Orbital cellulitis

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SUMMARY Forty-nine cases of orbital cellulitis were reviewed. The average age of patients at presentation was 31 years. The onset of symptoms varied from seven days or less in 28 patients, one to four weeks in 17 patients, and more than four weeks in four patients. The leucocyte count, available in 33 patients, was greater than $10 \times 10^9/l$ in only nine. Abnormal sinuses were noted radiographically in 61%. Computed tomography scans, performed on nine patients, revealed non-localised inflammation in three and an orbital mass in six. Cultures, in general, were disappointing. Seventeen surgical procedures were performed on 14 patients. The complications of orbital cellulitis, occurring in five patients, included osteomyelitis of the maxillary bone, strabismus, afferent pupillary defect, chronic draining sinus, and scarred upper eyelid. Usually the treatment of orbital cellulitis requires aggressive parenteral antibiotic therapy and judicious surgical intervention.

Orbital cellulitis is an uncommon, potentially lethal disease. Prior to the discovery of antibiotics mortality rates of 20% to 50%, and blindness in 20% to 55% of the survivors, were reported.^{1,2} Although improvement since that time has been dramatic, several series have recorded significant morbidity and mortality despite the use of antibiotics.³⁻¹⁶ A review of 49 patients with orbital cellulitis seen in the Orbital Clinic at Moorfields Eye Hospital during a 13-year period demonstrates the advantages of giving appropriate antibiotics by the intramuscular or intravenous route. There were no deaths in this series, and damage to structures within the orbit was infrequent.

Patients and methods

The clinical records of all patients with a diagnosis of orbital cellulitis between 1970 and 1983 were reviewed. Forty-nine patients (24 male, 25 female) composed the study group. Patients were included only if they had postseptal orbital inflammation considered to be caused by bacteria, if pus was drained from the orbit, or prompt resolution of the signs and symptoms followed antibiotic therapy. Patients ranged in age from 4 weeks to 71 years, mean age 31 years. Ten patients were aged 14 years or less.

All patients had radiographs of the skull, with under-tilted occipito-mental and oblique radiographs

showing details of the paranasal sinuses. In a few patients axial hypocycloidal tomograms were obtained to reveal the anatomy of the ethmoid and sphenoid sinuses. Towards the end of the review period computed tomography (CT) scans were also obtained in selected patients.

The patients were treated with a wide range of antibiotics. Those most commonly used were penicillin, synthetic penicillins effective against penicillinase-producing bacteria, ampicillin, amoxicillin, and chloramphenicol. These antibiotics were used alone or in combination, in large doses, and administered parenterally. Rifampin, ethambutol, and isoniazid were used to treat two patients who had tuberculous infections of the orbit.

Surgical drainage was performed in patients who had clinical and radiological evidence of an orbital abscess. In a number of patients sinus drainage procedures were carried out, either during the infectious period or at a later date. We included this surgery in the results only if it was performed during the period of active orbital cellulitis.

Follow-up data through complete resolution of the orbital cellulitis were available in all cases.

Results

Thirty of the 49 patients with orbital cellulitis had left orbital involvement and 17 had right orbital involvement. In two cases the orbital cellulitis was bilateral. Twenty-four of the 49 patients presented in the four

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Fig. 1 *Marked eyelid oedema and proptosis in a patient with orbital cellulitis with chemosis and decreased ocular motility.*

months between November and February, with fewer patients seen in the summer months.

Signs and symptoms were present for seven days or less in 28 patients, from one to four weeks in 17 patients, and more than four weeks in four patients. Two of these four patients had presumed tuberculoma of the orbit. Chemosis and eyelid swelling were present in all patients, and 45 had reduction of ocular movements (Fig. 1). The eye was displaced from its normal position in 46 patients; in the majority it was proptosed and displaced laterally or downwards. Only 16 patients had pyrexia when first seen; seven of the 16 were less than 14 years of age.

Twenty-three patients had reduced visual acuity of one Snellen line or more in the affected eye, and 20 patients had normal vision. Three patients had eyelid swelling that precluded visual assessment. In two infants vision was not assessed. One patient had an anophthalmic socket.

The leucocyte count, available on admission in 33 patients, was less than $10 \times 10^9/l$ in 24, and $10 \times 10^9/l$ or greater in nine patients (range, $5-35 \times 10^9/l$). The Westergren sedimentation rate, available in 25 cases, was 15 mm/h or less in nine patients, and greater than 15 mm/h in 16 (range 2 to 56 mm/h). Skull x-rays showed sinus abnormalities in 61% of patients, with the frontal, maxillary, or ethmoid sinuses, alone or in combination, almost equally involved (Fig. 2). Sphenoidal sinusitis was uncommon. Lytic lesions of the superior temporal orbital rim (Fig. 3) were present in two cases of presumed orbital tuberculosis. One of these lesions enlarged over an 8-month period in concert with an enlarging lung nodule. In one patient air was present in the orbit, noted at surgery to have a direct communication between the antrum and the orbit.

