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Bacillus cereus post-traumatic endophthalmitis: about a case

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Abstract:
Endophthalmitis resulting from non-surgical penetrating trauma to the eye is an increasingly infection in Morocco. The latest published studies have attributed the highest incidence of this infection to gram-positive organisms, in particular Staphylococcus epidermidis. Fungal causes have been much less frequently reported. Bacillus species are recognised as major causes of post-traumatic eye disease, with infection rates making them the second most frequently isolated organisms. Bacillus cereus, a particularly virulent pathogen, causes fulminant endophthalmitis characterised by rapid destruction of intravitreal contents and poor visual performance. Certain toxins produced by the organism can contribute to its particular virulence. The currently recommended approach to suspected post-traumatic infection involves the emergency use of diagnostic vitrectomy and intraocular culture, the use of intravitreal antibiotics and combined treatment with systemic and local antibiotics.

Key Word*: Bacillus cereus, Post-traumatic, Endophthalmitis*

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I. Introduction

Post-traumatic endophthalmitis is a serious complication present in 2 to 7% of cases caused by an intraocular foreign body[1]. Recently published data have attributed the highest incidence of this infection to gram-positive bacteria, notably Bacillus, which represents the second most frequently encountered group of germs in culture after Staphylococcus epidermidis. Bacillus, in particular cereus, is a virulent and destructive pathogen, its toxins elaborated by itself cause an endophthalmitis characterized by a fast destruction of the intravitreous content and an alteration of visual acuity. The treatment of this condition is still not precisely determined and the evolution is often fulminant with a pejorative functional prognosis if treatment is delayed. The prevention of this complication remains an important issue in the management of this type of patient. Therefore an appropriate management with a wound suture is the clearly established recommendation. Other preventive procedures should be discussed [2].

We thought it would be interesting to present this case of post-traumatic Bacillus cereus endophthalmitis caused by an intraocular foreign body diagnosed in the bacteriology laboratory at Hassan II University Hospital in Fez, and to specify the bacteriological and therapeutic characteristics of this type of germ.

II. Case

A 51 years old woman consulted in the Ophthalmologic Emergency department with endophthalmitis complicating a corneal abscess in her right eye due to a plant spine, which caused eye pain, redness and decreased visual acuity, with chemosis, palpebral oedema and a hypopyon of 1/3 of the anterior chamber on clinical examination. Bacteriological samples (cornea + anterior chamber) should be taken with an intravitreal injection of Fortum + vancomycin.

These samples were sent to the bacteriology laboratory for direct examination and culture. Direct examination showed the presence of a significant cell reaction and gram-positive bacteria (GPC). After 24 hours incubation at 37°C on different culture media, the culture revealed the presence of greyish, large, rounded, flattened, and irregularly outlined colonies with extensive hemolysis on sheep blood agar **(Figure 1)**. Gram staining showed the presence of gram positive bacteria **(Figure 2)** which were identified using the Foenix automaton as Bacillus cereus sensitive to Imipenem, Ertapenem, Quinolones, Amikacin, Gentamicin, Trimethoprim - Sulfametoxazole, Spiramycin, Fucidic Acid, Erythromycin, Vancomycin and Teicoplanin according to CASFM recommendations **(Figure 3).**

The patient was treated by an antibiotic therapy made of Tobrex eye drops and Ciprofloxacin, both locally and systemically. The evolution was favorable and the patient improved clinically and was regained her visual acuity.

III. Discussion

Open eyeball trauma with an intraocular foreign body is the most common cause of Bacillus endophthalmitis[3].

In 1950, Smith proposed three groups of bacillus based on the shape of the endospore and the morphological changes they cause in the bacterial body. The first group is represented by a non-deforming oval endospore which Bacillus cereus is a part, the second by a deforming oval endospore, and the third by a deforming round endospore[4]. Bacillus Cereus is a gram-positive bacteria, mobile by peritrichous ciliature, growing on an ordinary culture media in 24 hours, aero-anaerobic, having a cytochrome oxidase, a lecithinase and a gelitinase, highly hemolytic and resistant to Penicillin G [4]. The virulence of this germ is attributed to its ability to produce numerous interacting exotoxins, which are responsible for inflammatory phenomena and cell destruction [4].

Bacillus cereus produces a broad spectrum of β lactamases making it resistant to most β lactams. Among the toxins that play an important role in the development of Bacillus Cereus endophthalmitis are phospholipase C which are able of destroying the phospholipic layer of membranes and histological lesions in different parts of the eye. These germ-induced lesions include inflammatory manifestations, uveitis, hypopyon, vitreous abscess, necrosis and retinal detachment. These lesions set in the first few hours, which is why it is important to treat rapidly, before the exotoxin is released [2, 5].

