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Methicillin-resistant *Staphylococcus aureus* (MRSA) Orbital Cellulitis- A case report and literature review

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Abstract— Orbital cellulitis is a clinical diagnosis. Once the diagnosis is made, an empirical antibiotic is started, and in most cases, the clinical improvement can be observed within 24-48 hours. We discuss treatment options in managing orbital cellulitis in a 34-year-old male in which no improvement was seen despite being started on empirical broad-spectrum antibiotic. Patient had a prior history of being bitten by an insect in the left upper eyelid while doing gardening about 5 days prior to admission. The patient developed left orbital cellulitis a few days following the insect bite. Patient was started empirical broad-spectrum antibiotic immediately, but no improvement observed. Culture and sensitivity taken from the upper eyelid grew methicillin-resistance *Staphylococcus aureus* (MRSA) which was sensitive to vancomycin. Patient was treated with intensive fourteen days of intravenous vancomycin. The infection resolved as evidenced by clinical improvement and reduction of white blood cells count.

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1 INTRODUCTION

The first notable study conducted regarding MRSA was in 1961, one year just after the launch of methicillin [1]. Since then, MRSA infection has become the main concern for *Staphylococcus aureus* infection because of the emergence of new strains that developed resistance towards beta lactam antibiotic group. MRSA infection is commonly seen in cases of recent hospitalization and surgery, residence in long-term care facility, dialysis, or indwelling percutaneous devices and catheter [2]. In early 1990's community acquired MRSA (CA-MRSA) was detected to cause infection in healthy individual as reported in U.S [3], Canada [4], Australia [5]. CA-MRSA sporadically arise in a community and can cause serious and even fatal infection especially in children and young adult [6,7]. About 90% of CA-MRSA presents as skin and soft tissue infection [8]. CA-MRSA also can cause serious ocular and orbital infection. The rate of ophthalmic infection with MRSA culture positive increased from 12% to 33% from 2000 to 2004 [9]. The infection caused by MRSA varies from conjunctivitis, keratitis, dacryocystitis, endophthalmitis and orbital cellulitis. Most of MRSA infection of the

orbit cause devastating complications [8]. In the literature, the percentage of orbital cellulitis due to MRSA infection is only documented in paediatric age which varies from 23% to 72% of isolated staphylococci infection [10,11].

2 CASE REPORT

A 34-year-old gentleman, who was previously healthy with no medical illnesses, presented with progressive painful left eye swelling for 5 days associated with blurring of vision. One day prior to this episode, he had history of being bitten by an insect to the left upper eyelid while gardening. Otherwise, there was no pus discharge from eyelid, no fever and good oral intake. He has no history of recent hospital admission.

On examination, right eye vision was 6/6 while left eye vision was 6/60. The left eye was proptosed with exophthalmometer reading of 17mm and right eye was 14mm. The left upper lid was swollen with areas of induration extending up to eyebrow. The swelling was warm, tender, firm, with the presence of a punctum medially near the medial canthal area but there was no pus discharge seen (Figure 1). Relative afferent pupillary defect was positive for left eye. Left eye

movement was restricted in all directions. The left conjunctiva was chemosed. Otherwise, cornea, anterior chamber, pupil, lens, intraocular pressure and fundus were normal.



Figure 1: Left eye swelling with mechanical ptosis and proptosis with area of induration noted medially

The patient was admitted and treated as left orbital cellulitis. He was started on empirical broad-spectrum antibiotic that covered gram positive bacteria, as skin infection is commonly caused by gram positive bacteria. Intravenous amoxicillin/clavulanate 1.2g TDS and intravenous metronidazole 500mg TDS were started on the day of admission. Computed Tomography (CT) of the brain, orbit, and paranasal sinuses were done to look for any collection in the orbit and extension of the infection to the brain or the cavernous sinus. CT scan in Figure 2 showed left eye proptosis, thickening with heterogenous enhancement of the left eyelid, with diffuse soft-tissue thickening and areas of enhancement of the retro-orbital fat. The left lateral rectus muscle and left superior rectus muscle were bulky and oedematous. There was no collection of pus within the orbit, brain or cavernous sinus in the CT scan.

Meanwhile, the patient was also referred to the otolaryngology and maxillofacial team whilst in the ward but no abnormality was noted by them. After 5 days of intravenous metronidazole and amoxicillin/clavulanate, patient's condition did not improve and was further complicated with high intraocular pressure. In view of poor clinical response, the antibiotic was changed to intravenous ceftriaxone 1g OD, a broad spectrum 4th generation cephalosporin antibiotic, and oral acetazolamide 250mg QID was started to reduce the intraocular pressure.

The left upper lid swelling ruptured on day 5 of admission with minimal pus. Incision and drainage under general anaesthesia was done. Left eye swelling and proptosis were resolving

after the surgery (Figure 3). The culture and sensitivity of pus swab taken from the eyelid swelling came back with MRSA infection that was sensitive to vancomycin. After discussion with the medical team, the antibiotic was changed to intravenous vancomycin 15mg/kg/day.



Figure 2: Left eye proptosis with loss of sinusoidal pattern of the intra-orbital optic nerve and no obvious abscess collection.



Figure 3: Left eye swelling and proptosis improved after incision and drainage.

