What antibiotics should we administer for paediatric orbital cellulitis? A national survey of NHS Trusts within the United Kingdom

Abstract
Paediatric orbital cellulitis is an ENT emergency. It is managed by Otolaryngologists, Paediatricians and Ophthalmologists, however management options may differ. Here we have attempted to identify and understand the antimicrobial regimes most commonly employed throughout the UK. ENT teams in 40 units were contacted through a questionnaire-based survey. Twenty-eight units responded (response rate 70%) of which ten trusts reported no policy requiring joint input from paediatrics, ENT and ophthalmology and six trusts had no antimicrobial guidelines. Commonest antibiotic regimes were ceftriaxone with metronidazole, ceftriaxone alone, or co-amoxiclav. Furthermore, a literature search of the various antimicrobial policies was carried out and advice was sought from a specialist microbiology department. The evidence suggests no general consensus on antibiotic policy of this ENT Emergency. We discuss the rationale behind the various antimicrobial regimes commonly employed from the evidence and expert microbiology advice.

Keywords
Paediatric orbital cellulitis, orbital abscess, antibiotic

Introduction
Orbital complications of sinusitis can have a significant impact on morbidity and mortality. They can be classified into preseptal (Chandler I) and post-septal (Chandler I-IV) disease. It is the latter that is a well-known complication of sinusitis and poses a greater threat to vision, hence requires prompt intervention.

A significant proportion of patients who present with orbital sepsis are children, which often makes adequate clinical assessment more difficult. Whilst the majority of children with preseptal cellulitis can be treated with oral antibiotics, those suspected of post-septal involvement should be admitted for parenteral antibiotics, and monitored closely. Such cases require joint input from the Paediatrics, ENT and Ophthalmology teams from admission so that prompt assessments can be made, and for those who are of concern early radiological imaging and surgical intervention can be considered.

The majority of children improve with aggressive medical management in the form of empirical parenteral antibiotics, however some patients deteriorate and require surgical drainage. It is unclear whether choice of antibiotic may play a role. Although various local policies have been developed, there are no national evidence-based guidelines identifying the most appropriate empirical antibiotics.
What antibiotics should we administer for paediatric orbital cellulitis?
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Following a recent discrepancy in antibiotic choice between the Paediatric and ENT teams within our trust in the management of a child who eventually required surgical drainage, we carried out a national survey investigating antibiotic regimes employed in NHS trusts throughout the UK.

Methods
ENT teams in forty units were contacted via telephone and asked to fill-out a short on-line questionnaire. The questionnaire addressed whether trusts had a policy requiring input from Paediatrics, ENT and Ophthalmology for those children admitted, whether they had specific antimicrobial guidelines for paediatric orbital cellulitis, and what choice of antibiotics were administered for such cases within their respective units.

Following this, the various antimicrobial policies described in the literature were reviewed. Advice was sought from a local specialist microbiology department in order to understand the reasoning behind the various antimicrobial policies.

Results
Twenty-eight units responded (response rate of 70%). Two units were situated in Scotland, two in Wales, and the remainder were in England. Thirteen were teaching hospitals and fifteen were district general hospitals.

Ten trusts (36%) had no policy requiring input from paediatrics, ENT and ophthalmology for those patients requiring admission. Six trusts (21%) had no specific antimicrobial guidelines for paediatric orbital cellulitis, and what choice of antibiotics were administered for such cases within their respective units.

Following this, the various antimicrobial policies described in the literature were reviewed. Advice was sought from a local specialist microbiology department in order to understand the reasoning behind the various antimicrobial policies.

Discussion
It was interesting to note that 36% of trusts did not employ a policy that required children admitted for this condition to be reviewed by the three main specialties (Paediatrics, ENT, Ophthalmology), and 21% had no specific antimicrobial guidelines.

It is clear that there is some heterogeneity in parenteral antibiotic choice when managing orbital cellulitis. Part of the problem is that in the majority of patients the causative pathogen is not identified as very few require surgical drainage for orbital cultures to be obtained, and blood cultures are only positive in up to one third of cases. The most common causative pathogens described in the literature include streptococci such as Streptococcus anginosus, S. pneumonia and S. pyogenes and Staphylococcus aureus (including the methicillin-resistant form; MRSA). Anaerobic bacteria are less prevalent and include, Peptostreptococcus sp., Prevotella sp. and Fusobacterium sp. The advent of the Haemophilus influenzae type b vaccination has resulted in a significant decline in cases caused by this organism, however it has not been completely eliminated. Fungi, such as Aspergillus sp., have also been implicated but are often limited to patients with various comorbidities predisposing them to immunosuppression. It is important to note that many cases are caused by a combination of different pathogens.

There is widespread consensus that patients should be treated aggressively with empirical broad-spectrum empirical antibiotics. However, no randomized controlled trials have been carried out to determine the most appropriate initial antibiotic choice. Regimes commonly suggested in recent literature include third generation cephalosporins (ceftriaxone or cefotaxime) in conjunction with anaerobic cover (metronidazole or clindamycin) and in some cases with the further addition of flucloxacillin. Other regimes include vancomycin with ceftriaxone, or piperacillin-tazobactam. In those who are allergic to penicillin, vancomycin alone or clindamycin in combination with a quinolone have been suggested.

Historically third generation cephalosporins were commonly employed, as they are effective against H. influenzae type b, which was a common and serious cause. Prior to cephalosporins, amoxicillin was used but many strains were resistant and chloramphenicol was an alternative. Cephalosporins are also...
The use of vancomycin and a cephalosporin would be justifiable if the incidence of MRSA infection was higher (however, rates of invasive disease caused by this organism are falling in the UK). There is less rationale behind the use of piperacillin-tazobactam, as this is primarily an agent used to treat Gram-negative infections, which are not a common cause of orbital abscesses. It is, however, effective against the other major causes (streptococci, staphylococci (not MRSA), anaerobes and H. influenzae). It may be considered too extreme in the initial stages, and co-amoxiclav alone may be sufficient in the majority of cases. Some anaerobes will be resistant to piperacillin-tazobactam and co-amoxiclav which is why the addition of clindamycin or metronidazole has been recommended. It is important to note that clindamycin is often used for serious S. pyogenes infections, as it is thought to help switch off toxin production.

Oral regimens suggested on discharge include clindamycin with or without amoxicillin or co-amoxiclav. In patients who are allergic to penicillin or cephalosporins, either ciprofloxacin or levofloxacin have been suggested. Clindamycin alone may not be effective against certain organisms - some isolates of staphylococci (MRSA in particular) and streptococci can be resistant. The reasoning behind using ciprofloxacin is unclear. Although it is effective against H. influenzae, it has very little activity against streptococci or staphylococci and has no action against anaerobes. Levofloxacin has better activity against streptococci and staphylococci and will cover H. influenzae, but will also have no anti-anaerobic activity.

**Conclusions**

Paediatric orbital cellulitis is a medical emergency, and if not treated promptly and appropriately can have significant orbital and intracranial complications. All patients requiring admission should be reviewed by the three specialties concerned. Prompt aggressive medical management is sufficient for the majority of patients; however this study suggests that this may be suboptimal in many trusts. Furthermore there is no general consensus on empirical antibiotic policy. We have attempted to understand the rationale behind the various antimicrobial regimes commonly employed. However, there is a clear lack of evidence. A large-scale multi-centre trial will help guide clinicians and may also identify whether local bacterial profiles differ between regions in the UK so that antimicrobial policies can be tailored accordingly. The development of multi-disciplinary guidelines may allow us to manage this condition more uniformly across the country.

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**Conflicts of interest**

None declared

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**References**