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Image-guided system endoscopic drainage of orbital abscess caused by methicillin-resistant *Staphylococcus aureus* in an infant

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ABSTRACT

INTRODUCTION: The management of orbital abscesses in neonates and infants is very challenging. Surgical drainage of the abscess is aimed at removing the pus and preventing blindness. We describe a case of orbital abscess in an infant that was caused by methicillin-resistant *Staphylococcus aureus* and that was successfully drained with image-guided endoscopic surgery.
PRESENTATION OF CASE: A 39-day-old infant presented with progressive right maxillary swelling complicated by methicillin-resistant *Staphylococcus aureus* orbital abscess. Tooth bud abscess was the most likely primary cause and a combination of intravenous antibiotics was initially prescribed. The collection of intra-orbital pus was removed using image-guided system-aided endoscopic surgical drainage.
DISCUSSION: Prompt diagnosis and management are very crucial. Endoscopic drainage of these abscesses in children has been described. Image-guided drainage of the orbital abscess is a newer technique that has been reported in a teenager and in adult patients. This is the first reported case of endoscopic orbital drainage surgery in an infant. The procedure was performed successfully. This approach provides for better identification of the anatomical structures in a very young patient. Injuries to the medial rectus, globe and optic nerve can be avoided with this technique.
CONCLUSION: Aggressive management of orbital abscesses in infants is mandatory. Image-guided endoscopic orbital drainage offers precise visualization and a safer technique in a relatively smaller orbit.

1. Introduction

Orbital abscess is an extremely rare ocular infection in neonates and infants. Recently, there have been numerous published cases of *Staphylococcus aureus* and methicillin-resistant *Staphylococcus aureus* (MRSA) infections causing orbital abscess in neonates and infants [1–9]. This condition usually responds to appropriate antimicrobial therapy.

Surgical drainage of the pus is aimed at preventing visual loss by releasing the orbital pressure and obtaining pus for bacterial isolation and antibiotic sensitivity testing. Surgical drainage of orbital abscesses under endoscopy was reported by Rogers et al. [1]. We describe a case of orbital abscess in an infant due to MRSA infection that was successfully drained with the assistance of this image-guided system. This work has been reported in accordance with the SCARE criteria [10].

2. Presentation of case

A 39-day-old previously healthy, full-term male infant presented with a history of progressive right maxillary swelling that extended to the right periorbital region for three days and was preceded by fever and poor feeding. The patient's mother reported no history of upper respiratory tract infection, eye discharge, or recent trauma or hospitalization.

Physical examination revealed a febrile (38 °C but hemodynamically stable infant. The right maxillary area was diffusely swollen and indurated, and the swelling extended to the zygoma and periorbital region (Fig. 1a). There was mild proptosis with chemosis at the temporal conjunctiva. The pupillary response was normal. No restriction of extraocular movements was observed. The retinal examination was normal. Examination of the fellow eye was essentially normal. Oro-nasal examination revealed multiple oral ulcers on the right upper alveolus at the molar region. No signs of rhinitis or respiratory tract infection were noted on flexible nasal endoscopy. Examinations of other systems were unremarkable.

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Fig. 1. a Right facial abscess causes swelling and extension to zygoma and periorbital area. b Thick purulent pus was drained via subciliary incision. c Persistent fullness of upper eyelid suggestive of non-resolving orbital abscess. d Resolved orbital abscess after endoscopic drainage.

The total white blood cell count (12,870 cells/mm^3), platelet count (554,000 cells/mm^3) and C-reactive protein (more than 200 mg/L) were elevated. A swab and blood culture of the right eye grew MRSA. Contrast-enhanced computed tomography (CE-CT) of the orbit and brain revealed a pre-masseteric muscle abscess extending into the right orbital cavity. Orbital abscess collection was noted in the extraconal retrobulbar and infero-medial areas with displacement of the medial rectus muscle (Fig. 2a and b). No subperiosteal collection, intracranial extension or intra-oral pathology was observed.

