AJNR

Retrievable versus nonretrievable coils.

G Debrun

AJNR Am J Neuroradiol 1997, 18 (7) 1389-1390
http://www.ajnr.org/content/18/7/1389.citation

LETTERS

Retrievable versus Nonretrievable Coils

I have read with great attention the article written by Chaloupka et al (1) in the August 1996 issue of *AJNR*. They treated two patients with nonretrievable coils. Although they did not have any complication, I wonder whether it is reasonable to offer a treatment that bears substantial risk of having one coil migrate into the parent vessel without the option of retrieving the coil, or only with great risk if a snare device is used. There are actually different types of retrievable coils on the market and I think that we should not take the risk of treating an aneurysm with nonretrievable coils. I have personally always refused to treat any aneurysm with nonretrievable coils. I waited until I had the opportunity to use the Guglielmi detachable coils (GDCs) (Target Therapeutics, Fremont, Calif), initially as one of the investigators, before these coils became approved by the Food and Drug Administration recently. I am surprised that this article did not address the advantages of using retrievable versus nonretrievable coils.

Gerard Debrun
Departments of Radiology and Neurosurgery
University of Illinois at Chicago

Reference

1. Chaloupka JC, Putman CM, Awad IA. Endovascular therapeutic approach to peripheral aneurysms of the superior cerebellar artery. *AJNR Am J Neuroradiol* 1996;17:1338–1342

Reply

We would like respectfully to point out that the objective of therapy in the two cases presented in our recent article was *specifically to achieve parent artery occlusion* near the site of the aneurysm. In both cases, endosaccular coil embolization with parent artery preservation was not possible because of the relatively large ostia of these aneurysms. Following this line of argument, one could simply dismiss such criticism on the basis of a misunderstanding of the objectives of therapy. However, Dr Debrun's emphasis on the use of a retrievable coil for endovascular therapy of aneurysms raises some important global issues of technique and technology. There is no question that, in general, retrievable coils increase the level of precision and safety in deployment during microcatheter embolotherapy. This is particularly crucial for performing safe and effective endosaccular coil embolization with parent artery preservation. However, use of retrievable coils is not without its disadvantages and risks, contrary to what Dr Debrun seems to imply. There have been several reports of significant technical failures of the various types of available retrievable coils worldwide, consisting of either inability to retrieve a coil already extruded from a microcatheter or inability to detach the coil once it is deployed. These technical failures occasionally can be remedied by retrieval maneuvers with a snare, although in some situations there have been significant clinical complications because of either inability to retrieve the coil or the attempt itself.

There are also other specific technical limitations in using the commercially available retrievable coil systems in the United States, where, to our knowledge, the only such system commercially available is the GDC. To use such a device, one is obligated to use a two marker band microcatheter (either 2.3F or 2.0F), which occasionally results in technical limitations in achieving very distal superselective catheterization (as is needed for treatment of peripheral aneurysms of the superior cerebellar artery) because of kinking of the catheter at the site of the proximal marker band. Furthermore, the smallest available size coils from the GDC system are 2 mm in helical diameter by 2 cm in length, and can be used only with a 2.0F double marker band microcatheter. Such a system poses the following additional technical limitations: (*a*) possible increased difficulty in achieving satisfactory superselective catheterization in tortuous vasculature because of the small size of the microcatheter, (*b*) inability to deposit an appropriate size coil within the parent artery, if this vessel is smaller than 2 mm in diameter, and (*c*) inability to occlude a short segment of the targeted parent artery because of excessive length of the coil. These last two difficulties can be overcome with the use of the new soft GDC coil (permitting more compact placement of the coils) and intentional overcoiling of the aneurysm sac to include the parent artery. However, in some situations only a short (2 mm), straight coil, which currently comes in only a nonretrievable variety, can be used to occlude selectively a segment of the superior cerebellar artery.

The major intention of our paper was to point out the ability to perform endovascular parent artery occlusion for the treatment of peripheral aneurysms of the superior cerebellar artery, since this is essentially what is accomplished most times when open microneurosurgical clipping is attempted. It should probably be left to the best judgment of the operator to assess ability to perform successful endovascular therapeutic occlusion of the vessel with the variety of devices available. There is no question that nonretrievable coil systems such as the GDC have several advantages, which in most cases should translate to improved efficacy and safety of therapy. However, these systems have their disadvantages and limitations as well. Therefore, judicious consideration of all available endovascular therapeutic technology for a particular problem would seem most clinically sound.

