

## The Use of Superomedial Conjunctival Approach in Drainage of Large Medial Subperiosteal Abscess Secondary to Ethmoiditis in Children: A Simple, Fast and Safe Technique

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Received date: December 11, 2018; Accepted date: January 03, 2019; Published date: January 10, 2019

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### Abstract

**Purpose:** To evaluate the superomedial conjunctival approach in management of large-sized medial subperiosteal abscess (MSPA) secondary to ethmoiditis in children.

**Methods:** This prospective, non-randomized, clinical intervention case study was conducted at the Orbital Clinic of Assiut University Hospital, the referral center of Upper Egypt in the period between October, 2015 and March, 2018. The study included 9 children with MSPA secondary to ethmoiditis that met the criteria for surgical drainage. In all cases, the MSPA was large (more than 2 cm in its greatest dimension or more than 4 mm in width) and in 3 cases there was relative afferent papillary defect (RAPD). Children with small MSPA without any signs of compressive optic neuropathy that may improve with intravenous broad-spectrum antibiotics were excluded. Under general anesthesia and coverage of intravenous antibiotics, the conjunctiva between the superior and medial recti was incised 8 mm from the limbus with application of tractional sutures to both recti to pull the globe down and out. With malleable orbital retractor the superomedial conjunctiva was retracted medially and the abscess was easily opened with blunt scissors, suctioned and followed by repeated irrigation and suction with solution containing broad spectrum antibiotics. The tractional sutures were removed and followed by application of broad-spectrum antibiotic ointment and eye bandage for 6 h.

**Results:** The age of the patients ranged from 1 to 10 y with an average of 6 y. 7 were males and 2 were females. The left side was involved in 6 cases while the right side was in 3 cases. On CT, the large MSPA was located posteriorly in 7 cases while it was anterior in 2 cases. In all cases and after drainage, the general symptoms were markedly improved within 48 h and the clinical signs were completely resolved in 1-2 weeks. The hospital stay was 2 d in 8 cases and 3 d in one case only. During the follow-up period of minimum 6 months (ranged from 6-30 m), no corneal complications or re-accumulation of MSPA with recurrence were reported.

**Conclusion:** The excellent results we have achieved make the superomedial conjunctival approach highly recommended for drainage of large-sized MSPA secondary to ethmoiditis in children especially if it is located posteriorly where the external approach is far away from the lesion. The technique is a few minutes approach with no facial scar. Also, it carries no risk of medial rectus or optic nerve damages as reported with transnasal endoscopic approach with its long learning curve. However, extension of the study to involve more cases with longer follow-up is recommended.

**Keywords:** Medial subperiosteal abscess; Ethmoiditis; Conjunctival drainage

### Introduction

Sinusitis represents 40%-70% of causes of orbital cellulitis and in most of cases; the infection originates from the ethmoid sinuses [1-3]. Orbital cellulitis can be complicated by the development of a subperiosteal abscess (SPA) which is usually located along the medial orbital wall forming medial subperiosteal abscess (MSPA). MSPA if not probably treated, it may extend to the orbital apex causing visual loss from either compressive or infectious optic neuropathy or extend to the intracranium causing serious complications such as meningitis, cavernous sinus thrombosis, brain abscess and even death [2,4].

In children, orbital cellulitis with small MSPA may take the chance of medical treatment with intravenous broad-spectrum antibiotics [5]. However, if the abscess is large or if there is any sign of vision affection or failure of response to medical treatment after 48 h, surgical intervention is highly recommended [5-7]. In the literature, several approaches were used to drain MSPA including transnasal endoscopic approach, external skin approach and combined transcaruncular and transnasal endoscopic approach [8,9].

To the author's knowledge, this is the first study which uses the superomedial conjunctival approach to drain large MSPA secondary to ethmoiditis in children and the study was conducted to evaluate such approach.

## Patients and Methods

After approval of the ethical committee of Faculty of Medicine, Assiut University according to the ethical principles outlined in the Declaration of Helsinki, the authors conducted this prospective, non-randomized, clinical intervention case study. This study included 9 children referred to the Orbital Clinic of Assiut University Hospital, the referral center of Upper Egypt with acute onset of unilateral proptosis secondary to medial subperiosteal abscess in the period between October, 2015 and March, 2018.