The patient was treated with intravenous cloxacillin 10 mg/kg and metronidazole 7.5 mg/kg every 8 h. The patient became afebrile on dual antibiotics. Daily oral care was performed for the oral ulcers. Intravenous ceftazidime 100 mg every 8 h was started, but vancomycin 10 mg/kg every 8 h was later used based on culture sensitivity. CE-CT of the orbits and brain was performed due to the persistent proptosis of the right eye and the slow clinical improvement of the right maxillary swelling. Urgent incision and drainage of the pre-masseteric muscle and periorbital abscess were performed using a right subciliary incision. Intra-operatively, a large

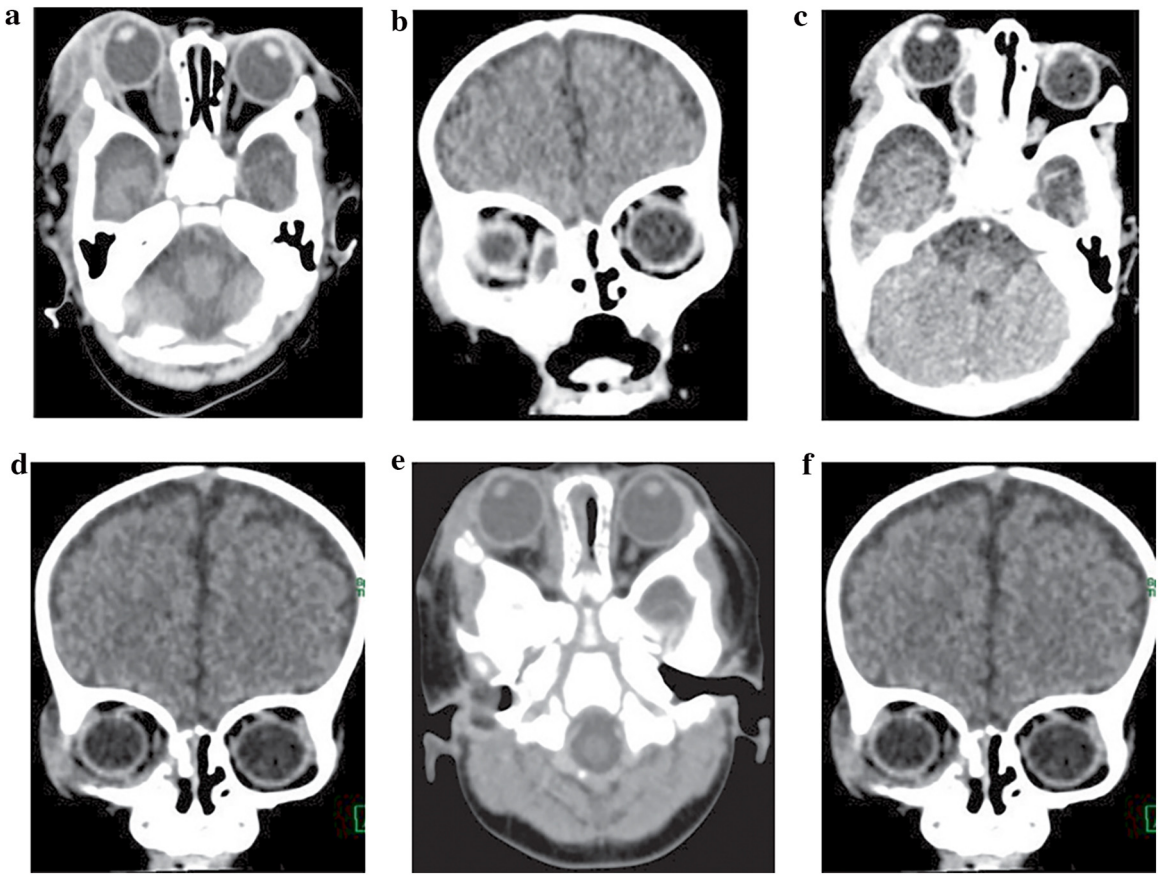

Fig. 2. Coronal and axial CT images of brain and orbit showing progressive right periorbital and extraconal abscesses. (a & b). On presentation (c & d) One week after drainage via subciliary incision; reduction of right periorbital collection but persistent extraconal abscess (e & f) Post image guided system endoscopic drainage; marked reduction of right extraconal abscess and improvement of proptosis.

collection of thick pus was released superficially down to the masseter muscle and from the lateral orbital area (Fig. 1b).