John C. Chaloupka
Departments of Radiology and Neurosurgery

Christopher M. Putman
Department of Radiology

Issam A. Awad
Department of Neurosurgery

Yale University School of Medicine
New Haven, Conn

Editor's note.—*Dr Debrun's letter was forwarded to Randall Higashida for comment.*

Comment

Chaloupka et al should be congratulated on their report of two patients who were successfully treated with minimally invasive endovascular techniques using coil occlusion for ruptured superior cerebellar artery aneurysms. This resulted in total occlusion of the aneurysms, alleviated the risk of recurrent bleeding, and allowed both patients, who suffered from acute subarachnoid hemorrhage, to avoid the more invasive procedure of surgical craniotomy with clipping or trapping of the aneurysm. Dr Debrun's comments bring to light the differing opinions, techniques, clinical approaches, and therapeutic options that the interventional neuroradiologist now has in treating patients with complex cerebrovascular disorders.

Fibered microcoils, the electrolytic platinum GDC, mechanical platinum detachable coils, mechanical tungsten detachable coils, detachable balloons, nondetachable balloons, liquid tissue adhesives including cyanoacrylates and cellulose acetate polymer, and intravascular stents have all been reported in successfully treating patients with both symptomatic intracranial and extracranial aneurysms either by primary occlusion of the aneurysm or with parent artery occlusion. In addition, experimental work involving endovascular lasers for tissue repair, endovascular polymers, and nonporous stent grafts for intracranial aneurysms have also recently been described. Each of these devices and techniques have certain advantages and disadvantages (1–4).

The interventional physician uses personal clinical judgment regarding approach, existing technical capabilities, and currently available techniques and devices *individualized* for each therapeutic case. The technique of using fibered, nonretrievable microcoils for occlusion of small vessels in both the extracranial and intracranial circulation is well documented as effective and is approved by the Food and Drug Administration as an indication for use in the neurovasculature. Dr Debrun points out that an alternative technique using the electrolytic GDC could have also been used and might have been safer. This coil has the advantage of being retrieved if it is not appropriately placed initially or if it migrates distally before detachment. The *disadvantages* of the GDCs are that they are nonfibered, less thrombogenic, softer, and less stable within the parent artery, and once detached they can also migrate or become displaced by the normal blood flow. For these reasons, they are not routinely used for parent vessel occlusion because they often require placement of many more coils than the more stable and thrombogenic fibered coils, thereby potentially increasing the risk of occlusion of longer segments of the proximal parent artery, which could result in larger areas of ischemia or infarction. However, an alternative approach might have been to pack the ruptured aneurysms with GDCs directly, until the aneurysm no longer fills. However, in the second case, it might not have been feasible to reach the more distal superior cerebellar artery aneurysm with a microcatheter, and attempting to do so could have resulted in vessel or aneurysm perforation.

In summary, there are different reasonable approaches to consider for effectively treating patients with life-threatening disorders by endovascular techniques. Good clinical judgment, technical expertise in all areas of endovascular intervention, and a knowledge of one's own capabilities and limitations are therefore the most important factors in determining good patient outcome.

Randall T. Higashida
Division of Interventional Neurovascular Radiology
Departments of Radiology and Neurological Surgery
University of California, San Francisco

References

1. Higashida RT, Halbach VV, Dowd CF, Hieshima GB. Intracranial aneurysms: evolution and future role of endovascular techniques. In: Hopkins LN, ed. *Neurosurgery Clinics of North America: Endovascular Approach to Central Nervous System Disease.* Philadelphia, Pa: WB Saunders; 1994;5(no 3):413–426
2. Terada T, Kinoshita Y, Yokote M, et al. Clinical use of mechanical detachable coils for dural arteriovenous fistula. *AJNR Am J Neuroradiol* 1996;17:1343–1348
3. O'Neill OR, Barnwell SL. Catheter systems and endovascular hardware. In: Maciunas RJ, ed. *Neurosurgical Topics: Endovascular Neurological Intervention.* Park Ridge, Ill: American Association of Neurological Surgeons. 1995;43–58
4. Mathis JM, Barr JD, Horton JA. Temporary and permanent occlusion of major cerebral vessels. In: Maciunas RJ, ed. *Neurosurgical Topics: Endovascular Neurological Intervention.* Park Ridge, Ill: American Association of Neurological Surgeons. 1995;59–74

The Intravascular Mobile Structure Detected with Duplex Carotid Ultrasound in Patients with Cardioembolic Carotid Artery Occlusion

Duplex carotid ultrasound is useful for diagnosing internal carotid artery (ICA) occlusion (1–3). Using duplex carotid ultrasonography, we identified mobile intravascular structures in five patients (4 men and 1 woman; mean age, 84 years) with acute cardioembolic carotid artery occlusion.