Computed tomography scans of the orbit were performed on nine patients. In six an abscess was shown (Fig. 4). Five of these abscesses were surgically drained, with the release of large quantities of pus, and one abscess resolved on medical therapy alone. A diffuse inflammatory reaction was shown in three patients, which later completely resolved on antibiotic therapy.

Twenty patients were on antibiotic therapy when first seen. Culture specimens were obtained from them and from most of the remainder after initiation of antibiotic therapy. Only a few cultures of blood or from conjunctiva, nose, abscess, or antrum were positive, and no one organism, or group of organ-

Fig. 2 *Skull x-ray showing maxillary and ethmoidal opacification with increased orbital soft tissue density on the side of orbital cellulitis.*

Fig. 3 Skull x-ray showing a superotemporal orbital rim lytic lesion in a patient with tuberculous infection of the orbit.

isms, emerged as the predominant cause of the orbital cellulitis. Cultures and stains for acid-fast bacilli in the two cases of probable tuberculosis were negative. Histological examination of the wall of one of these abscesses revealed non-specific granulomatous inflammation. Similarly, there was granulomatous inflammation with vasculitis and perivasculitis in an orbital biopsy specimen obtained from a patient

Fig. 4 Computed tomography of the orbits shows a soft tissue mass in the lateral orbit displacing the globe. Also note the contralateral eyelid oedema, which gives the impression of bilateral orbital disease.

Fig. 5 Remarkable improvement in same patient as in fig. 1, 48 hours after superotemporal transeptal orbital abscess drainage.

with positive serology and syphilitic orbital cellulitis.

Many factors may have predisposed to the development of orbital cellulitis. Eight patients gave a history of chronic sinusitis. In two patients orbital cellulitis followed sinus surgery. Proptosis suddenly developed in an 11-month-old infant, three weeks after a viral upper respiratory tract infection, rash, and uveitis were treated with steroids. Other predisposing factors included: infected chalazion (2); eyelid laceration (1); dental surgery (1); nasal septum infection (1); infected penetrating keratoplasty (1); and hypogammaglobulinaemia (1).

Seventeen surgical procedures were performed on 14 patients; the main indication for surgery was to release pus. In 12 patients the orbital abscess was incised and drained (Fig. 5); in three of these 12 patients the paranasal sinuses were drained simultaneously. Diagnostic orbital biopsies were performed in three patients. In two patients a persistent draining sinus tract was excised.

Five patients had long-term complications following orbital cellulitis: in four of them the complications were attributable to the orbital cellulitis, and in one patient, a 4-week-old infant, osteomyelitis of the maxillary bone was present after drainage of an orbital abscess. The infant was treated at another hospital and made a good recovery. In one patient sinus tract drainage from the upper eyelid persisted for eight months after incision and drainage of an abscess and for four months after the sinus tract was surgically excised. The sinus eventually closed. Vertical shortening of the upper eyelid developed after drainage of an abscess. Restricted movement of the globe developed in another patient, necessitating muscle surgery. One patient had a residual afferent pupillary defect, but retained 6/9 vision.

Discussion

Orbital cellulitis usually appears as an acute infection which, in the preantibiotic era, frequently led to blindness and even death. Sometimes these patients present with less dramatic signs and symptoms, with the result that the physician may not vigorously pursue the courses of therapy available today.^{3 4 6 17 18} In our series 43% of presenting symptoms were present for more than seven days, and fever was absent in 66% of patients. Similarly, laboratory data such as the leucocyte count and sedimentation rate were often normal.

