

Are your **MRI contrast agents** cost-effective?

Learn more about generic **Gadolinium-Based Contrast Agents**.



FRESENIUS
KABI

caring for life

AJNR

Percutaneous transnasal sphenoidotomy with sphenoid window.

R B Towbin, C M Myer and R F Thompson

AJNR Am J Neuroradiol 1989, 10 (4) 845-847

<http://www.ajnr.org/content/10/4/845>

This information is current as
of April 16, 2024.

Percutaneous Transnasal Sphenoidotomy with Sphenoid Window

Richard B. Towbin^{1,2}
Charles M. Myer³
Robert F. Thompson³

Ten percutaneous transnasal sphenoidotomies were performed in nine children; and in seven, a sphenoid window was also created. All procedures were performed in the special procedures laboratory, with biplane fluoroscopic guidance used in each case. Under general anesthesia, with the child in the supine position, a 14-gauge antral trocar was placed transnasally into the sphenoid sinus. The sinus was aspirated and material was obtained for culture. A Takahashi forceps was placed via the same tract into the sphenoid sinus. The cusps were centered across the anterior cortex, and under fluoroscopic visualization, opened and rotated 360°, creating a sphenoid window. All procedures were completed without complication, and no child required further surgery.

Recognition of sphenoid sinus disease is difficult because of its rarity, its anatomic location deep within the skull, and its lack of specific signs and symptoms. For these reasons, it is often misdiagnosed [1]; and, despite careful evaluation, the diagnosis of sphenoid sinusitis is often delayed until complications are present.

Once sphenoid inflammation is recognized, parenteral antimicrobial agents are administered. However, if symptoms persist or neurologic signs are present or develop, sinus drainage is necessary. Several surgical approaches for treatment of sphenoid sinusitis have been described since 1926 when Proetz [2] introduced displacement irrigation. In our opinion, the current surgical approaches are not especially well suited to children [3]. We report our experience with fluoroscopically guided percutaneous transnasal sphenoidotomy.

Subjects and Methods

From February 1981 to February 1988, 10 percutaneous transnasal sphenoidotomies were performed in nine children. Seven of these patients also had a sphenoid window created. The series included five girls and four boys ages 6 to 18 years old (mean, 13 years). Seven of the 10 sphenoidotomies were performed over a 12-month period ending February 1988. The signs and symptoms leading to percutaneous transnasal sphenoidotomy included severe or progressive headaches, fever, facial pain and focal sensory loss, meningitis, and a generalized seizure. Imaging consisted of sinus radiographs in all 10 cases and CT in eight of 10 cases. The two patients who did not have a preoperative CT scan were treated prior to its availability. Results from these two children have been previously reported [3]. MR imaging was performed in one patient, who required multiplanar evaluation for nasopharyngeal rhabdomyosarcoma.

All procedures were performed in the special procedures laboratory, where the patient was intubated and general anesthesia was administered. Anterior rhinoscopy was performed and cottonoid pledgets impregnated with 0.5% Neo-Synephrine were placed. With the child in a supine position, the sphenoid sinus was identified with anteroposterior and lateral fluoroscopy. Utilizing biplane fluoroscopic guidance, we placed a 14-gauge antral trocar transnasally and angled it toward the anteroinferomedial surface of the sphenoid sinus.

Initially, the trocar was monitored with anteroposterior fluoroscopy so that it paralleled the nasal septum (Fig. 1A). Simultaneously, lateral fluoroscopy guided the trocar to the anteroinferior surface of the sphenoid rostrum. Then, while we monitored with lateral fluoroscopy, we

Received June 6, 1988; revision requested September 8, 1988; revision received November 11, 1988; accepted November 30, 1988.

¹ Department of Radiology, Children's Hospital Medical Center and the University of Cincinnati College of Medicine, Cincinnati, OH 45229-2899.

² Present address: Department of Radiology, Children's Hospital of Michigan, 3901 Beaubien Blvd., Detroit, MI 48201. Address reprint requests to R.B. Towbin.

³ Department of Otolaryngology and Maxillofacial Surgery, Children's Hospital Medical Center and the University of Cincinnati College of Medicine, Cincinnati, OH 45229-2899.