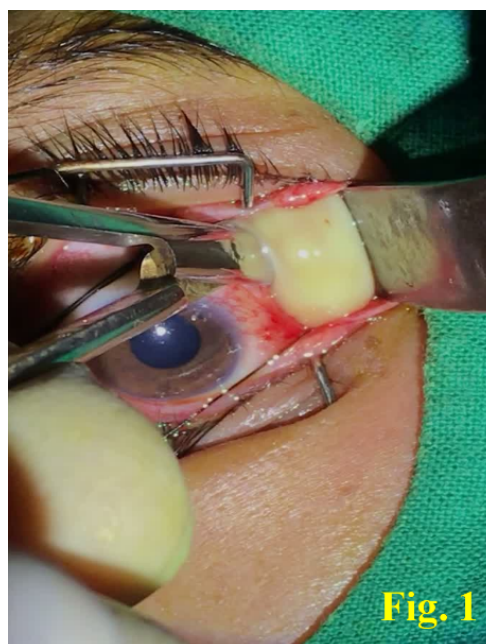
A well-formed consent was signed by the parents of each child included in the study explaining the condition of the child, the treatment plan and the surgical risks and complications including that of the general anesthesia. It also included an agreement to use the data as well as the patient photographs in the publication.

All children were subjected to full ophthalmic examination including visual acuity, pupillary examination, fundus biomicroscopy and orbital examination. All patients were subjected to thin-slice contrast enhanced CT to confirm the diagnosis of medial subperiosteal abscess secondary to ethmoiditis and to measure the dimension of the MSPA. Also, systemic workup including temperature chart and complete blood picture were done. Patients with large MSPA (more than 2 cm in its greatest dimension or more than 4 mm in width or if there is any sign of optic nerve compression were included in the study. Cases with MSPA smaller than the previously mentioned dimensions were excluded.

After obtaining an informed well-written consent, all cases received immediate IV broad-spectrum antibiotics under Pediatric Consultation and under general anesthesia, the conjunctiva was incised 8mm from the limbus between the superior and medial rectus muscles with application of a tractional suture to each muscle. By using a blunt tipped scissor, the superomedial conjunctiva was dissected from the underlying Tenons and intermuscular septum to reach the extraconal space. The superomedial conjunctiva was retracted medially by malleable orbital retractor while the tractional sutures were used to pull the globe down and out. The blunt scissor was directed in a medial, posterior and downward direction towards the medial orbital wall where the MSPA can be reached and opened easily (Figure 1). The abscess was suctioned, followed by repeated irrigation and suction with solution containing broad-spectrum antibiotics and ended by injection of few cc of broad-spectrum antibiotics in the medial subperiosteal space. The two tractional sutures were removed with no

closure of the incised conjunctiva. A broad spectrum antibiotic ointment was applied to the conjunctival sac and the eye was bandaged for 6 h for fear of development of any orbital hematoma.

Post-operatively, the IV antibiotics were continued for 72 h where most of general symptoms were improved and followed by oral antibiotics for a week. Non-steroidal anti-inflammatory drugs were prescribed for 2 weeks, while topical antibiotic drop and ointments were continued for 3 weeks. The follow-up period was ranged from 6 to 30 months with an average of 16.5 months to detect any postoperative complications or MSPA refilling and recurrence.



**Figure 1:** Colored gross photograph demonstrates the superomedial approach for drainage of MSPA with the pus came out.

## Results

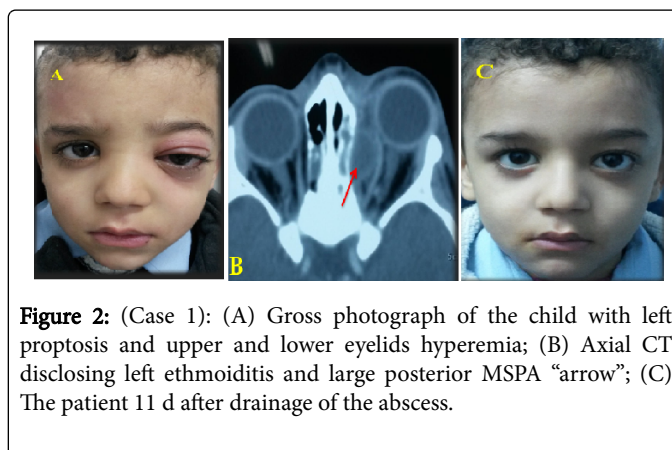
The following Table 1 summarizes the demographic data of the included 9 patients of this study.