The diagnosis was established based on clinical and angiographic findings (4). Four patients had atrial fibrillation and one patient had acute inferior myocardial infarction. Duplex carotid ultrasound and cerebral angiography were done on the same day, within 2 days after the onset of symptoms. B-mode scans demonstrated a mobile,

Fig 1. B-mode scan images in a patient with internal carotid occlusion caused by cardioembolic stroke show that the movement of the echogenic intravascular structure was synchronous with the cardiac cycle in the origin of left ICA. The intravascular structure moved quickly from the proximal to the distal ICA during the systole of the cardiac cycle. During the diastole, the structure moved slowly from the distal to the proximal ICA.

A, The intravascular structure was located at the proximal ICA origin in the end-diastole of the cardiac cycle.

B, The intravascular structure stood midway between the position of the end-diastole and the end-systole during the systole of the cardiac cycle.

C, The intravascular structure was located at the distal ICA origin in the end-systole of the cardiac cycle.

echogenic intravascular structure in the proximal ICA (Fig 1) in three cases and in the common carotid artery (CCA) in two cases. The movement of the echogenic intravascular structure was synchronous with the cardiac cycle. It moved quickly from the proximal to the distal ICA or CCA during the systole of the cardiac cycle. During diastole, the structure moved slowly from the distal to the proximal ICA or CCA. In all cases, Doppler blood flow signal in the affected CCA showed absent diastolic flow, indicating ICA occlusion. In three of five cases, follow-up duplex carotid ultrasound showed disappearance of a mobile intravascular mass 7 days after the onset. Doppler blood flow signal showed reappearance of diastolic flow, indicating a recanalization of the ICA occlusion, subsequently confirmed with angiography. In the other two cases, the mobile intravascular structure became stable gradually and changed to a nonmobile hyperechoic structure 10 days after the onset. We believe the intravascular structures turned to solid thrombi.

In patients with acute cardioembloic ICA occlusion, the embolus is usually lodged at the top of the ICA. We think that the intravascular mobile structure was probably a fresh thrombus extending from the occluded part of the internal carotid artery to the proximal side. In the acute phase of ICA occlusion, it is important to distinguish between cardioembolic and atherothrombotic stroke because the treatment will vary depending on the cause. We suspect that the mobile intravascular structure detected with ultrasonography may help diagnose embolic ICA occlusion.

Kazumi Kimura
Department of Cerebrovascular Disease
Kumamoto City (Japan) Hospital

Makoto Uchino
First Department of Internal Medicine
Kumamoto University School of Medicine

References

1. Fell G, Phillips DJ, Chikos PM, Harley JD, Thiele BL, Strandness DE. Ultrasonic duplex scanning for disease of the carotid artery. *Circulation* 1981;6:1191–1195
2. Hoshino H, Takagi M, Takeuchi I, Akutsu T, Takagi Y, Ebihara S. Recanalization of intracranial carotid occlusion detected by duplex carotid sonography. *Stroke* 1989;20:680–689
3. Yasaka M, Omae T, Tsuchiya T, Yamaguchi T. Ultrasonic evaluation of the site of carotid axis occlusion in patients with acute cardioembolic stroke. *Stroke* 1992;23:420–422
4. Adams HP, Bendixen BH, Kappelle LJ, et al. TOAST investigator: classification of subtype of acute ischemic stroke: definitions for use in a multicenter clinical trial. *Stroke* 1993;24:35–41

Comment

The letter from Drs Kimura and Uchino presents five well-documented cases of cardioembolic cervical carotid artery occlusion. These are relatively rare cases. More commonly, there is evidence of distal ICA occlusion but not of intraluminal thrombus. Doppler ultrasound can reliably show whether the cervical carotid arteries are patent or virtually occluded. In the absence of seeing the rare "intravascular mobile structure," all five of these patients exhibited no diastolic flow, and a diagnosis of ICA occlusion or near occlusion would have been made. The identification of an intraluminal thrombus is rare in practice, but it is important to recognize it. Although not a subject of their letter, one will occasionally see a thrombus in the proximal ICA without vascular occlusion. These thrombi are usually associated with ulcerated atherosclerotic plaque. When identified, this has been an indication for urgent carotid surgery to avert a threatened stroke.

Perhaps the more interesting question is what if any role Doppler carotid ultrasound should play in the emerging era of intravenous and intraarterial thrombolysis. The recent intravenous alteplase protocols make no mention of Doppler carotid ultrasound. The proponents of intraarterial therapy use diagnostic angiography as their evaluation tool. A combination of carotid Doppler ultrasound and transcranial ultrasound is capable of ruling out both ICA and proximal circle of Willis region vascular occlusion. Is

this reliable enough to avoid arteriography in those patients with a "normal" ultrasound exam? Since time is of the essence in thrombolysis therapy, is the time needed for the ultrasound examination acceptable? If carotid Doppler ultrasound shows ICA occlusion, is intraarterial therapy preferable to intravenous treatment? The answers to these questions lie in future research. At the moment, the identification of intraluminal thrombus with ultrasound is an interesting observation, but its role in therapeutic decision-making remains problematic.