AJNR 10:845-847, July/August 1989
0195-6108/89/1004-0845

© American Society of Neuroradiology

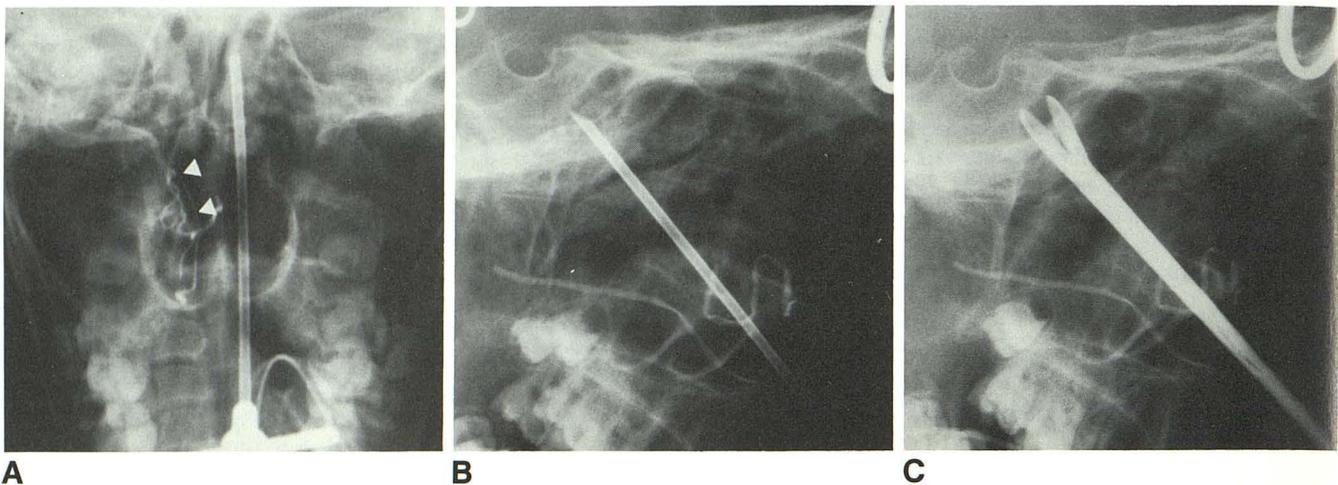


Fig. 1.—A, Anteroposterior radiograph with a 14-gauge antral trocar positioned adjacent to left nasal septum. A nasal pledget (arrowheads) is seen within right naris.

B, Lateral radiograph shows trocar within left sphenoid sinus. Trocar passes through rostrum of sphenoid bone anteroinferiorly.

C, Creation of a sphenoid window. Lateral radiograph with Takahashi forceps positioned with its cusps centered across anterior bony cortex. Cusps are opened and rotated 360° under fluoroscopic guidance.

advanced the trocar into the sphenoid sinus (Fig. 1B). The sinus was aspirated and material was obtained for culture. A Takahashi forceps was placed in the same tract, and, under biplane fluoroscopic guidance, we inserted it into the sphenoid sinus. The cusps of the forceps were withdrawn so that they were centered over the anterior bony cortex. The forceps was opened and the instrument was rotated 360°, creating a sphenoid window (Fig. 1C). (If necessary, a biopsy specimen can be obtained by using the forceps, and anterior nasal packing can be inserted.) The patient was returned to the recovery room for observation.

Results

Ten percutaneous transnasal sphenoidotomies were performed in nine children. Eight had bilateral sphenoidotomies while two had unilateral procedures. In seven of nine patients, sphenoid windows were also created. Sinus radiographs demonstrated sphenoid sinus abnormalities in nine of 10 instances. CT was performed in eight of 10 cases and demonstrated sphenoid sinus disease in all instances. CT proved to be the best technique for demonstrating the pathologic anatomy.

The underlying diseases associated with sphenoid sinusitis that led to percutaneous transnasal sphenoidotomies included malignancy in three cases, acute sphenoid sinusitis without predisposing factors in two cases, complicated sinusitis in two cases, and cystic fibrosis and trauma in one case each. Patients presented with one or more clinical symptoms. Six children presented with severe headaches, four with fever, and three with diminished level of consciousness.

Of the 10 percutaneous transnasal sphenoidotomies performed, nine were done for infection and one for biopsy of an intrasphenoid mass. The other two children with an underlying malignancy had sphenoid sinusitis without an accompanying sphenoid mass. In all nine instances of inflammatory disease, mucopus was aspirated. In the patient with rhabdo-

myosarcoma, biopsy material was obtained with the Takahashi forceps and sent for histopathologic examination, which documented tumor recurrence. No further operative procedure was required in any patient.

Discussion

To approach the sphenoid sinus safely and effectively, either through an open surgical procedure or percutaneously, the anatomic relationships of adjacent structures must be understood. The sphenoid sinus is present at birth but begins to pneumatize at approximately 3 to 5 years of age. Pneumatization progresses in an anteroposterior direction and is usually complete by 15 years of age.