There was an improvement in the facial abscess a week later (Fig. 1c). However, a repeat CE-CT scan revealed a persistent collection of retro-orbital pus (Fig. 2c and d). Endoscopic right partial uncinectomy, anterior ethmoidectomy, and removal of the lamina papyracea with a spoon curette and Blakesley forceps assisted by an image-guided system were performed by the Otorhinolaryngology-Head and Neck Surgery team.

The image-guided system was used intraoperatively to check and confirm the location of the intra-orbital abscess and the position of the medial rectus muscle prior to incision of the medial periorbital fascia. Five milliliters of thick mucoid pus was successfully drained. Excisional biopsy of a right superior whitish gingival mass was also performed. The histopathological examination confirmed an inflamed tooth with abscess formation.

Postoperative recovery was uneventful, and intravenous vancomycin was completed for 14 days. The dosage of vancomycin was adjusted according to therapeutic drug monitoring level. A second blood culture and intraoperative pus culture were sterile. The proptosis of the right eye, periorbital inflammation and right cheek swelling resolved completely (Fig. 1d). The resolution of the right orbital abscess was shown on the repeat CT of the orbit (Fig. 2e and f). There was no sight-threatening ocular sequelae post-endoscopic orbital decompression surgery. The infant was discharged healthy with normal renal function and no evidence of hearing loss.

3. Discussion

Drainage of orbital abscess in neonates and infants can be extremely challenging. Table 1 provides a summary of orbital abscesses in infants who required surgical drainage that were reported in the literature between 2007 and 2016. We included our patient and another 12 published case reports of patients who were less than three months old [1–9,11–13].

Our patient presented at 39 days of life. The youngest patient was a 12-day-old neonate reported by Gogri et al., while the oldest patient was a 74-day-old infant reported by Sharma et al. [11,12]. Both genders are equally affected. MRSA infection was the most common organism cultured, with eight infants who were infected. Ethmoiditis was the main cause of orbital abscess in our review [1,3–8,11]. Other causes included congenital dacryocystitis, post-surgical repair of congenital choanal atresia, conjunctivitis and vertical transmission [2,12,13]. Abscess of the tooth bud was the most likely site of primary infection in our patient.

The endoscopic drainage procedure to decompress the orbital abscess was described in three patients [1,3,11]. Surgical techniques in each of those three patients involved maxillary antrostomy, anterior ethmoidectomy, and transnasal uncinectomy, while maxillary antrostomy and total ethmoidectomy had also been described in earlier case reports [1,7,9,11–13]. An image-guided system endoscopic approach was used to assist the surgical drainage in our patient.

The image-guided system was initially developed for the practice of neurosurgery. However, the system is gaining popularity

Table 1
Published orbital abscess cases in less than 3-months-old infants from 2007 to 2016.