Christopher G. Ullrich
Charlotte Radiology and
Department of Radiology
Carolinas Medical Center
Charlotte, NC

Measuring Intraaneurysmal Flow: Risk of Perforation

I have read with great interest the article by Benndorf et al (1) in the August 1996 *AJNR*. Although I realize that it is important to understand the hemodynamics of cerebral aneurysms, I would be reluctant to submit a patient with a cerebral aneurysm to the risk of perforation of the sac with the Doppler guidewire, or to the formation or dislodgment of clot within the sac. I am not convinced that the information obtained in these two cases was worth the risks taken. The risks of perforation were probably low because the two aneurysms were giant, but what about small aneurysms? I am not sure that this protocol would be accepted by any Institutional Review Board in this country.

Gerard Debrun
Departments of Radiology and Neurosurgery
University of Illinois at Chicago

Reference

1. Benndorf G, Wellnhofer E, Lanksch W, Felix R. Intraaneurysmal flow: evaluation with Doppler guidewires. *AJNR Am J Neuroradiol* 1996;17:1333–1337

Reply

We certainly agree that there is always a risk of perforation during endovascular managemenet of intracranial aneurysms associated with the use of microcatheters, microguidewires, coils, or balloons. This risk is without any doubt higher in ruptured aneurysms than in nonruptured ones. Whether the use of a flow wire with the same characteristics and mechanical properties as a microguidewire usually used for catheterization of aneurysms for endovascular treatment creates any additional risk remains at least questionable. If flow measurements were done with the same technique as we described, there is probably no significant higher risk for patients with large or giant nonruptured aneurysms.

G. Benndorf
Department of Radiology/Neurointervention
Virchow Klinikum
Humboldt University Berlin (Germany)

Comment

Until quite recently, almost all interventional neuroradiologic procedures were initiated, performed, and monitored entirely through the use of anatomic (ie, angiographic and *indirect* physiological) observations. Benndorf and colleague's article provides an excellent example of the type of endeavor that, in my view, is essential for advancement of these capabilities to a higher level. When one considers that while, on the one hand, most practitioners accept and understand the established concepts of the origin, growth, and rupture of saccular aneurysms and hemodynamic stresses but, on the other, are still "flummoxed" when faced with the challenge of accurately predicting aneurysm behavior (risk) in an asymptomatic patient, the importance of trying to add physiological measurements to our armamentarium becomes painfully obvious.

I appreciate Dr Debrun's concern that use of the Doppler wire might increase the risk of aneurysm rupture during the time of endovascular treatment. Personal experience with this device, however, would make me believe that if, as suggested by Benndorf et al, the Doppler wire is not used for aneurysm catheterization, but only is deployed into an aneurysm after catheter position has been established, the added risk would be nil. The tip of this wire is no different from many other wires used on a daily basis in our practices.

When I sought funding from my institution to travel to Paris in the late 1970s to learn something about detachable balloons from Gerard Debrun, questions were raised by some colleagues regarding the ethics of using these homemade devices, which at that time could be sterilized only by placing them for some hours into an ice chest containing formaldehyde chips. How tragic it would have been for all those who have had their vascular lesions cured by detachable balloons if Debrun's creativity and pioneering efforts had been thwarted by such undue conservatism. Current and emerging technologies offer the very real promise of allowing tremendous improvement in the ability to diagnose and treat patients with vascular disease of the central nervous system. Although caution and care are surely warranted, an aggressive attempt at exploiting these advances is appropriate.

Charles M. Strother
Departments of Radiology, Neurology, and Neurosurgery
University of Wisconsin
Madison

MR Techniques for the Internal Auditory Canal

I read the article by Allen et al (1) in the August 1996 *AJNR* with great interest. We described the fast spin-echo technique of MR cisternography in the evaluation of the internal auditory canal (IAC) in 1993 (2). We found pseudodefects in the internal auditory recesses on individual sections in 1% of cases. These apparent defects were not seen in the composite maximum intensity projection images and can result from partial volume effect from adjacent bone in patients with a narrow IAC and, infrequently, can be caused by cerebrospinal fluid pulsation artifact. To increase the accuracy of the MR cisternographic exam, we included individual and composite maximum intensity projection sections in coronal view and have recently added a sagittal oblique view with sections directed along the plane of the IAC annotated from the axial scan (3) (Fig 2).

