Cosmetic Considerations in Surgery for Orbital Subperiosteal Abscess in Children

Experience With a Combined Transcaruncular and Transnasal Endoscopic Approach

Ron W. Pelton, MD, PhD; Marshall E. Smith, MD; Bhupendra C. K. Patel, MD; Steven M. Kelly, MD

Objective: To evaluate the outcomes of a new surgical approach in children with acute sinusitis and medial orbital subperiosteal abscess.

Design: Case series.

Setting: Tertiary pediatric hospital.

Patients: Eleven children aged 6 weeks to 13 years with orbital subperiosteal abscess and acute sinusitis who met indication for surgery by visual compromise and/or refractory course to medical therapy.

Intervention: The medial orbital abscess was drained via a transcaruncular approach, which provided access to the medial orbital wall. An endoscopic ethmoidectomy was also performed.

Main Outcome Measures: Judgment of cosmetic appearance by surgeon and family, resolution of symptoms, length of hospital stay, and complications.

Results: All children had prompt resolution of symptoms after surgical drainage. Cosmetic outcome was excellent in all patients with no cutaneous scar or eyelid malposition. After edema and cellulitis had resolved, no family member could tell a difference in appearance between the eyes. No complications of these combined procedures were identified. One patient who had initially undergone transnasal endoscopic orbital drainage alone experienced a recurrence of infection 17 days later. He was then treated by the combined transcaruncular and endoscopic approach with prompt resolution of his symptoms. One of 4 patients treated initially with transcaruncular approach alone without endoscopic ethmoidectomy had recurrence of acute sinusitis and orbital abscess 16 months later and was successfully treated with an endoscopic approach.

Conclusions: The combined endoscopic and transcaruncular surgical approach to medial orbital subperiosteal abscess and acute sinusitis provides a cosmetically superior outcome compared with standard orbital approaches requiring a cutaneous incision. The transcaruncular approach can be considered as an alternative or adjunct approach to the medial orbit, with the same cosmetic advantages as transnasal endoscopic drainage.


A CUTE SINUSITIS complicated by orbital infection is seen in children from infancy through adolescence and adults of all ages.1 Cases have even been reported in neonates.2 When an ethmoid sinus infection migrates through the lamina papyracea, an abscess may develop under the medial orbital periosteum. This results in inflammation and displacement of the orbital contents, causing proptosis, limitation of gaze, and the potential for visual compromise. The prompt diagnosis of this condition is facilitated by the use of computed tomography (CT). When the clinical examination and CT findings suggest an orbital abscess and when there is concern for visual compromise or if there has been no response to medical treatment, the patient is taken to the operating room for surgical intervention. This usually requires drainage of the ethmoid sinusitis (the source of the infection) as well as the orbital abscess. The traditional approach to medial orbital abscess drainage has been through the external ethmoidectomy approach, using an incision along the medial aspect of the eyebrow and extending along the side of the nose (ie, the Lynch incision).3 Transnasal drainage of a medial orbital abscess with the use of endoscopic sinus instruments was first reported by Manning4 in 1993. Since then, a number of reports have described this technique.5-10 However, this approach is not without limitations. Acute infection in the sinus causes markedly inflamed tissue that bleeds readily. Control of bleeding is necessary for visualization with sinus telescopes, which prolongs the procedure. Fur-
thermore, because the abscess cavity is not well visualized from the nasal side of the lamina papyracea, there may be less certainty regarding the adequacy of drainage.

Since 1996, we have used a technique that combines a transcaruncular approach to the orbital abscess with endoscopic sinus drainage. The transcaruncular approach is a lower eyelid transconjunctival incision extended medially around the lacrimal caruncle. It has been used for access to the medial orbit in facial trauma.\(^1\)\(^2\) We report our experience with this combined approach.

### METHODS

We identified 11 patients with acute orbital subperiosteal abscess and sinusitis, who had been treated with the transcaruncular or combined approach as described previously between 1996 and 2000. The purpose of this case series was to examine the outcomes of only those patients treated with this transcaruncular surgical approach. Therefore, any patients with orbital infection and sinusitis who responded to medical management alone (eg, intravenous antibiotics) or any patients treated by any other surgical technique (eg, open ethmoidectomy) were not examined in this study.

A medical record review for length of stay, hospital course, and postoperative complications was conducted. The endoscopic ethmoidectomy procedure used in this study has been previously reported by a number of authors.\(^4\)\(^-\)\(^10\) The transcaruncular approach is described as follows. Bupivacaine hydrochloride with epinephrine is infiltrated into the lower eyelid and medial canthal region. An incision is made with tenotomy scissors through the conjunctiva just medial or lateral to the caruncle (Figure 1 and Figure 2). Sharp and blunt dissection then proceeds posteriorly to the anterior medial orbital wall (Figure 3). The orbital periosteum is incised sharply and elevated along the lamina papyracea until the abscess cavity is encountered (Figure 4). The abscess is cultured, drained, and irrigated. The lamina may be dehiscent or can be opened into the ethmoid cavity. Communication with the nasal passage is confirmed by endoscopic visualization of an instrument placed from the orbital side into the ethmoid cavity. The conjunctival incision is closed with a single 6-0 plain gut fast-absorbing suture. A vessel loop drain, if placed, is removed on the first postoperative day.

