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Drainage of subperiosteal orbital abscesses complicating pediatric ethmoiditis: Comparison between external and transnasal approaches

F. Rubin, S. Pierrot, M. Lebreton, P. Contencin, V. Couloigner *

Pediatric ENT Department, Hôpital Necker – Enfants Malades, AP-HP, Université Paris V, France

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ABSTRACT

Objective: The aim of the present study was to compare the external (EA), transnasal endoscopic (TEA), and combined (CA) external and transnasal approaches to drain orbital subperiosteal abscesses complicating pediatric ethmoiditis.
Methods: This retrospective study included 38 children consecutively operated in our center for an orbital subperiosteal abscess complicating an acute ethmoiditis. The distribution of surgical approaches used for our patients was the following: 12 TEA (32%), 21 EA (55%) and 5 CA (13%). All data were retrieved from patients' clinical charts.
Results: No surgical complication was observed in the present study regardless of the approach. The percentage of surgical failures requiring additional drainage was almost twice as high after TEA (failure rate: 25%) than after EA (failure rate 14.3%), but this difference was not significant. Parameters which significantly influenced the risk of failure of TEA were the length and width of the abscess. The duration of postoperative hospitalization was significantly lower in the TEA group (3.1 days) than in the EA one (5.4 days). There were no failures in the CA group.
Conclusions: Failures of surgical drainage of orbital subperiosteal abscess complicating pediatric ethmoiditis are not rare and did not differ between external and transnasal endoscopic approaches in our study. The transnasal route is associated with a shorter postoperative duration of postoperative hospitalization. CA seems to be a viable surgical option combining the advantages of both endoscopic and external approaches.

1. Introduction

Ethmoiditis is a frequent form of pediatric sinusitis. It can occur at a very young age since the ethmoid sinus is already well developed and separated from the nasal cavities from birth. The main concern for acute ethmoiditis is the possibility for development of orbital complications. Spread of the infection to the periorbital space occurs by eroding the lamina papyracea, or through haematogenous spread. When a subperiosteal orbital abscess (stage III of Chandler's classification) develops, a surgical drainage is often necessary in addition to intravenous antibiotics [1]. The optimal surgical approach for this drainage remains controversial (see Section 4). The aim of the present study was to address this issue by comparing the effectiveness and complications of EA, TEA, and combined approaches (CA) in a retrospective series of children operated upon for orbital abscesses complicating acute ethmoiditis.

2. Materials and methods

This retrospective study encompassed all consecutive cases of orbital subperiosteal abscesses complicating pediatric acute ethmoiditis (age < 18 years; stage III of the Chandler's classification) and surgically drained in our department between 2005 and 2012. Abscesses with a lateral orbital extension, which cannot be properly reached by TEA, were excluded. Data were obtained by retrieving patients' clinical charts and imaging. We found 38 patients eligible for inclusion out of 534 cases of pediatric acute ethmoiditis referred to our center during the study period. One case was excluded because the ethmoiditis was associated with an orbital subperiosteal infection but also with an abscess of the lateral part of the upper eyelid which was drained trough an incision of the outer canthus (Fig. 1). No EA, TEA or CA procedure was performed in this patient. Patient's follow-up duration was at least 2 months. This short duration is due to the fact that, as many emergency units, we usually send

* Corresponding author at: Service d'ORL Pédiatrique, Hôpital Necker, 149, rue de Sèvres 75015 Paris, France. Tel.: +33 1 44 49 46 82; fax: +33 1 44 49 46 90.
E-mail address: vincent.couloigner@nck.aphp.fr (V. Couloigner).

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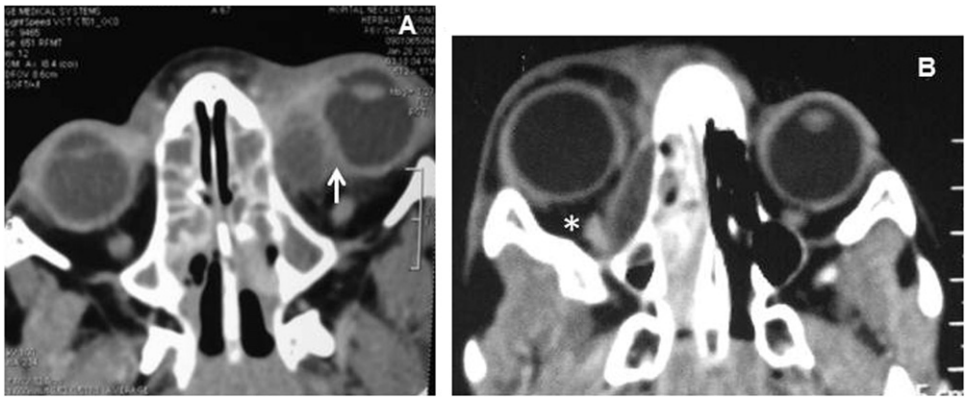

Fig. 1. Examples of cases requiring a consultation by the ophthalmologist. (A) Lorine, 8-year-old. Left ethmoiditis with wide subperiosteal orbital abscess and deformation of the eye (white arrow). (B) Sami, 8-year-old. Right ethmoiditis with subperiosteal abscess extending near the optic nerve (*). Preoperative mydriasis and visual impairment rapidly healed after surgical drainage through an external approach.

patients to other ENT centers located closer to their home once we become confident enough in the favorable outcome of their infection.