Other sites of MRSA infection on the patient was also looked for such as in the nasal cavity and lungs but all were negative. He completed fourteen days of intravenous vancomycin without any complications. The infection was treated completely as evidenced by improvement of left eye vision to 6/6 and reduction of eyelid swelling and proptosis. The serial white blood cell count showed a decreasing trend from $23 \times 10^9/L$ to $12.4 \times 10^9/L$.

3 DISCUSSION

Orbital cellulitis is a sight-threatening condition that requires an early detection and prompt treatment. Before the introduction of HiB vaccine in 1985, Haemophilus influenzae was the most common pathogen causing orbital cellulitis [8]. Later staphylococci and streptococci infections

have emerged as major microbes in orbital abscess [10]. Other less common pathogens include *Streptococcus milleri*, *Neisseria*, *diphtheroids*, *Bacteroides*, *Veillonella*, *Prevotella*, *Peptostreptococcus*, *Moraxella catarrhalis* [11], and fungi such as *Aspergillus* spp., *Candida*, *Mucor*, *Penicillium*, *Cladosporium* and *Fusarium* [12].

Recently, MRSA infection has become a frequent cause of orbital cellulitis especially in paediatrics age group as reported in a retrospective study in Houston, Texas that states MRSA infection represent 73% of all *S.aureus* isolated [10]. A case of MRSA orbital cellulitis in a healthy adult was first reported in USA in 2005 which was complicated with cavernous sinus thrombosis [13]. Most of MRSA infection reported in Malaysia causes soft tissue infection such as breast abscess, shoulder abscess, scrotal abscess, and diabetic foot infection [14]. However, MRSA orbital cellulitis has not been reported in Malaysia before.

Orbital cellulitis can be caused by extension of an infection from the paranasal sinuses or other periorbital structures such as the face, globe, or lacrimal sac. It can also occur following direct inoculation of the orbit from trauma or surgery, or hematogenous spread from bacteremia [15]. The most common predisposing factor is sinusitis which account for about 39.4% followed by trauma 19.7% [16]. Chandellar has classified complications of sinusitis into 5 groups [17] as in Table 1.

Orbital cellulitis is diagnosed clinically, and prompt empirical intravenous antibiotic should be started to prevent serious complications such as permanent visual loss, diplopia, ophthalmoplegia, optic neuropathy, central retinal artery occlusion, cavernous sinus thrombosis, meningitis, intracranial abscess formation, and septic embolus [18,19]. It is important to differentiate between preseptal cellulitis and orbital cellulitis as both disease confers comparable signs and symptoms such as eyelid edema, erythema and chemosis. The signs that suggest there is deeper infection include external ophthalmoplegia, proptosis, and decreased visual acuity [16,18].

In our case, the patient presented with subacute left eye proptosis and reduced vision preceded by history of trauma which clearly suggest deeper infection. Therefore, this patient warrants immediate admission and management.

As the most common causative organism for orbital cellulitis is staphylococci and streptococci, intravenous amoxicillin/clavulanic acid was commenced. Amoxicillin/clavulanic acid is bactericidal and very effective against methicillin-susceptible *Staphylococcus aureus* infection [20] and first-line antibiotic in orbital cellulitis.

Table 1: The group of orbital infection deriving from sinusitis.

Group	Diagnosis
Group 1	Preseptal cellulitis
Group 2	Orbital cellulitis
Group 3	Subperiosteal abscess
Group 4	Orbital abscess
Group 5	Cavernous sinus thrombosis

As the patient's condition was not improving and complicated with high intraocular pressure, the antibiotic was changed to intravenous ceftriaxone because it is a broad-spectrum antibiotic that can cross the blood brain barrier. Based on previous study, there was abscess formation in about 53.2% of orbital infection [16], but in our patient CT scan finding did not show signs of abscess formation except the clinical presence of minimal pus collection on the upper lid medially. Surgical intervention is usually required in cases of orbital cellulitis with optic nerve involvement or when orbital cellulitis failed to respond to medical management [16]. The main purpose of surgery is to drain any purulent material, to relieve intracranial pressure, to clear intra-conal space, and to obtain adequate culture material for identification of causative organism.

It is very important to confirm the causative organism through the culture and sensitivity test especially if the infection did not improve with the empirical antibiotic. Suitable antibiotic which is sensitive to the organism will then be started. In our case, the antibiotic was changed to vancomycin because the organism cultured was MRSA and sensitive to vancomycin. A case reported by Mathias *et al.* due to delayed incision and drainage and initiation of vancomycin in MRSA orbital cellulitis lead to blindness [21].

Therefore, combination therapy of ampicillin-sulbactam or cephalosporin with vancomycin [22,23] or oral clindamycin [24] was recommended for high risk suspected MRSA infection. Oral rifampicin was added to

intravenous vancomycin in case of disseminated disease [15].

4 CONCLUSION

MRSA orbital cellulitis is uncommon, and the diagnosis and management are challenging. Our case illustrated the common risk event of MRSA infection and successful recovery with second line treatment after empirical antibiotic had failed. Therefore, we suggest that for patients highly suspected with MRSA infection, to consider second line antibiotic therapy or combination antibiotic therapy early while waiting for the culture and sensitivity result. Based on previous studies, it is important to consider surgical drainage in cases where there's poor response to medical treatment in order to prevent inevitable complications.

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CONFLICT OF INTEREST

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

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