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# Late-Onset Orbital Cellulitis with Abscess Formation Caused by Klebsiella Pneumoniae*

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## ABSTRACT

Klebsiella pneumoniae is a facultative anaerobic gram-negative, non-motile, capsulated, gas-producing rod found widely in nature and often associated with urinary and respiratory infections in humans. Orbital cellulitis with abscess formation caused by K. pneumoniae is rare. Here, we present a case of K. pneumonia-inducing orbital cellulitis with abscess formation in a patient who had undergone an orbital wall fracture prosthesis with hydroxyapatite implantation due to orbital trauma 9 years ago. The patient was treated successfully with antibiotics and surgery.

**Keywords:** Orbital Cellulitis; Abscess; Klebsiella Pneumoniae

## 1. Case Report

A 52-year-old man presented to our ophthalmology department with a 1 week history of eye pain, blepharedema, conjunctival congestion, and proptosis in the left eye. 7 days prior, he had suddenly developed a fever of 39.0˚C after a continuous period of being overworked. A tentative diagnosis of orbital cellulitis was made and the patient was treated with intravenous cefoxitin sodium as an inpatient. Most of the symptoms slightly improved. Nine years before his presentation, the patient had been admitted to our hospital for the first time with orbital trauma following a traffic accident. He had received an orbital wall fracture prosthesis with hydroxyapatite implantation. He denied recent facial trauma or dental work. Visual acuity was 20/20 in both eyes. The adduction of the left eye was severely restricted. Due to his orbital trauma and surgical history, we advised him to undergo an orbital computed tomography. To our surprise, a huge abscess formation was seen adjacent to the implant of the medial wall of the left orbit (**Figure 1**). The laboratory findings showed a high level of leukocytes, erythrocyte sedimentation rate, and C-reactive protein. Under general anesthesia, incision and drainage of the orbital abscess was performed. The purulent material was collected and cultured immediately. The isolate was found to be gram-negative. Using the Vitek II automated system (bioMérieux, Marcyl'Etoile, France), the isolate was confirmed as extended-spectrum $\beta$-lactamase-producing Klebsiella pneumoniae, with a 96% confidence level. Antimicrobial susceptibility test was performed using the Vitek II automated system which resulted in the MICs shown in **Table 1**. The Kirby-Bauer agar diffusion method was used as a confirmatory tool. The Clinical and Laboratory Standards Institute (CLSI) guidelines for susceptibility testing of K. pneumoniae were followed. After surgery, the patient was managed with intravenous piperacillin/tazobactam 4.5 mg/12 h for 7 days and imipenem/cilastatin sodium 250 mg/12 h for 14 days. His symptoms subsided completely and laboratory findings became normal without recurrence for 6 months.

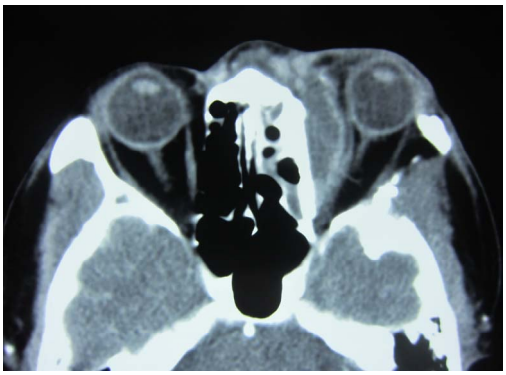

**Figure 1. Computed tomography of the orbit showing orbital cellulitis with a huge abscess adjacent to the hydroxyapatite implant of the medial wall of the left orbit and partial pneumatization of the left ethmoidal sinus.**

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**Table 1. Disk susceptibilities of the K. pneumoniae isolates.**

| Antibiotic | MIC (μg/ml) | Susceptibility[α] |
|---|---|---|
| Ampicillin | ≥32 | R |
| Ampicillin/sulbactam | 16 | I |
| Piperacillin/tazobactam | 8 | S |
| Cefazolin | ≤4 | R |
| Cefotetan | ≤4 | S |
| Ceftazidime | ≤1 | S |
| Ceftriaxone | ≤1 | S |
| Cefepime | ≤1 | S |
| Aztreonam | ≤1 | S |
| Ertapenem | 0.25 | S |
| Imipenem | ≤1 | S |
| Amikacin | ≤2 | S |
| Gentamicin | ≤1 | S |
| Tobramycin | ≤1 | S |
| Ciproxacin | 1 | S |
| Levofloxacin | 1 | S |
| Nitrofurantoin | 256 | R |
| Trimethoprim/sulfanilamide | 2/38 | S |