Case N.	Age/Year	Gender	RAPD	MSPA	Culture	Hospital stay/Day	Follow up in month
1	9	M	-ve	Posterior	S. aureus	2	30
2	4	M	+ve	Posterior	-ve	2	27
3	6	F	-ve	Anterior	-ve	2	22
4	9	M	-ve	Posterior	S. aureus	2	18
5	7	M	-ve	Posterior	-ve	2	14
6	10	M	-ve	Posterior	-ve	2	13
7	3	M	+ve	Posterior	-ve	2	11
8	5	F	-ve	Anterior	-ve	2	8

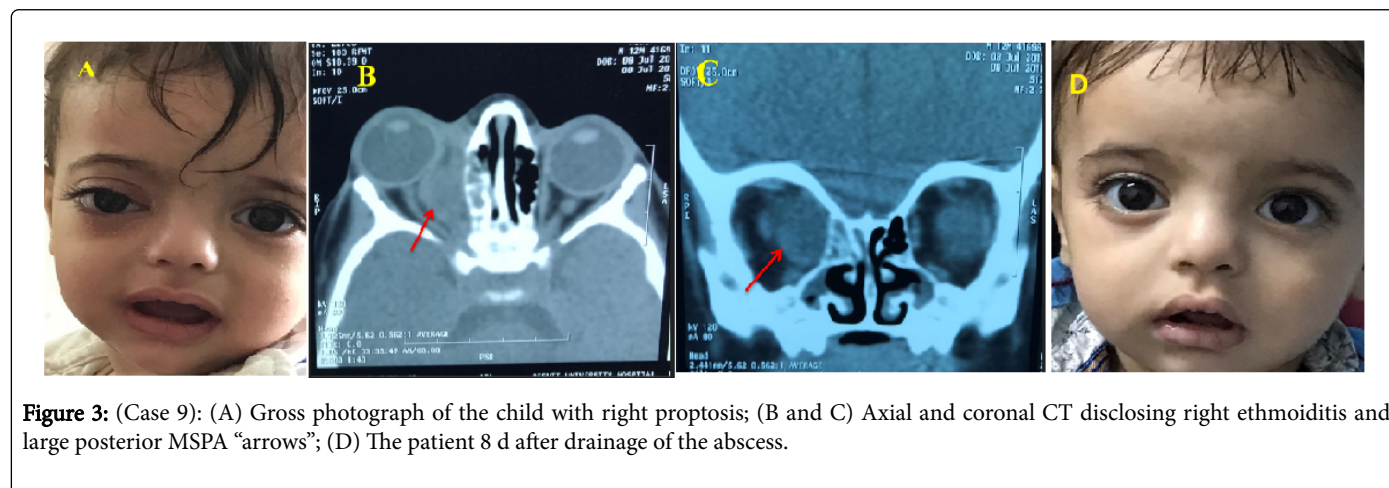
9	1	M	+ve	Posterior	-ve	3	6
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**Table 1:** The following table summarizes the demographic data of the included 9 patients of this study.

The age of the children was ranged from 1-10 years, 6 cases were under the age of 9 y and 3 cases were 9 y or more with an average of 6 y. 7 cases were male and 2 cases were female. The lesion was in the left side in 6 cases while in the right side in 3 cases. RAPD was documented in 3 cases. Contrast-enhanced CT disclosed ethmoiditis with large-sized MSPA (more than 4 mm in width and or more than 2 cm in its greatest dimension) and the abscess was posterior in 7 cases where the posterior ethmoidal air cells were more infected (Figures 2 and 3) while anterior in 2 cases where the anterior ethmoidal air cells were more infected (Figure 4). The culture sensitivity test was negative in 7 cases, and *Staphylococcus aureus* was reported in 2 cases. In all cases, the general symptoms were markedly improved within 48 h and the clinical signs were completely resolved in 1-2 weeks. The hospital stay was 2 d in 8 cases and 3 d in one case. During the follow-up period ranged from 6-30 months with an average of 16.5 months, no one case had significant conjunctival scarring, corneal complications, injury to either the medial rectus or superior rectus, spread of infection to deep orbital tissues, or MSPA refilling and recurrence.



**Figure 2:** (Case 1): (A) Gross photograph of the child with left proptosis and upper and lower eyelids hyperemia; (B) Axial CT disclosing left ethmoiditis and large posterior MSPA "arrow"; (C) The patient 11 d after drainage of the abscess.



**Figure 3:** (Case 9): (A) Gross photograph of the child with right proptosis; (B and C) Axial and coronal CT disclosing right ethmoiditis and large posterior MSPA "arrows"; (D) The patient 8 d after drainage of the abscess.

