

CASE REPORT

Pansinusitis-associated Superior Subperiosteal Abscess in An Adolescent: A Case Report

MAFFAR NH^{1,2}, TEO SK¹, ABD AZIZ H¹, AZHANY Y^{2*}

¹Department of Ophthalmology, Hospital Sultanah Aminah, Johor Bahru, Malaysia

²Department of Ophthalmology and Visual Science, School of Medical Sciences, Universiti Sains Malaysia, Kubang Kerian, Kelantan, Malaysia

Received: 31 Jul 2023 / Accepted: 06 Aug 2024

ABSTRAK

Abses subperiosteal adalah komplikasi orbital yang serius bagi rinosinusitis pediatrik. Komplikasi orbit daripada rinosinusitis jarang berlaku tetapi memerlukan rawatan segera dan berkesan untuk mengelakkan akibat buruk seperti buta kekal. Kes kami menunjukkan komplikasi orbital yang jarang berlaku tetapi berpotensi berbahaya akibat sinusitis yang tidak dirawat. Seorang remaja lelaki berusia 14 tahun mengalami proptosis mata kanan yang semakin teruk dan penglihatan yang sangat berkurangan. Pengimejan tomografi (CT) otak, orbit dan sinus paranasal menunjukkan kewujudan abses subperiosteal superior di bahagian kanan serta keradangan sinus menyeluruh (pansinusitis). Pesakit menerima rawatan perubatan dan pembedahan dalam tempoh 48 jam selepas kemasukan ke dalam wad, yang terdiri daripada intravena spektrum luas ceftriaxone dan metronidazole, dan pembedahan kecemasan sinus endoskopik berfungsi (FESS). Pesakit menunjukkan peningkatan yang ketara selepas selesai menerima rawatan. Rawatan segera dan agresif yang menggabungkan kedua-dua pendekatan iaitu pembedahan dan perubatan dalam merawat abses subperiosteal adalah sangat diperlukan untuk mengelakkan morbiditi.

Kata kunci: Abses subperiosteal; antibiotik; pembedahan sinus endoskopik berfungsi; sinusitis

ABSTRACT

Subperiosteal abscess is a serious orbital complication of pediatric rhinosinusitis. Orbital complications from rhinosinusitis are uncommon but require prompt and effective treatment to prevent disastrous consequences such as permanent blindness. Our case demonstrated a rare but potentially hazardous orbital complication of untreated sinusitis. A 14-year-old boy presented with worsening right eye proptosis and profoundly reduced

Address for correspondence and reprint requests: Yaakub Azhany. Department of Ophthalmology and Visual Science, School of Medical Sciences, Health Campus, Universiti Sains Malaysia, 16150 Kubang Kerian, Kelantan, Malaysia. Tel: +609 767 6362 Email: azhany@usm.my

vision. Computed tomography (CT) of the brain, orbit and paranasal sinuses revealed a right superior subperiosteal abscess with pansinusitis. He received both medical and surgical treatment within 48 hours of admission, consisting of broad-spectrum intravenous ceftriaxone and metronidazole and emergency functional endoscopic sinus surgery (FESS). He improved tremendously upon completion of treatments. Prompt and aggressive treatment combining both surgical and medical approaches in treating superior subperiosteal abscess may be necessary to avoid morbidity.

Keywords: Antibiotic; functional endoscopic sinus surgery; sinusitis; subperiosteal abscess

INTRODUCTION

Subperiosteal abscess is a rare illness that can result in sight-threatening or life-threatening complications, particularly in children. It is a category of known suppurative orbital complications produced by sinusitis, with a 15 to 17% prevalence. The incidence of orbital complications due to acute sinusitis in children ranges from 60 to 80%.

Based on the anatomical relationship of the orbital septum, orbital infections can generally be divided into preseptal and postseptal infections. The subperiosteal abscess is a postseptal infection, defined as a collection of mucopurulent material under the periosteal spaces of the orbit surrounding the sinuses. The thin lamina

papyracea facilitates the spread of disease. Chandler’s classification system is still used internationally, identifying distinct orbital infection types. As indicated in Table 1, this system accurately characterises the severity and extent of orbital infections. Delays in treatment and management can have catastrophic consequences.