We used a technique similar to that recommended by the authors (fast spin-echo, matrix 512 × 384) in the evaluation of the pituitary region (2) and found that it was inadequate because of pulsation artifacts from the carotid arteries. The saturation pulse used by the authors might have improved this problem. We have also used another modified fast spin-echo technique for MR myelographic studies (4), using more sections in a shorter time, but with less spatial resolution than with MR cisternography. A primary value of MR cisternography is that it is cost-effective in screening evaluations for a large number of patients with sensorineural hearing loss for whom, currently, contrast-enhanced MR is performed and is negative. However, contrast-enhanced studies should still be obtained in the evaluation of the IAC in cases of multiple lesions, such as in patients with neurofibromatosis type II and subarachnoid metastases. Also, contrast-enhanced studies should be used for acoustic neuromas shown with MR cisternography to involve the fundus of the IAC, since the contrast-enhanced study can show tumor extension into the adjacent inner ear structures better.

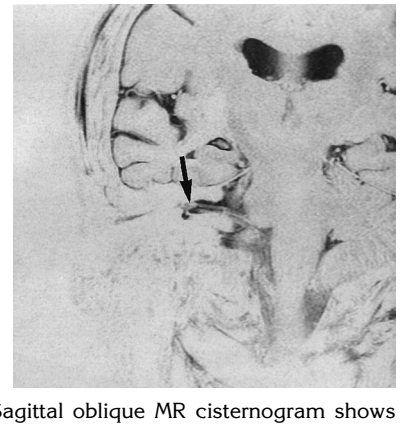

Fig 2. Sagittal oblique MR cisternogram shows a tiny intracanalicular tumor in the fundus of the right IAC.

Taher El-Gammal
Department of Radiology
University of Alabama at Birmingham

References

1. Allen RW, Harnsberger HR, Shelton C, et al. Low-cost high-resolution fast spin-echo MR of acoustic schwannoma: an alternative to enhanced conventional spin-echo MR? *AJNR Am J Neuroradiol* 1996;17:1205–1210
2. El Gammal T, Brooks BS. MR cisternography: initial experience in 41 cases. *AJNR Am J Neuroradiol* 1994;15:1647–1656
3. El Gammal T, Brooks BS. Imaging of the cranial subarachnoid spaces. In: Taveras JM, Ferrucci JT, eds. *Radiology Diagnosis-Imaging-Intervention*. Philadelphia, Pa: JB Lippincott; 1996:1–19
4. El Gammal T, Crews CE. MR myelography of the cervical spine. *Radiographics* 1996;16:77–88

Reply

There is no question that our technique represents a refinement of Dr El-Gammal's so-called MR cisternographic technique. A reference to his *AJNR* article would have been appropriate had we made the connection between his more general article and our more tightly focused effort. In his original work on MR cisternography, Dr El-Gammal reported a 1% incidence of "pseudodefects," which he ascribed to either partial volume averaging in narrow IACs or cerebrospinal fluid pulsation artifact. This artifact was not present on his maximum intensity projection images. At the time of our study, we also found pseudodefects in the fluid spaces of the IAC and cerebellopontine angle. The absence of these pseudodefects on the orthogonal view of this area and their disappearance from view on the maximum intensity projection images minimized this problem. The previous 3-mm two-dimensional fast spin-echo technique has since given way to a 1-mm three-dimensional fast spin-echo technique using flow compensation. This later pulse sequence overcomes both the small IAC volume averaging problem and the pseudodefects that arise from cerebrospinal fluid pulsation artifacts.

We completely agree with Dr El-Gammal's statement that "a primary value of MR cisternography is that it is cost-effective in screening evaluations for a large number of patients with sensorineural hearing loss for whom, currently, contrast-enhanced MR is performed and is negative." We have now had a busy (10 to 20 cases per week) screening program in place for 2 years with unenhanced high-resolution fast spin-echo MR for patients suspected of having acoustic schwannoma. This fast spin-echo MR examination has completely replaced conventional contrast-enhanced T1-weighted MR imaging of the IAC–cerebellopontine angle as the initial study in this clinical situation. The conventional full study, including the contrast-enhanced axial and coronal IAC–cerebellopontine angle T1-weighted MR imaging with full-brain T2-weighted MR im-

aging, is reserved for equivocal fast spin-echo MR studies (1 in 25). We consider the fast spin-echo exam equivocal whenever the individual cranial nerves of this area cannot be seen clearly. Usually patient motion is the cause of equivocal fast spin-echo MR exams. Only if the fast spin-echo MR exam is less expensive than the conventional MR exam and replaces this exam is it a cost-effective screening study.