Author, Year of publication	Age of patient/Gender	Abscess(es) site	Organism isolated	Source of infection	Surgical approach	Technique
Rogers et al. [1], 2007	13-day-old/Male	Anteromedial orbital space	MRSA	Ethmoiditis	Endoscopic	Maxillary antrostomy, anterior ethmoidectomy and orbital decompression
Mohan et al. [2], 2007	22-day-old/Female	Intraconal space	*Staphylococcus aureus*	Congenital dacryocystitis	Open	Superomedial orbitotomy
Soon VT [3], 2009	38-day-old/Male	Medial subperiosteal orbital abscess	Methicillin-resistant coagulase-negative *Staphylococcus*	Ethmoiditis	Endoscopic	Not described
Vaska et al. [4], 2011	14-day-old/Female	Multiple locules of low density fluid with irregular enhancing margins in the right orbit	MRSA	Ethmoiditis	Open	Not described
Kobayashi et al. [5], 2011	60-day-old/Male	Subperiosteal abscess between the inferior rectus muscle and inferomedial orbital wall	MRSA	Ethmoiditis	Open	Not described
Tsironi et al. [6], 2012	28-day-old/Male	Retrobulbar fatty tissue between the medial, lateral, inferior rectus muscles and the wall of the globe	MRSA	Ethmoiditis	Open	Incision of the lower lid inner fornix
Lei et al. [7], 2012	30-day-old/Male	Subperiosteal abscess at medial and superior aspect	MRSA	Ethmoiditis	Open	Orbitotomy
Lin et al. [8], 2013	28-day-old Male	Medial and inferior retrobulbar	MRSA	Ethmoiditis	Open	Not described
Yang et al. [9], 2013	14-day-old/Female	Medial, lateral with extension along the orbital floor	*Staphylococcus aureus*	Post-surgical correction of congenital choanal atresia	Open	Lateral orbitotomy
Sharma et al. [11], 2014	74-day-old/Female	Medial subperiosteal abscess	ORSA	Ethmoid and maxillary sinusitis	Endoscopic	Transnasal endoscopic – uncinectomy, maxillary antrostomy, total ethmoidectomy, and orbital decompression
Gogri et al. [12], 2015	12-day-old/Female	Retrobulbar – postero-inferior extending to upper and lower antero-lateral quadrant	CA-MRSA	Vertical transmission	Open	Anterior orbitotomy
Yazici et al. [13], 2016	30-day-old/Male	Lateral retrobulbar	*Pseudomonas aeruginosa*	Conjunctivitis	Open	Lateral orbitotomy
Present case	39-day-old/Male	Extraconal, retrobulbar and infero-medial orbit	MRSA	Tooth bud abscess	Endoscopic	Image-guided system, transnasal partial uncinectomy, anterior ethmoidectomy and orbital decompression

SA: *Staphyloccocus aureus*; MRSA: Methicillin resistant *Staphyloccocus aureus*; ORSA: Oxacillin resistant *Staphyloccocus auerues*; CA-MRSA: Community acquired- Methicillin resistant *Staphyloccocus aureus.*

in sinus surgery to aid in localization during endoscopy. This system integrates a navigational tracking system with the patient's computed tomography images intraoperatively to safely identify anatomical structures and locations for advancing the probe. Hence, the procedure reduced the risk of iatrogenic injury to the adjacent left medial rectus muscle, globe, and optic nerve during the decompression surgery in our patient.

Based on a PubMed search, we found three reported cases involving the drainage of orbital abscess using an image-guided system in a 14-year-old and in two adult patients [14–16]. However, this is the first case of endoscopic orbital drainage surgery described as utilizing the above technique in an infant. A precise identification of anatomical structures in this very young patient offered a safer approach during endoscopic surgery to avoid sight-threatening and other devastating ocular complications. Our patient showed remarkable clinical improvement after surgical drainage of the pus and the completion of a course of intravenous antibiotics.

4. Conclusions

The management of orbital abscesses in infants is challenging. Endoscopic drainage of orbital abscess aided by a real-time imaging guidance system is a new and safe approach to drain orbital abscess in infants. Intraoperative complications can be minimized with this technique.

Conflicts of interest

None.

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Ethical approval

Ethical committee approval was not required to publish this case report.

Consent

Written informed consent from patient has been obtained and signed.

Author contributions

TCL – primary author
SI, SN, AB, IM, CN, TN – had involved in the clinical management of patient
SI – supervised and edited the final manuscript

Guarantor

Dr. Ismail Shatriah.

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