CASE REPORT

A healthy 14-year-old boy presented with 5 days of worsening right eye proptosis. He experienced severely impaired vision and extremely restricted eye movement in the right eye. Initial clinical examinations revealed a visual acuity of 3/60 at 1 foot in his right eye, along

TABLE 1: Chandler’s classification

Class	Location	Stage	Clinical Description
I	Preseptal	Preseptal cellulitis	Inflammatory edema anterior to the orbital septum
II	Postseptal	Orbital Cellulitis	Diffuse edema of orbital contents without abscess formation
III	Postseptal	Subperiosteal abscess	Mucopurulent collection beneath the periosteal spaces of the orbit
IV	Postseptal	Orbital abscess	Mucopurulent collection within the orbit
V	Postseptal	Cavernous sinus thrombosis	Posterior extension of the infection into the cavernous sinus

with a relative afferent pupil defect and optic nerve dysfunction. Figure 1 showed his severe non-axial proptosis, external ophthalmoplegia and partial ptosis. The anterior segment examination revealed infiltrates in the inferior aspect of the right cornea and elevated intraocular pressure (30 mmHg). A fundusoscopic examination of the right eye showed a cherry-red spot at the macula with retinal whitening and attenuated blood vessels infero-

temporally. The left eye's visual acuity was 6/6, and its ophthalmic examination was unremarkable. His vital signs were within the acceptable range, and he remained afebrile throughout his illness. Haematological examinations showed elevated erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP) levels, as well as leucocytosis with predominant neutrophils.



FIGURE 1: The right eye showed severe non-axial proptosis and partial ptosis. A chemosis of the conjunctiva and an edematous eyelid was visible

An urgent contrast-enhanced computed tomography (CECT) scan of the brain, orbit and paranasal sinuses was performed on the day of admission. The scan revealed right orbital cellulitis, anterolateral superior subperiosteal abscess involving the right orbital roof, and right-sided pansinusitis, as shown in Figure 2. There was no evidence of intracranial extension or cavernous sinus thrombosis.

The patient was admitted to the hospital and started on broad-spectrum intravenous ceftriaxone and metronidazole. We placed his right eye in a humidity chamber. The case was co-managed with the Otorhinolaryngology (ORL) team.

The day after admission, he underwent emergency functional endoscopic sinus surgery (FESS) and right superior orbital abscess drainage via anterior orbitotomy under general anesthesia. *Streptococcus pneumoniae* was cultured from the pus taken intraoperatively from the superior subperiosteal abscess. He received a one-week course of intravenous ceftriaxone and metronidazole, followed by a one-week course of oral co-amoxiclav and metronidazole. He was then discharged and monitored weekly at our clinic. After 21 days, his right eye proptosis had subsided, and visual acuity improved to a best-corrected visual acuity (BCVA) of 6/9.

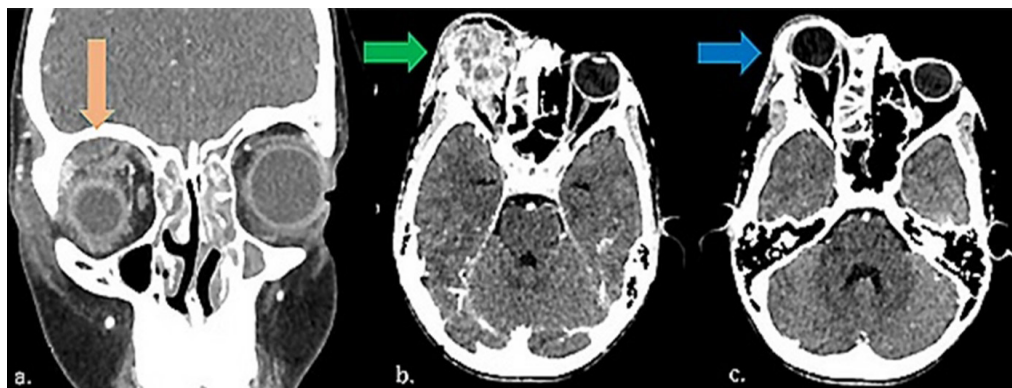


FIGURE 2: (a) A coronal view of the CT scan revealed a hypodense, enhancing subperiosteal collection on the roof of the right orbit, compressing the eyeball downward (orange arrow) with pansinusitis; (b) and (c) Axial view showed right superior subperiosteal abscess (green arrow) and severe proptosis with orbital cellulitis (blue arrow) (different levels of axial cut).