Finally, if one uses the phased-array temporomandibular joint coil and maximizes the 3-D fast spin-echo technique, the resolution of the study is such that IAC–cerebellopontine angle and inner ear schwannomas are clearly delineated. We have not found it necessary to use enhanced T1-weighted MR images to define the relationship of the tumor in the fundus of the IAC to the adjacent inner ear compartments.

H. Ric Harnsberger
Neuroradiology

Clough Shelton
Otolaryngology–Head and Neck Surgery

University of Utah Medical Center
Salt Lake City

Comment

We agree with both authors that in screening for acoustic neuromas, high-resolution MR techniques in cases where the cerebrospinal fluid is of high signal intensity can be very competitive with contrast-enhanced T1-weighted imaging. There are many techniques that allow the cerebrospinal fluid spaces of the IAC, the cerebellopontine angle, and the fluid-filled otic capsule structures to be exquisitely seen without contrast enhancement (1–5). These authors have focused on 2-D fast spin-echo techniques. I also agree that there is greater difficulty when the IAC or the tumors are small. This is to be expected, since the cerebrospinal fluid acts as an inherent contrast agent outlining the normal nerves and abnormalities. When there is no cerebrospinal fluid, the nerves cannot be seen well. Thus, smaller tumors will be more commonly missed or confused. These author's 3-mm-thick image protocols are not truly high resolution with such thick sections. We acquire the images with sections ranging from 1.5 to 0.5 mm thickness.

We do disagree with some of Allen et al's statements about the disadvantages of gradient-echo imaging compared with fast spin-echo imaging. We have already published data (6) showing that spin-echo images are not immune to serious magnetic susceptibility misregistration artifacts. Fast spin-echo images have their own set of limitations, including increased blurring with longer echo trains, long echo times, limited number of excitations, and long repetition times. To overcome the inherent limitations with gradient echoes, we use very short echo times (3.8 milliseconds with standard 10 mT/m, and 1.9 to 2.3 milliseconds with high-speed 22 mT/m gradient coils) and acquire different excitation pulse phase angles followed by averaging. This permits acquisition of true 3-D data, with similar spatial resolution in all dimensions. We have shown that this gradient-echo technique can generate images that improve signal-to-noise ratios over 2-D fast spin-echo when using standard gradient coils. Most recently, our preliminary study using high-speed gradients showed a twofold increase in signal-to-noise ratio and fewer artifacts for our gradient-echo technique than comparable 3-D fast spin-echo techniques (Fig 3). It is possible to see individual nerves in the cerebellopontine angle and IAC. The overall image quality is better than with fast spin-echo, and the artifacts related to magnetic susceptibility are similar.

We propose that the true imaging goal of screening for acoustic schwannoma should not be just to see the IAC or cerebellopontine angle, but rather to achieve direct continuous visibility of the individual nerves of the seventh and eighth cranial nerve complex and the otic capsule. As this technology becomes common, the need for contrast to diagnose lesions in the fluid spaces will shrink.

There is a greater challenge in the evaluation of patients with retrocochlear symptoms, since defining acoustic neuromas is one of the easier tasks. Symptoms in patients with hearing and vestibular functional disorders are notoriously nonspecific (7). I believe that unenhanced exams can be used to diagnose most patients who have normal-sized IACs and most acoustic tumors, but this may not be adequate for the complete evaluation of this diverse patient group. The true underlying disease in many of these patients might be not an acoustic tumor, but rather something else, such as multiple sclerosis, encephalitis, cerebrovascular disease, mastoiditis, meningioma, tortuous vessels, aneurysm, dermoid, epidermoid (temporal bone or cerebellopontine angle), vestibulitis, giant vestibular aqueduct, otosclerosis, Meniere disease, carcinomatosis, or meningitis. We believe we will have more problems in sorting out these patients than simply determining whether they have an acoustic tumor. In most patients we might need to return to a more global exam to discover one of these other masqueraders. Contrast enhancement might help, as might MR angiography, diffusion imaging, high-resolution T1-weighted gradient-echo imaging (8, 9), and magnetization transfer.

