89% to 35% after balloon angioplasty and to 21% after WST placement. Post-dilation was not required. The trackability of the WST delivery catheter through tortuous vasculature was very good and there was more than sufficient wall apposition to remodel all lesions without the need for post-dilation. All 3 patients successfully completed the PTA and stenting procedures and discharged neurologically intact. No complication, vessel dissection/rupture, or thromboembolic events occurred. No stroke or death occurred at 30-day follow-up; the status of all patients was stable with relief of symptoms and no restenosis was revealed by transcranial Doppler at 30-day.

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These results indicate that the Boston Scientific self-expanding Wingspan™ Stent System with Gateway™ PTA Balloon Catheter may be a safe treatment of atherosclerotic intracranial lesions. Undersizing of PTA balloon and self-expansion of WST may minimize trauma to the parent vessel while providing for good wall apposition. Enrollment and long term follow-up are ongoing.

Keywords: stent, intracranial, stenosis

The authors of this work have indicated that they will be discussing/presenting an unapproved or investigative use of Wingspan™ made by Boston Scientific Neurovascular for use as self-expanding stents specifically designed for the treatment of intracranial (IC) atherosclerotic disease.

The authors of this work have indicated the following affiliations/disclosures: Boston Scientific, Paid Consultant, Employees

Paper 43A-9 Starting at 2:12 PM, Ending at 2:21PM

Real-time MRI Guided Neurovascular Intervention

Pile-Spellman, J.¹·Feng, L.¹·Lin, E.¹·Gupta, G.¹·Dashnaw, S.¹·Zhang, H.¹·Oklu, R.¹·Baytion, M.¹·Dumoulin, C.²

¹Columbia University, New York, NY, ²General Electric, Schenectady, NY.

Introduction

Compared to conventional fluoroscopy, real-time magnetic resonance imaging (MRI) guidance offers many advantages for diagnostic and interventional neurovascular procedures. Continuous intraprocedural assessment of tissue viability and brain function with diffusion weighted imaging, perfusion weighted imaging, and functional MRI provides new dimensions for the treatment of cerebrovascular diseases, particularly ischemic stroke. Visualization of neurovascular anatomy is available with multiplanar MRA images and 3D reconstructions. MR-guided endovascular procedures are safer to patients and operators due to the lack of ionizing radiation. Furthermore, gadolinium-based contrast agents exhibit lower nephrotoxicity and allergic potential than iodinated contrast agents. We performed a pilot animal study to assess feasibility of performing interventional neurovascular procedures under real-time MRI guidance.

Materials and Methods

After obtaining percutaneous vascular access to the femoral artery on the MR table, transfemoral catheterization of the carotid arteries was performed in 10 pigs using active MR-tracking catheters and guidewires. Intraarterial (IA) contrast enhanced MRA confirmed catheter position and evaluated the distal vascular anatomy. Carotid stenting was performed in five animals. The carotid and subclavian arteries were occluded with balloons to create stroke models in five animals

and intraarterial thrombolysis was carried out in two animals. Necropsy was performed on all animals to assess the intervention and presence of unintended vascular injury.

Results

The carotid arteries were catheterized minutes after obtaining vascular road maps. Ten nitinol stents were successfully placed into the bilateral carotid arteries in all five animals (Figure 1). The stent positions were confirmed by necropsy with no unintended vascular injury. In separate experiments, all target vessels were occluded successfully with balloons (figure 2). After the carotid artery branches were occluded intentionally with blood clots in two animals, we infused IA rtPA, which resulted in recannulization of these vessels (figure 3).

Conclusion

Carotid stenting, embolization, and thrombolytic procedures were successfully performed in a swine model using active MR-tracking, suggesting neurovascular intervention may be feasible under real-time MRI guidance.

Figure 1. Active-Tracking Catheterization

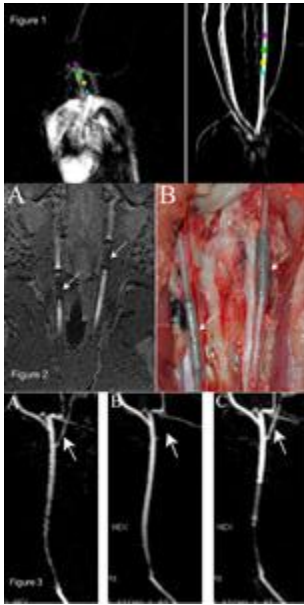
a. Catheterization of brachiocephalic artery with active-tracking devices. (A, aorta; BCA, brachiocephalic artery; LSCA: left subclavian artery; CCA: common carotid artery).
b. Catheterization of the common carotid arteries with active-tracking devices.