The ophthalmoplegia resolved, and optic nerve function improved. After a month of follow-up, no evidence of an abscess remained. The patient continues to attend ORL team appointments for sinusitis management and follow-up.

DISCUSSION

In this case report, the patient was diagnosed with an anterolateral superior subperiosteal abscess with impending central retinal artery occlusion (CRAO) and pansinusitis but had no history of sinusitis. He experienced no sinusitis symptoms and had no pertinent medical or family history. Subperiosteal abscess, an ocular complication of sinusitis, typically associates with ethmoidal or maxillary sinusitis. It rarely links to frontal sinusitis unless part of pansinusitis. In pediatric cases, it can rapidly progress to a sight-threatening or even life-threatening condition. This case demonstrates the necessity of combining surgical and conservative medical treatments to manage extensive superior subperiosteal

abscesses in children.

When a patient presents with orbital infections caused by sinusitis, the treatment plan relies on ophthalmologic examinations and radiological findings. A multidisciplinary approach involving ophthalmologists, radiologists, and otorhinolaryngologists is essential for treating subperiosteal abscesses, along with high-quality computed tomography imaging of the orbit and paranasal sinuses. The optimal treatment for subperiosteal abscesses remains debatable, with no established standard of care.

Immediate intravenous antibiotic administration is crucial before obtaining a computed tomography (CT) scan (Gavriel et al. 2016; Rahbar et al. 2001). Surgical drainage may be necessary if a relative afferent pupillary defect occurs, fever persists beyond 36 hours, the clinical condition deteriorates after 48 hours, or no improvement is observed after 72 hours. (Gavriel et al. 2016; Rahbar et al. 2001).

Despite radiographic evidence of a subperiosteal abscess, some authors

recommend treatment of intravenous antibiotics only (Gavriel et al. 2016; Kayhan et al. 2010; Sciarretta et al. 2017). Others argue that the existence of such subperiosteal abscess necessitates prompt surgical drainage of both the abscess and infected sinuses. (Adil et al. 2020; Kayhan et al. 2010; Sciarretta et al. 2017). Even with optimal therapy, there is a 20% complication rate and up to 33% vision loss rate. Vision loss is believed to result from increased intraorbital pressure due to the abscess's mass effect, leading to retinal ischemia from central artery obstruction.

Ideally, patients presenting with subperiosteal abscess-related symptoms should undergo a CT scan of the orbit and paranasal sinuses within 24 hours of admission, according to a systematic review by Wong and Levi (2018). Antibiotics are administered to patients with CT-confirmed subperiosteal abscesses and alarming ocular symptoms, preparing them for early surgical drainage. Children age under nine who present with mild symptoms and no ocular issues respond favourably to a trial of intravenous antibiotics and close observation. The decision is primarily influenced by abscess size and the presence or absence of frontal sinus involvement (Adil et al. 2020; Wong & Levi 2018). Recent studies have shown that surgical intervention is the best treatment approach in the pediatric population, regardless of age, when there is a large abscess, frontal sinus involvement and alarming ocular symptoms. (Adil et al. 2020; Sciarretta et al. 2017; Wong & Levi 2018). Due to the rapid progression of the infection toward intracranial involvement, several authors recommend early drainage of a superior subperiosteal abscess (Gavriel et al. 2016; Wong & Levi 2018). It has

been postulated that children older than 9 years have smaller sinus ostia, making them more vulnerable to colonisation by aerobic and anaerobic bacteria when sinusitis develops. The resulting subperiosteal abscess formation is unlikely to resolve with medical treatment alone. A superior subperiosteal abscess is typically inaccessible using the FESS procedure and usually requires a combined surgical technique, whereas a medial subperiosteal abscess can be effectively treated via FESS (Gavriel et al. 2016; Pool & McGinn 2018). Patients' characteristics from previous studies are summarised in Table 2.

In the present case, we immediately administered intravenous antibiotics to the patient upon admission. After consulting with ORL experts, we decided to perform surgical drainage 24 hours after administering antibiotics, considering the location of the subperiosteal abscess and the presence of sight-threatening symptoms. The choice of surgical drainage technique depends on the anatomical location of the subperiosteal abscess. Our patient recovered well from an extensive anterolateral superior subperiosteal abscess following a combined endoscopic-external approach of FESS and anterior orbitotomy. His superior subperiosteal abscess resolved completely with no traces of pus remaining. Clinicians must be aware of subperiosteal abscess variations and the medical and surgical approaches that are most suitable for patients while posing the fewest risks.