Donald W. Chakeres
Petra Schmalbrock
Department of Radiology
Ohio State University
College of Medicine
Columbus

References

1. Ying K, Schmalbrock P, Clymer BP. Echo time reduction for submillimeter resolution imaging with a phase encoded time reduced acquisition method. *Magn Reson Med* 1995;33:82–87
2. Brogan M, Chakeres DW, Schmalbrock P. Comparison of high-resolution 3DFT and computed tomography in the evaluation of the

otic capsule and vestibular aqueduct. *AJNR Am J Neuroradiol* 1991;12:1–11
3. Schmalbrock P, Brogan M, Chakeres DW, Hacker V, Ying K, Clymer B. Optimization of submillimeter resolution MR imaging methods for the inner ear. *J Magn Reson Imaging* 1993;3:451–459
4. Oehler M, Chakeres DW, Schmalbrock P. Reformatted planar 'Christmas tree' MR appearance of the endolymphatic sac. *AJNR Am J Neuroradiol* 1995;16:1525–1528
5. Schmalbrock P, Dailiana T, Chakeres DW, et al. Submillimeter-resolution MR of the endolymphatic sac in healthy subjects and patients with Meniere disease. *AJNR Am J Neuroradiol* 1996;17: 1707–1716
6. Oehler M, Schmalbrock P, Chakeres DW, Kuraucay S. Magnetic susceptibility artifacts seen on high-resolution MR of the temporal bone. *AJNR Am J Neuroradiol* 1995;16:1135–1143
7. Levy RA, Arts HA. Predicting neuroradiologic outcome in patients referred for audiovestibular dysfunction. *AJNR Am J Neuroradiol* 1996;17:1717–1724
8. Dailiana T, Chakeres D, Schmalbrock P, Williams P, Aletras A. High-resolution MR of the intraparotid facial nerve and parotid duct. *AJNR Am J Neuroradiol* 1997;18:165–172
9. McGhee R, Chakeres DW, Schmalbrock P, Brogan M, Negulesco J. The extracranial facial nerve: high-resolution three-dimensional Fourier transform MR imaging. *AJNR Am J Neuroradiol* 1993;14: 465–472

A Plea for Proper Recognition: The Syndrome of Maestre de San Juan–Kallmann

I am writing to correct the unintentional neglect of a true pioneer in three recent papers that appeared in the *American Journal of Neuroradiology* (1, 2, 3). These papers are on the so-called Kallmann syndrome (a form of congenital hypogonadotropic hypogonadism with anosmia), which has been attributed traditionally to a publication by Kallmann in 1944 (4). Evidence has been found to prove that the Spanish pathologist Aurelio Maestre de San Juan described the association of olfactory and genital abnormalities in postmortem studies as far back as 1856 (5). Subsequently, a report of a syndrome associating these two conditions was made by Weidenreich in 1914 (6). The syndrome has regained radiologic attention because of MR imaging, which nicely contributes to its diagnosis and depiction. However, of the three papers that have appeared in *AJNR,* only the one by Truwit et al (3) recognized the earlier work of Maestre de San Juan (5).

Since a scientific paper should be accurate in its recognition of historical origin of scientific observation, we propose that this disease be referred to as *Maestre de San Juan–Kallmann,* or possibly the syndrome of *Maestre de San Juan–Weidenreich–Kallmann.*

Recognition of original observations in recent years resulted in the renaming of some syndromes such as the Chiari syndrome, formerly Arnold-Chiari syndrome. Sensitivity to historic contribution indicated that the original observation was that of Chiari. Consequently, the second-