Like the nasal cavity, the sphenoid sinus is lined with ciliated pseudostratified columnar epithelium. The sphenoid ostium is located at the anterosuperior portion of the sphenoid sinus and drains into the sphenoid recess of the nose. In 1941, Van Alyea [4], using cadaver skulls, determined that the average length, width, and height of the sphenoid sinus were 23 mm, 17 mm, and 19 mm, respectively. Dixon [5] and later Fujii et al. [6] demonstrated that the thinnest portion of the sphenoid sinus was its anterior wall, which ranged from 0.1 to 0.7 mm (mean, 0.4 mm) in thickness. For this reason we chose this site for percutaneous puncture.

Several critical structures lie adjacent to the sphenoid sinus. The internal carotid artery rests against the lateral surface of the body of the sphenoid bone and indents the posterolateral wall in 60–95% of cases [4, 5]. A layer of bone less than 0.5 mm thick separates the internal carotid artery from the sinus in 88% of patients and is dehiscent in 8%. The optic canals protrude into the superolateral wall of the sinus and project deeply into the sinus cavity in 7%. The maxillary branch of the trigeminal nerve frequently bulges into the inferolateral wall of the sphenoid bone. The cavernous sinus lies lateral to

the sphenoid sinus and contains cranial nerves III, IV, VI, and the ophthalmic and maxillary divisions of V. Cranial nerves III, IV, and VI, and the three branches of the ophthalmic nerve pass through the superior orbital fissure, and the maxillary nerve passes through the foramen rotundum [4-6].

The sphenoid sinus is rarely symmetric and usually does not communicate from side to side. Therefore, axial and often direct coronal CT is useful for preoperative planning. Because of its proximity to vital structures, injury to the lateral wall of the sphenoid sinus offers the potential for neural and arterial damage. Therefore, care must be exercised when approaching the sinus either through an open surgical procedure or transnasally.

There are several surgical approaches to the sphenoid sinus, including the intranasal transethmoid sphenoidotomy, transantral sphenoidotomy, external transethmoid sphenoidotomy, transseptal sphenoidotomy, and, most recently, the endoscopic transnasal sphenoidotomy [7]. In our opinion, none of these procedures is optimally suited to pediatric patients. The transantral and transethmoidal exposures are limited because of the child's small size. The transantral approach is difficult in children because of limited space and by the presence of unerupted secondary dentition; injury to the tooth buds can result in future dental problems. The transethmoidal approach also suffers from a limited operative exposure and the potential for a poor cosmetic result. Thus, other alternatives are preferred. The transseptal approach is not favored because damage to the nasal septum may interfere with subsequent midfacial development. While the endoscopic approach appears to have promise, it is more difficult to perform in children because of their size and the lack of appropriate instrumentation.

The fluoroscopically guided percutaneous transnasal sphenoidotomy has several advantages over the other procedures. In our preliminary experience, it seems to be less complicated and is completed in less time and at a lower cost than the other approaches. In our series, the postoperative

morbidity was minimal and our patients required little nursing care and only a short hospital stay. In addition, the percutaneous approach does not result in cosmetic problems or local sensory deficit, and the adjacent sinuses are undisturbed. However, if necessary, aspiration and irrigation of the maxillary antra can be carried out during the same period of anesthesia with little additional time or morbidity. Also, percutaneous transnasal sphenoidotomy is a versatile procedure that can be performed either to diagnose and treat acute or recurrent inflammatory disease or to obtain a biopsy specimen.

In conclusion, we believe that the fluoroscopically guided percutaneous transnasal sphenoidotomy is a safe and effective procedure for management of children with acute sphenoid sinusitis and may obviate the need for surgical procedures.

ACKNOWLEDGMENT

We thank Juanita Hunter for manuscript preparation and administrative assistance.

REFERENCES

1. Lew D, Southwick FS, Montgomery WW, et al. Sphenoid sinusitis: a review of 30 cases. *N Engl J Med* **1983**;10: 1149-1154
2. Proetz AW. Displacement irrigation of the nasal sinuses: new procedure in diagnosis and conservative treatment. *Arch Otolaryngol* **1926**;4: 1-13
3. Myer CM III, Herwig SO, Seid AB, et al. Acute sphenoid sinusitis in children. *Am J Otolaryngol* **1982**;3: 223-226
4. Van Alyea OE. Sphenoid sinus: anatomic study, with consideration of the clinical significance of the structural characteristics of the sphenoid sinus. *Arch Otolaryngol* **1941**;34: 225-253
5. Dixon FW. A comparative study of the sphenoid sinus (a study of 1600 skulls). *Ann Otol Rhin Laryn* **1937**;46: 687-698
6. Fujii K, Chambers SM, Rhoton AL Jr. Neurovascular relationships of the sphenoid sinus. *J Neurosurg* **1979**;50: 31-39
7. Zinreich SJ, Kennedy DW, Rosenbaum AE, et al. Paranasal sinuses: CT imaging requirements for endoscopic surgery. *Radiology* **1987**;163: 769-775