## Discussion and Conclusion

Orbital cellulitis is defined as an acute infectious inflammation of the post-septal orbital tissues. In 40%-74% of cases, orbital cellulitis is caused by extension of infection from adjacent paranasal sinuses and in most of cases the infection originates from the ethmoid sinuses. In ethmoiditis, the infection spreads to the orbital region through the bony dehiscences, neurovascular foramina, or by septic thrombophlebitis of ophthalmic venous system [1-3].

Orbital cellulitis secondary to ethmoiditis can be complicated by the development of MSPA which if it is not probably treated, the infection can extend to the orbital apex causing visual loss from either compressive or infectious optic neuropathy or spread to the intracranium causing meningitis, cavernous sinus thrombosis, brain abscess and even death [2,4].

Children with orbital cellulitis require careful evaluation with thorough history, physical and ocular examination with particular

attention to fever, level of consciousness, degree of proptosis, painful ophthalmoplegia, vision affection and afferent pupillary defect. Thin cuts contrast enhanced CT is the preferred imaging technique in evaluating these cases. CT provides adequate visualization of the orbits, sinuses, cavernous sinus and the frontal lobe. It also discloses the presence of MSPA, its size and its posterior extension [2,4].

In children especially under the age of 9 y, medical treatment with intravenous antibiotics can be effective in treatment of ethmoiditis with small MSPA [5]. Surgical indications for drainage of MSPA in children include large abscess (more than 4 mm in width, and or more than 2 cm in its longest dimension), no clinical improvement, or clinical deterioration after 48 h of appropriate medical treatment or if there is any sign of vision affection [5-7]. In the present study, 6 patients were aged less than 9 y and 3 patients were aged 9 y or more. In all cases the MSPA was large and it was located posteriorly in 7 cases, while anterior in 2 cases. In 3 cases RAPD was reported.





**Figure 4:** (Case 3): (A) Gross photograph of the child with severe left upper eyelid edema and hyperemia; (B) Axial CT demonstrating large anterior MSPA “arrow”; (C) The patient 14 d after drainage of the abscess.

Many surgical approaches were used to drain MSPA including transnasal endoscopic approach, external skin approach and combined transcaruncular and transnasal endoscopic approach. External skin approach with modified Lyuch incision has the advantage of being easy and direct approach but it can leave unsightly facial scar. The combination of infectious material and the drain can affect the proper wound healing of the skin [8,9].

Manning in 1993 was the first to describe trans-nasal endoscopic ethmoidectomy combined with removal of a portion of the lamina papyracea for drainage of MSPA (9). The advantages of this technique include the ability to concurrently drain the involved ethmoid sinus and the MSPA aiming to decrease the incidence of abscess reformation as well as avoiding potential for a facial scar. However, this technique should only be performed by a surgeon experienced in endoscopic surgery as most of the patients are young with small nose and with more potential for bleeding. Major complications were also reported with endoscopic surgery such as damage to the medial rectus resulting in strabismus and damage or even resection of the optic nerve causing blindness [10,11]. For fear of these major complications, some authors recommended the effectiveness of minimal endoscopic opening of the medial wall of the bulla ethmoidalis and lamina papyracea without concomitant ethmoidectomy when combined with IV antibiotics for treatment of MSPA [12]. Pelton et al. in 2003 used combined transcaruncular orbital and endoscopic sinus approach to confirm abscess drainage from its both sides [9].

In this study, the use of superomedial conjunctival approach combined with intravenous antibiotics was effective in treatment of MSPA in all cases. None of the cases developed intra-operative bleeding and the hospital stay was only 2 d in 8 out of the 9 cases. Post-operatively, no conjunctival scarring, superior or medial rectus damage, corneal complications, MSPA reformation and recurrence or spread of infection to deep orbital tissues were reported during the follow-up period ranged from 6-30 months with an average of 16.5 months. In addition the authors believe that after proper drainage of the abscess combined with IV antibiotics in such age group the orbital vasculature will aid in rapid healing. This technique is easy to learn, fast and carries no potential for facial scar or damage to the medial rectus and the optic nerve. Long-term follow-up with increased number of cases are recommended.

## Conflict of Interest

The authors have no conflict of interest. The authors alone are responsible for the content and writing of the paper.

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**Citation:** Mohammad AENA, Mohammad AAEN (2019) The Use of Superomedial Conjunctival Approach in Drainage of Large Medial Subperiosteal Abscess Secondary to Ethmoiditis in Children: A Simple, Fast and Safe Technique. J Clin Exp Ophthalmol 10: 778. doi: [10.4172/2155-9570.1000778](https://doi.org/10.4172/2155-9570.1000778)