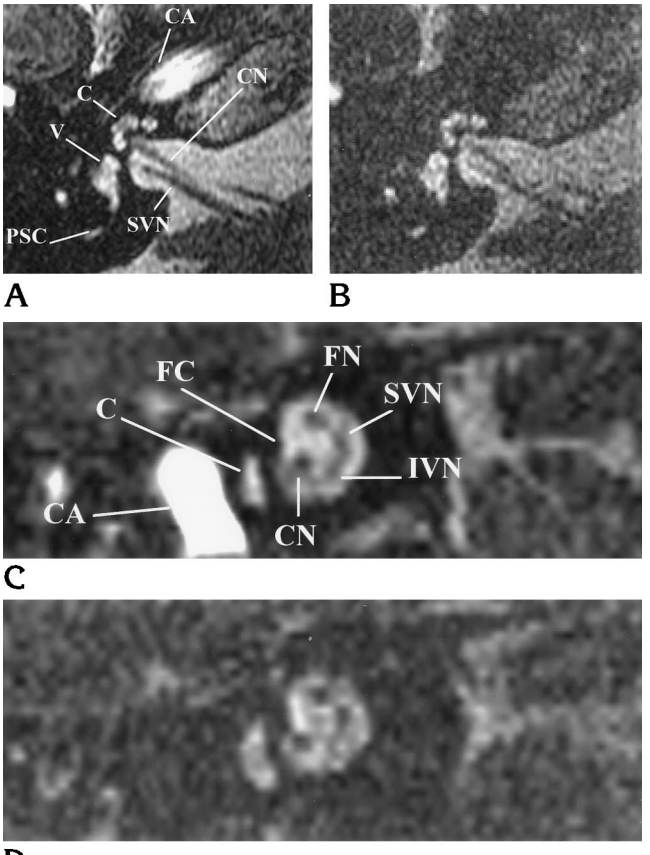

Fig 3. Axial three-dimensional gradient-echo (*A*) and 3-D fast spin-echo (*B*) images of the same volunteer at the same level. Both images were acquired at 1.5 T using a Signa system (General Electric, Milwaukee, Wis). The gradient-echo parameters are 12.8/2.3/6 (repetition time/echo time/excitations [each with a different radio frequency phase angle]), 40° flip angle, and 32-kHz bandwidth. The 3-D fast spin-echo parameters are 4000/155, echo train length of 32, 64-kHz bandwidth, 8 sections per slab, and echo spacing of 12.1. The images were acquired in 8 minutes using high-speed gradient coils and 0.3 × 0.6 × 0.7-mm voxel size for both. Note that the image quality of the gradient-echo image is clearly of better quality than the fast spin-echo. Also note that the magnetic susceptibility artifacts flattening the lateral margin of the vestibule (*V*) are essentially identical. Other labeled structures on the gradient-echo image are the cochlea (*C*), carotid artery (*CA*), posterior semicircular canal (*PSC*), cochlear nerve (*CN*), and superior vestibular nerve (*SVN*).

C and *D,* A comparison of sagittal reconstructions of axially acquired 3-D gradient-echo (*C*) and 3-D fast spin-echo (*D*) sequences. The image acquisition is identical to *A* and *B.* Labeled structures include the cochlea (*C*), falciform crest (*FC*), carotid artery (*CA*), cochlear nerve (*CN*), facial nerve (*FN*), inferior vestibular nerve (*IVN*), and superior vestibular nerve (*SVN*). Good visibility of each nerve in the IAC is possible. Note that the cochlear nerve is the largest in diameter, followed by the facial and then the vestibular branches. This is an anatomic fact that is not usually seen without excellent image quality. Also note the better visibility of the cisternal spaces adjacent to the cerebellum on the gradient-echo images compared with the fast spin-echo images.

ary placement of Chiari in naming this syndrome was considered inappropriate.

Alberto Muñoz
Elisa Dieguez
Seccion de Neurorradiologia
Servicio de Radiodiagnostico
Hospital Universitario 12 de Octubre
Madrid, Spain

References

1. Yousem DM, Turner WJD, Li C, Snyder PJ, Doty RL. Kallmann syndrome: MR evaluation of olfactory syndrome. *AJNR Am J Neuroradiol* 1993;14:839–843
2. Knorr JR, Ragland RL, Brown RS, Gelber N. Kallmann syndrome: MR findings. *AJNR Am J Neuroradiol* 1993;14:845–851
3. Truwit CL, Barkovich AJ, Grumbach MM, Martini JJ. MR imaging of Kallmann syndrome, a genetic disorder of neuronal migration affecting the olfactory and genital systems. *AJNR Am J Neuroradiol* 1993;14:827–838
4. Kallmann FJ, Schoenfeld WA, Barrera SE. The genetic aspects of primary eunuchoidism. *Am J Ment Defic* 1944;48:203–206
5. Maestre de San Juan A. Teratología: falta total de los nervios olfatorios con anosmia en un individuo en quien existía una atrofia congénita de los testículos y miembro viril. *El Siglo Médico* 1856; 3:211
6. Lightman S. Kallmann's syndrome. *J R Soc Med* 1988;81:315–316

Editor's note.—*Drs Muñoz and Dieguez have raised an interesting point. The appearance of this letter in a peer-reviewed journal will possibly result in its appearance in* Index Medicus. *From there it's a short step to dictionaries of medical eponyms and perhaps ultimate immortality for Professor Maestre de San Juan. If such happens, Drs Muñoz and Dieguez will certainly receive the credit for bringing this to the attention of the medical community.*

Errata

In the April 1997 table of contents, there was an error in the summary of "Measurement of the Normal Optic Chiasm on Coronal MR Images" by Wagner et al (page A6). The summary should have read "MR measurements of the area and width of the optic chiasm reveal values of 43.7 mm^2 and 14.0 mm, respectively."

In the April 1997 issue, some figure parts were labeled in error in the article by Bergui et al, "Uncommon Symptomatic Cerebral Vascular Malformations" (1997;18:779–783). Figures 1B and 1C should have been switched, and Figures 2B and 2C should have been switched. As the figures appeared, 1B showed the venous phase and 1C the arterial phase; 2B showed the late arterial phase and 2C the early arterial phase.