In 4 cases, the transcaruncular approach was the primary surgical intervention. A combined approach of transcaruncular orbitotomy and endoscopic ethmoidectomy was performed in 6 cases. In 1 case, endoscopic drainage alone was performed. This was followed 16 days later by a combined approach after the infection recurred.

### RESULTS

The Table summarizes the patient data. The patient ages ranged from 6 weeks to 13 years. There were 8 male and 3 female patients. The average length of stay was 3.7 days (range, 1-7 days). Six patients were taken to the operating room on the first day of presentation, 4 on the second day, and 1 on the third day. All patients had puru-

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**Table**

<table>
<thead>
<tr>
<th>Patient</th>
<th>Age (years)</th>
<th>Gender</th>
<th>Length of Stay (days)</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>6</td>
<td>Male</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>7</td>
<td>Male</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>6</td>
<td>Female</td>
<td>7</td>
</tr>
<tr>
<td>4</td>
<td>10</td>
<td>Male</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>13</td>
<td>Male</td>
<td>7</td>
</tr>
<tr>
<td>6</td>
<td>8</td>
<td>Female</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>12</td>
<td>Male</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>3</td>
<td>Male</td>
<td>4</td>
</tr>
<tr>
<td>9</td>
<td>11</td>
<td>Female</td>
<td>5</td>
</tr>
<tr>
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<td>Male</td>
<td>3</td>
</tr>
<tr>
<td>11</td>
<td>6</td>
<td>Female</td>
<td>4</td>
</tr>
</tbody>
</table>

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lence at surgery. *Streptococcus pneumoniae* grew in 2 cultures, group A *Streptococcus* in 3, and *Staphylococcus aureus* in 2. Four cultures had no growth.

After resolution of the infection, the cosmetic appearance in all subjects was normal. No asymmetry was noted in the facial features, and no external scar was visible. No case of eyelid malposition, limitation of extraocular movement, or lacrimal obstruction developed.

Two patients had complications of recurrent abscess formation requiring a second operation. The first case was a 13-year-old adolescent whose initial procedure was with endoscopic ethmoidectomy and abscess drainage. After initial improvement in symptoms, he relapsed 16 days later. He was again taken to the operating room for transcervical abscess drainage and another sinus endoscopy. Granulation tissue, but no loculated purulence, was identified in the medial orbit at the second surgery. The symptoms subsequently resolved. The second patient was a 9-year-old boy treated with a transcervical orbitotomy and abscess drainage alone. This infection resolved, but an orbital subperiosteal abscess recurred on the same side 16 months later.

At the second surgery, an endoscopic ethmoidectomy and abscess drainage was performed, without orbitotomy. The patient had resolution of his symptoms and has been followed up for 10 months without recurrence.

### COMMENT

The traditional approach to subperiosteal abscess of the medial orbit is by external ethmoidectomy through a Lynch incision. This results in a cutaneous scar at the medial eyebrow and extending along side of the nose. The scar created by this incision is perpendicular to relaxed skin tension lines and often results in webbing of the medial canthal skin. Although z-plasty modification of this incision can give improvement, an approach to the medial orbit that avoids a cutaneous scar is desirable. Drainage of medial orbital subperiosteal abscess via an endoscopic ethmoidectomy was first described in 1993. Since then, this approach has been used successfully in over 80 cases reported at a number of institutions. Comparison of the endoscopic outcomes with those of the external ethmoidectomy approach revealed a shorter length of hospital stay and faster resolution of orbital edema when the endoscopic approach is used. However, it is not without occasional problems. Page and Wiatrak reported that in 1 of 8 cases, the endoscopic approach was abandoned owing to poor visualization and an external approach was used. Poor visualization may be expected due to the bleeding from inflamed sinus mucosa. The use of powered instrumentation for sinus debridement may minimize this difficulty. Rahbar et al recently reported that in 2 of 11 cases of medial orbital abscess treated with endoscopic drainage, a second endoscopic procedure to facilitate drainage was performed 24 to 48 hours later because of worsening results of the ocular examination.

The transcervical approach to the medial orbital wall allows easy access and visualization of the abscess cavity from the orbital side of the lamina papyracea without a cutaneous scar. When used in conjunction with endoscopic sinus drainage, this technique allows confirmation of complete drainage of the abscess cavity on both the nasal and orbital sides. Our results indicate that the patient outcomes, in terms of length of stay and resolution of symptoms, are not different from recent re-

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**Figure 4.** The periosteum is elevated until the abscess (A) is found and drained. ES indicates ethmoid sinus; MR, medial rectus; LD, lacrimal duct; and C, caruncle.