CONCLUSION

This case report highlights the significance of ruling out asymptomatic sinus infections in young patients, which can

TABLE 2: Characteristics of the patients in previous studies

Study	Presenting signs/symptoms	Initial treatment	Indication for operation	Operation	Location of SPA	Culture
Rahbar et al. (2001) (n=19)	Ophthalmoplegia, proptosis, erythema, decreased visual acuity, eyelid edema	All patients received IV antibiotics	5 patients responded well to conservative treatment alone 14 patients deteriorated clinically	- External drainage (n=3) Endoscopic (n=11)	Medial SPA Superior SPA Medial or medial-inferior SPA	Combination of <i>Streptococcus</i> , <i>Staphylococcus</i> , <i>Haemophilus</i>
Gavriel et al. (2011) (n=6)	Ophthalmoplegia, chemosis, orbital pain, nasal discharge, eyelid edema, proptosis	All patients received IV antibiotics	Only one patient showed clinical improvement with conservative treatment	-	Posterosuperior SPA (thinnest and smallest in dimension in this study)	Not mentioned in the study
Sciarretta et al. (2017) (n=9)	Ophthalmoplegia, eyelid erythema, edema, proptosis	All patients received IV antibiotics	No improvement after 48 hours	Endoscopic (n=3) Combined (external and endoscopic) (n=2) Endoscopic (n=8) Combined (endoscopic and neurosurgical drainage) (n=1)	Anterosuperior SPA Anterolateral superior SPA Not mentioned in the study	<i>Streptococcus pneumoniae</i>
Kayhan et al. (2010) (n=10)	Proptosis, ophthalmoplegia, eyelid edema, chemosis	All patients received IV antibiotics	No improvement after 48 hours	Endoscopic (n=4) Combined (external and endoscopic) (n=6)	Medial SPA Superior SPA	Not mentioned in the study

SPA: subperiosteal abscess

lead to catastrophic ocular complications: subperiosteal abscesses. The prognosis for orbital complications associated with paranasal sinusitis is favourable if doctors promptly perform diagnostic imaging and initiate broad-spectrum antibiotic therapy, followed by targeted antibiotics and immediate surgical drainage. Pediatric sinusitis resulting in subperiosteal abscess requires swift evaluation, treatment, and management to prevent detrimental outcomes.

REFERENCES

- Adil, E.A., Muir, M.E., Kawai, K., Dombrowski, N.D., Cunningham, M.J. 2020. Pediatric subperiosteal abscess secondary to acute sinusitis: A systematic review and meta-analysis. *Laryngoscope* **130**(12): 2906-12.
- Gavriel, H., Jabrin, B., Eviatar, E. 2016. Management of superior subperiosteal orbital abscess. *Eur Arch Otorhinolaryngol* **273**(1): 145-50.
- Kayhan, F.T., Sayin, I., Yazici, Z.M., Erdur, O. 2010. Management of orbital subperiosteal abscess. *J Craniofac Surg* **21**(4): 1114-7.
- Pool, C., McGinn, J. 2018. Endoscopic management of subperiosteal abscesses. *Oper Tech Otolaryngol Head Neck Surg* **29**(4): 222-5.
- Rahbar, R., Robson, C.D., Petersen, R.A., DiCanzio, J., Rosbe, K.W., McGill, T.J., Healy, G.B. 2001. Management of orbital subperiosteal abscess in children. *Arch Otolaryngol Head Neck Surg* **127**(3): 281-6.
- Sciarretta, V., Demattè, M., Farneti, P., Fornaciari, M., Corsini, I., Piccin, O., Saggese, D., Fernandez, I.J. 2017. Management of orbital cellulitis and subperiosteal orbital abscess in pediatric patients: A ten-year review. *Int J Pediatr Otorhinolaryngol* **96**: 72-6.
- Wong, S.J., Levi, J. 2018. Management of pediatric orbital cellulitis: A systematic review. *Int J Pediatr Otorhinolaryngol* **110**: 123-9.