[α]R, resistant; I, intermediary; S, susceptible

## 2. Discussion

K. pneumoniae is a facultative anaerobic gram-negative, non-motile, capsulated, gas-producing rod found commonly in nature and is often associated with urinary and respiratory infections in humans. K. pneumoniae is the most common and most important rod of the Klebsiella species that are identified as pathogenic to humans and include K. pneumoniae, R. oxytoca, K. ornithinolytica, K. planticola, and K. terrigena. It is also a common opportunistic pathogen in humans; therefore, immunocompromised and/or postoperative patients are prone to suffer from infections with this pathogen. In addition, K. pneumoniae is one of the most important pathogen that can product extended-spectrum beta-lactamases, leading to its resistance to most antibiotics.

K. pneumoniae is associated with wound infections [1-3], respiratory tract infections [4], arthritis [5-8], osteomyelitis [5,7], septicemia [5,9], meningitis [5,10-11], genitourinary infection [7,12], and so on. Eyeball infections due to K. pneumoniae is not rare and can cause keratitis [13], conjunctivitis [14] and endophthalmitis [15-17]. However, to the best of our knowledge, orbital cellulitis caused by K. pneumoniae has rarely been reported in the literature [18-20].

Orbital cellulitis and abscess are medical emergencies. Delayed or inadequate management may lead to permanent loss of vision [21-23]. Therefore, history-taking, clinical examination, and laboratory investigation including proper orbital imaging is essential in determining the source of infection [24]. There are various sources of orbital cellulitis, including the sinuses, open fractures, foreign bodies, periocular surgery, Munchausen's syndrome, intraocular tumors, and so on [24,25]. The skin and the sinuses are colonized by various microorganisms. Orbital cellulitis following trauma is due to direct exposure of the orbital contents to these microorganisms [24]. Open and closed periorbital fractures involving the sinuses or the nasal bone, may be a risk factor for orbital infection [26,27]. The most common bacteria isolated from pediatric and adult patients with community-acquired acute purulent sinusitis are *Streptococcus pneumoniae*, *Haemophilus influenzae*, *Moraxella catarrhalis*, and *Streptococcus pyogenes*. *Staphylococcus aureus* and anaerobic bacteria (*Prevotella* and *Porphyromonas*, *Fusobacterium* and *Peptostreptococcus spp*) are the main isolates in chronic sinusitis [28]. Infection may present within a few hours to several years after trauma [23,24].

After some surgeries involving the orbit, there is an increased risk for infection, especially in the presence of alloplastic foreign bodies. Cataract surgery [29,30], blepharoplasty [31], strabismus surgery [32,33], and other

 

procedures may all expose the orbit to infection [34,35]. Therefore, patients undergoing any interventional procedures should be closely monitored for signs of infection and should be treated aggressively if evidence of an infection is found [24].

Because K. pneumoniae is almost extended-spectrum $\beta$-lactamase-producing bacillus, it is resistant to most antibiotics. Susceptibility testing is necessary to help physicians choose the appropriate antibiotics in clinic. In our case, the results of the susceptibility testing showed that piperacillin/tazobactam, cefazolin, cefotetan, ceftazidime, ceftriaxone, cefepime, aztreonam, ertapenem, imipenem, amikacin, gentamicin, tobramycin, ciproxacin, levofloxacin are all effective. However, the extended-spectrum $\beta$-lactamase-producing bacteria, which show susceptible to penicillins, cephalosporins and aztreonam often become resistant to them. Therefore, $\beta$-lactamase inhibitors and carbapenems are recommended in clinical practice. Our patient was treated with intravenous piperacillin/tazobactam for 7 days and oral imipenem for 14 days after surgery without recurrence for 6 months.

## 3. Conclusion

To our knowledge, this is the first case of late-onset orbital cellulitis and abscess formation induced by K. pneumoniae after an orbital wall fracture prosthesis with hydroxyapatite implantation reported in the literature. Orbital cellulitis and abscess formation due to K. pneumoniae should be considered, whenever patients suffer the orbital trauma and undergo surgery.

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