Figure 2. Stents in Bilateral Carotid Arteries

a. A coronal FSPGR image with T1 weighting demonstrates hyperintense blood in the carotid lumens. The stents are identified by the susceptibility artifacts of nitinol. The inferior margin of the left stent is intentionally matched with the superior edge of the right stent.
b. Necropsy reveals the stents in the same positions as shown on MRI. Both common carotid arteries have shiny adventitia without evidence of perforation or mural hematoma formation.

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Figure 3 a. IA contrast enhanced MRA of left carotid artery.
b. Occlusion of ascending pharyngeal artery.
c . Recanalization after thrombolysis.



Keywords: Real time MRI Guidance, Interventional Neuroradiology

The authors of this work have indicated the following affiliations/disclosures: General Electric, Employee

Paper 43A-10 Starting at 2:21 PM, Ending at 2:30PM

“3D”- and Dynamic Sequences in Fetal MRI

Prayer, D. •Brugger, P. C. •Kasprian, G. •Mittermayer, C. •Krampl, E. •Herold, C.

Medical University Vienna
Vienna, AUSTRIA.

Purpose:

To demonstrate the ability of “3D”-and dynamic sequences to add information to fetal CNS-MRI studies. **Material and Methods:** In 15 consecutive fetal MRIs, done because of suspect CNS/extra CNS abnormalities, between the 19th and 32nd gestational week (GW), SSFSE - (20-40 mm slab), and dynamic TFE sequences (8-50mm thickness, 4 frames/second) were added to the routine fetal-MRI protocol (including T2, T1, FLAIR, diffusion weighted imaging, and steady state free precession sequences [1]). Indications consisted of twin-to-twin transfusion syndrome (3), ventricular asymmetry (1), suspect choroid plexus cyst (1), intrauterine growth restriction (2), Chiari II malformation (1), cardiac tumor (1), facial cleft (2), diaphragmatic hernia (3), dwarfism (1) and polyhydramnios (2). On “3D” images gyration, body surface, shape of extremities, thickness of soft-tissue, and configuration/course of the umbilical cord was evaluated. Dynamic sequences were screened for the proof of normal general-movements [2], and in case of spinal

pathology especially for all qualities of leg movements, hand movements, and swallowing.

Results:

“3D”-sequences showed normal conditions in 13/18 cases, pathology detected/confirmed by “3D”-imaging consisted of: abnormalities of face/skull relation (3), extremities (2), and soft-tissue thickness (2). In 12/18 fetuses general movements/leg-movements were observed at least once during the examination time (30-40 minutes), hand movements in 8/18, and swallowing in 6/10 in whom this movement was specially looked for.

Conclusion:

“3D”- and especially dynamic fetal imaging add functional information that allows a more accurate estimation of pathological conditions than the use of routine sequences only. In addition, this sort of “clinical” information introduces a new dimension to fetal MRI.

References:

1. Prayer D, Brugger PC, Prayer L Fetal MRI: techniques & protocols. *Pediatric Radiology* 2004, in press.
2. Prechtl HFR. Qualitative changes of spontaneous movements in fetus and preterm infant are a marker of neurological dysfunction. *Early Hum Dev* 1990;23: 151-8.

Keywords: fetal magnetic resonance, dynamic imaging, fetal movements



PROGRAM ADDENDUM – PART 2 6-3-04

The program changes listed below were received after the ASNR 42nd Annual Meeting Proceedings Book and Program Addendum went to press.

Monday, June 7

Session 6b

- Page 14 - Paper 13, Accuracy of Dynamic Perfusion CT with Deconvolution in Detecting Acute Hemispheric Stroke, will be presented by William P. Dillon, MD.
- Page 19 – Paper 21, Dynamic Perfusion CT: Optimizing the Temporal Resolution and Contrast Volume for Calculation of Perfusion CT Parameters in Stroke Patients, will be presented by William P. Dillon, MD
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Tuesday, June 8

Session 23d

- Page 99 – Paper 135, Longitudinal MR Imaging Changes and MR Spectroscopy of Neurocutaneous Melanosis with Subsequent Development of Malignant Peritonitis, will be presented by Robert J. Bert, MD.

Friday, June 11

Session 65b

- Page 282 – Paper 371- Multislice CT Angiography in Diagnosing Vertebral Artery Dissection: Comparison with Catheter Angiography, has been withdrawn.

PROCEEDINGS BOOK ADDENDUM

NeuroNews Session

- Page 5 – Paper 43A-1, The Use of Radiofrequency for the Palliative Treatment of Sacral Chordomas, has been withdrawn.