2.1. Treatment protocol

All patients were hospitalized, underwent cranial and facial CT-imaging with contrast, and were treated with intravenous antibiotics consisting of Ceftriaxone 100 mg/kg/day associate with Clindamycin 40 mg/kg/day. The intravenous antibiotic treatment was possibly modified as a function of the results of intraoperative bacteriological samples, and was maintained until the end of hospitalization. After patient discharge, an oral antibiotic treatment was systematically prescribed for 7 days. When no bacteria was isolated from bacteriological samples and in the absence of a known allergy to this antimicrobial, the child was given amoxicillin/clavulanic acid. Consultation by an ophthalmologist was requested when the patient reported a visual acuity decrease, when the physical examination identified a relative afferent pupillary defect, when the CT-scan showed an extension of the abscess in the vicinity of the optic nerve (Fig. 1) or in case of wide abscess causing a substantial proptosis (Fig. 1). In other cases, we did not call the ophthalmologist since we estimated that the risk of permanent visual complication was negligible. The indications for surgical drainage were the following ones: (1) abscess width >5 mm; (2) absence of improvement in signs and symptoms after 48–72 h of intravenous antibiotics; (3) severe clinical complications such as epidural empyema, loss of visual acuity or cavernous sinus thrombophlebitis.

Since our department is the pediatric ENT emergency center for the Ile-De-France district (Paris and surrounding area: 12 million inhabitants), the surgery was performed by the ENT specialists on call at the time of surgery. These were not usually attending surgeons but fellows. Our written protocol did not specify which technique had to be used in case of surgical indication. Thus, the choice between the TEA, EA or CA was left to the on call surgeon as a function of the characteristics of the abscess, but also of his or her personal training and skills in pediatric transnasal endoscopic surgery.

EA began with a 10 mm cutaneous incision in the inner canthus area. The abscess was reached by elevating the periosteum from the lamina papyracea. A rubber Delbet corrugated drain (Peters Surgical, Bobigny, France) was left through the incision during two days in order to irrigate the infected tissues twice a day with a 10% povidine iodine – containing solution (Betadine®, Asta Medica, Merignac, France). TEA consisted of opening the ipsilateral ethmoidal cells by transnasal endoscopic approach, using a 30° rigid telescope. The extent of the ethmoidectomy varied between surgeons, from limited opening of the anterior ethmoidal cells and of the bulla, until a flow of pus appears, to direct exposure of the abscess through a small opening of the lamina papyracea. Some surgeons combined both techniques (CA).

2.2. Outcome parameters and statistics

The data retrieved from the clinical charts were patients' age and sex, presenting symptoms, delay between the onset of sinusitis symptoms and the first medical visit, blood count, CRP level, microbiological and imaging data, clinical complications, detailed medical and surgical treatments, duration of hospitalization, treatment outcomes in terms of efficacy and complications. Patients' minimal follow-up was 2 months after surgery.

Comparisons of various parameters between the EA, TEA and CA groups were performed using Khi2 or Student's *t* test.

3. Results

The prevalence of orbital subperiosteal abscesses complicating acute pediatric ethmoiditis and requiring surgical drainage was

Table 1
Patients' demographic and clinical features.

Mean	Overall ($n=38$)	EA ($n=21$)	TEA ($n=12$)	CA ($n=5$)	p (EA vs TEA)	p (TEA vs CA)	p (EA vs CA)
Age (years) Median (extreme values)	8.3 (1.5–16)	8.8 (3–16)	6.8 (1.5–12)	12.0 (4.5–15)	0.23	0.11	0.28
Sex ratio (W/M)	1	1.23	0.66	0.8	0.12	0.81	0.35
Delay between symptoms onset and first medical visit (days)	1.6 (0–6)	1.6 (0–6)	1.58 (0–5)	1.8 (0–5)	0.88	0.83	0.83
Width of abscess (mm)	9.8 (3–28.5)	10.9 (5–28.5)	6.4 (3–25)	14.5 (9–28)	0.10	0.89	0.34
Length of abscess (mm)	21.2 (6–40)	22.25 (6–40)	19.9 (8–32)	19.5 (15–28)	0.46	0.92	0.55
Abscess width/orbital diameter ratio[a]	0.31 (0.125–1.05)	0.34 (0.125–1.05)	0.21 (0.125–0.806)	0.46 (0.26–0.9)	0.20	0.11	0.41
Abscess length/orbital diameter ratio	0.68 (0.29–1.22)	0.7 (0.41–1.22)	0.67 (0.29–1.03)	0.61 (0.44–0.9)	0.75	0.68	0.54
CRP (mg/L)	124 (20–306)	106 (20–306)	139 (30–209)	217 (217)	0.32	NS	NS

[a] Orbital diameter was defined using the distance between the external and internal canthi in a horizontal plane.