### Patient Data

<table>
<thead>
<tr>
<th>Age, y</th>
<th>Sex</th>
<th>LOS, d</th>
<th>DOR</th>
<th>Procedures</th>
<th>Additional Procedure</th>
<th>Culture Result</th>
<th>Complications</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.4 F</td>
<td>1</td>
<td>1</td>
<td>TO</td>
<td>None</td>
<td>NG</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>0.1 M</td>
<td>4</td>
<td>1</td>
<td>TO</td>
<td>None</td>
<td><em>Staphylococcus aureus</em></td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>10.4 M</td>
<td>4</td>
<td>2</td>
<td>TO</td>
<td>None</td>
<td>Group A <em>Streptococcus</em></td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>9.8 M</td>
<td>3</td>
<td>1</td>
<td>TO</td>
<td>None</td>
<td>NG</td>
<td>Recurrence 16 mo later*</td>
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</tr>
<tr>
<td>10.8 M</td>
<td>7</td>
<td>3</td>
<td>TO/EE</td>
<td>Maxillary sinus irrigation</td>
<td>NG</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>10.2 M</td>
<td>4</td>
<td>2</td>
<td>TO/EE</td>
<td>Maxillary antrostomy</td>
<td>NG</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>7.3 M</td>
<td>3</td>
<td>2</td>
<td>TO/EE</td>
<td>None</td>
<td>Group A <em>Streptococcus</em></td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>2.4 F</td>
<td>4</td>
<td>2</td>
<td>TO/EE</td>
<td>Maxillary sinus irrigation</td>
<td>Group A <em>Streptococcus</em></td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>1.0 F</td>
<td>4</td>
<td>1</td>
<td>TO/EE</td>
<td>Maxillary sinus irrigation</td>
<td><em>Streptococcus pneumoniae</em></td>
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<tr>
<td>3.5 F</td>
<td>3</td>
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<td>None</td>
<td><em>S pneumoniae</em></td>
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<td>None</td>
</tr>
<tr>
<td>13.2 M</td>
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<td>1</td>
<td>EE</td>
<td>None</td>
<td><em>S aureus</em></td>
<td>Relapse 18 d later†</td>
<td>None</td>
</tr>
</tbody>
</table>

Abbreviations: DOR, day of operation; EE, endoscopic ethmoidectomy; LOS, length of stay; NG, no growth; TO, transcervical orbitotomy.

* Treated with endoscopic ethmoidectomy and orbital abscess drainage.
† Treated with combined TO/EE.
ports. In the 6 cases in which we used both transcarun-
cular and transnasal endoscopic approaches, no recurrence
or relapse developed. The transcaruncular/transorbital ap-
proach alone, without endoscopic ethmoidectomy, was
successfully used in 3 cases in our series. A direct com-
parison between it and the transnasal endoscopic ap-
proach alone to orbital drainage awaits a prospective study.

CONCLUSIONS

Medial subperiosteal abscesses of the orbit can be suc-
cessfully treated through a combined transcaruncular or-
bital and endoscopic sinus approach. This gives the sur-
geons confirmation of abscess drainage from both sides
of the abscess. It allows access to the medial orbital wall
without a cutaneous incision and its associated cos-
metic disadvantages. The transcaruncular approach is an
excellent alternative in situations for which transnasal
endoscopic approach is not feasible or has failed.

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REFERENCES

1. Harris GJ. Subperiosteal abscess of the orbit: age as a factor in the bacteriologic
2. Reddy SC, Sharma HS, Mazidah AS, Darnal HK, Mahaydin M. Orbital abscess
due to acute ethmoiditis in a neonate. Int J Pediatr Otorhinolaryngol. 1999;49:
81-86.
3. Skedros D, Haddad J, Bluestone CD, Curtin HD. Subperiosteal orbital abscess in
children: diagnosis, microbiology, and management. Laryngoscope. 1993;103:
28-32.
5. Deutsch E, Eilon A, Hevron I, et al. Functional endoscopic sinus surgery of or-
bital subperiosteal abscess in children. Int J Pediatr Otorhinolaryngol. 1996;34:
181-190.
6. Page EL, Wiatrak BJ. Endoscopic vs external drainage of orbital subperiosteal
7. Pereira KD, Mitchell RB, Younis RT, Lazar RH. Management of medial subperi-
osteal abscess of the orbit in children—a 5 year experience. Int J Pediatr Oto-
8. Arjmand EMI, Lusk RP, Muntz HR. Pediatric sinusitis and subperiosteal orbital
109:886-894.
11. Balch KC, Goldberg RA, Green JP, Shorr N. The transcaruncular approach to the
medial orbit and ethmoid sinus: a cosmetically superior option to the cutaneous
12. Shorr N, Baylis HI, Goldberg RA, Perry JD. Transcaruncular approach to the me-
13. Esclamado RM, Cummings CW. Z-plasty modification of the Lynch incision. Lary-
goscope. 1989;99:886-897.