It is therefore important that clinicians should be aware that orbital cellulitis may occur without signs of acute inflammation so that patients can be admitted to hospital and parenteral therapy started without delay. Chemosis, globe displacement, and decreased ocular movements are signs of orbital involvement. A complete history and a physical and ocular examination should always be performed. Predisposing factors, especially any history of sinus disease or sinus surgery, should be sought. Sinus x-rays, an integral part of the evaluation of orbital disease, should be obtained in all cases of suspected orbital cellulitis. Abnormal radiographs of the sinuses lend support to this diagnosis. The radiographic evidence of sinus disease found in 61% of our patients, with equal involvement of the maxillary, ethmoid, and frontal sinuses, is in contradistinction to the well-known predominance of ethmoid sinusitis associated with orbital cellulitis in younger children.⁷ Similarly, Schramm *et al.*⁴ noted a 74% incidence of clinical and radiographic evidence of sinusitis. This frequent association of sinusitis with orbital cellulitis may explain the higher incidence of orbital cellulitis in winter than in summer.¹⁴ Presumably the increased number of respiratory tract infections associated with the winter months would result in an increase in the incidence of sinusitis, which would then be reflected in an increased incidence of orbital cellulitis. No reason for left-sided predominance of orbital cellulitis can be determined in our series or others.¹⁴

Many patients have been started on antibiotics by the primary physician before initial referral. This was the case in 40% of our patients. Furthermore, many of the remaining patients were given antibiotic therapy after referral and prior to obtaining cultures. This probably lowered the number of positive cultures. Nasal and conjunctival cultures have not been found to help in evaluating these patients.^{3 8 17} Nasal cultures are rarely positive for the offending organism, though they may occasionally provide useful information in the presence of active sinus disease. Blood cultures, while seldom positive in adults (12% in Krohel *et al.*³), are more productive in the paediatric

population, where a 30% incidence of bacteraemia was noted by Schramm *et al.*⁸ in children under 5. *Haemophilus influenzae* was most commonly cultured in this group.

Haemophilus influenzae, *Streptococcus pneumoniae*, *Staphylococcus aureus*, and *Str. pyogenes* are the commonest causes of orbital cellulitis.^{8 9} Anaerobic bacteria are not commonly searched for, but they also may cause orbital cellulitis. Fortunately these bacteria are sensitive to penicillin.¹⁶ Not surprisingly, these same organisms are listed among the commonest causes of sinusitis.¹⁹

Therapy in children under 4 years of age should include coverage of *H. influenzae*.^{17 20 21} Ampicillin, 200 mg/kg/day, in divided doses combined with a penicillinase-resistant antibiotic (nafcillin or oxacillin 100 mg/kg/day) should be administered parenterally. Because of the increased incidence of ampicillin-resistant strains of *H. influenzae* the use of intravenous chloramphenicol (100 mg/kg/day) should be carefully considered.²² In adults the initial therapy should consist of high doses of intravenous penicillin (2 000 000 units) alternating with nafcillin or oxacillin, 1.5 g every four hours. This should be given so the patient receives antibiotics every two hours. If the patient has a history of a non-anaphylactic reaction to penicillin, cefotaxime 1.2 g every six hours should be substituted. In the case of a previous anaphylactic reaction to penicillin or its derivatives clindamycin, chloramphenicol, or vancomycin may be given.²³

If the patient fails to improve on aggressive antibiotic therapy, a number of factors should be considered. The infecting organism may not be sensitive to a particular antibiotic or combination of antibiotics, and other antibiotic therapy may be started. This decision ideally would be based on positive nasal cultures in the presence of active sinus disease or on positive blood cultures; however, these data usually are not available. Computed tomography scans of the orbit should be obtained for patients unresponsive to antibiotic therapy.²⁴ If an orbital or subperiosteal abscess is present, or if the case has been misdiagnosed, and the patient has a rhabdomyosarcoma orbital pseudotumour, metastatic carcinoma with necrosis, or an atypical infective agent such as the tubercle bacillus, the CT scan will usually outline the extent of orbital involvement. Most abscesses are well localised except in acute cases evolving over 24 to 48 hours. Here CT scans may show only non-specific inflammation of the orbit, such as scleral-uvula rim thickening and muscle engorgement. When an abscess is suspected but not confirmed by CT scans, ultrasonography may confirm its presence, with its usual internal acoustic characteristics.³

Indications for surgery include unresponsiveness

to antibiotics, decreasing vision, presence of an orbital foreign body, orbital or subperiosteal abscess, and the need for diagnostic biopsy. Localisation by CT scanning best determines the surgical approach to be used. Often a combined ophthalmological-otolaryngological approach is required to establish drainage of both the sinus and the orbit. The drains are left in place until drainage stops, and intravenous antibiotics are continued for seven days thereafter.

Grave complications of orbital cellulitis, including blindness and death, still occur. Other serious complications, besides those occurring in our series, include cavernous sinus thrombosis, hypopituitarism, subdural empyema, cerebral abscess, and meningitis.^{4,5,18,25} However, aggressive, appropriate parenteral antibiotic therapy and judicious surgical intervention can considerably decrease the frequency of these serious complications.

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