As far as the antibiogram is concerned, Bacillus Cereus is not very sensitive to Beta lactam antibiotics because it possesses a group II chromosomal beta-lactamase, which is responsible for the natural resistance to penicillin G and to amino and carboxypenicillins. Cephalosporins are not very active. Bacillus Cereus produces a carbapenemase which is a group III metalloprotease and is responsible for in vitro resistance to Imipenem and many other beta-lactam antibiotics. However, it is still sensitive to Erythromycin, Clindamycin, Chloramphenicol, Vancomycin, Aminosides, Cyclines and Sulfonamides. It is naturally resistant to colistin [6].

The treatment of this condition is based on treating any open globe trauma with early suturing of the wound within the first 24 hours. Systemic and intraviteal antibiotic therapy especially its therapeutic class, dosage and duration is controversial. Curative treatment is initially probabilistic and then adapted by microbiological results [7].

Some cases of Bacillus cereus endophthalmitis have been described in the literature, Barletta J.P. [8] reported in her study three cases of total recovery of vision after penetrating foreign body trauma leading to Bacillus cereus endophthalmitis. The course of action was to perform a vitrectomy combined with an intravitreal injection of Clindamycin and Gentamicin and the same combination of intravenous antibiotics in one case and only the intravitreal injection in the other two cases. This synergistic action of Clindamycin and Gentamicin was described in 1981 by O'Day [9].

Another experimental study carried out by Alfaro D.V. in dogs with Bacillus cereus endophthalmitis showed the efficacy of intravitreal injections of Vancomycin or Imipenem. The results of histopathological examinations were satisfactory with a decrease in inflammatory lesions and tissue necrosis compared to intravitreal injections with Ciprofloxacin. This study also demonstrated that intravitreal injection of Vancomycin and Imipinem will not be effective unless injected early [10]. The data in the literature do not converge on the antibiotics to be injected intravitreously, the two most frequently used combinations are Vancomycin and an Aminoside [11].

The use of fluorquinolones is recommended by some authors because it is a class of antibiotics with a broad spectrum of action with penetration into the eye. One study found that an oral dose of ciprofloxacin makes it possible to reach therapeutic doses for almost all bacteria generally implicated in post-traumatic endophthalmitis. For these reasons, the authors recommend starting with dual antibiotic therapy with the combination of vancomycin and fluoro-quinolone intravenously for 5 days, followed by an oral relay for one week. On the other hand, the use of vancomycin in IVT is particularly interesting to cover the risk of infection with Bacillus cereus, all of which are resistant to beta-lactam antibiotics by beta-lactamase. Vancomycin in combination with ceftazidime should be carried out at two different sites to prevent them from precipitating and becoming no longer active [12, 13].

All of the studies described in the literature highlighted essential and common factors to improve prognosis. The early diagnosis is essentially bacteriological with the removal of the foreign body, surgical management if interested, and intravitreal injection of antibiotics because systemic and topical antibiotic therapy does not penetrate in sufficient concentrations to control such an acute infection. Nevertheless, probabilistic local and systemic antibiotic therapy should be administered as early as possible before bacteriological results.

In a literature review of 6 studies including 91 studies of post-traumatic endophthalmitis, the enucleation rate for B cereus infection was 17, whereas in the case of Staphylococcus epidermidis no cases of enucleation were reported [12]. In the series reported by Foster, which included 83 cases of Bacillus post-traumatic endophthalmitis, 62 patients (75%) progressed to phthysis and most of the other cases had very poor final visual acuity [5].

In our single case study, the prognosis of our patient is favorable due to early bacteriological diagnosis, adequate management by intravitreal administration of Vancomycin and ciprofloxacin + aminoside synergy which allowed the patient to recover her visual acuity.

IV. Conclusion

Bacillus cereus remains a virulent and destructive germ of the intravitreous contents leading to a rapid deterioration of visual acuity. The currently recommended approach for a suspected post-traumatic infection with this germ involves suturing the wound and early use of local, intravitreal and general antibiotic therapy. It will then be adapted to the microbiological results of the samples taken at the beginning of the treatment without delaying it.

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Figure 1: Greyish, rounded, flattened, irregularly contoured colonies with extensive hemolysis on sheep blood agar after 24 hours incubation at 37°C.

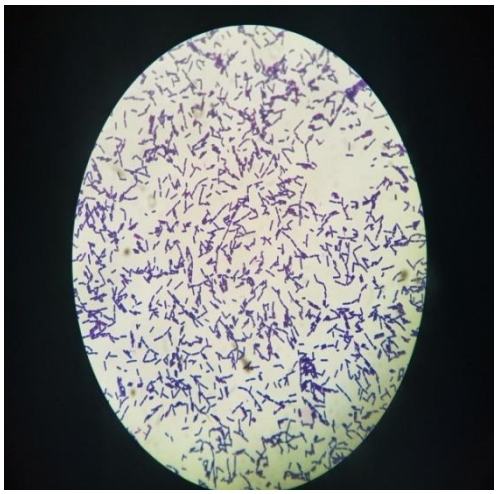

Figure 2: Gram stain showing the presence of gram-positive bacteria

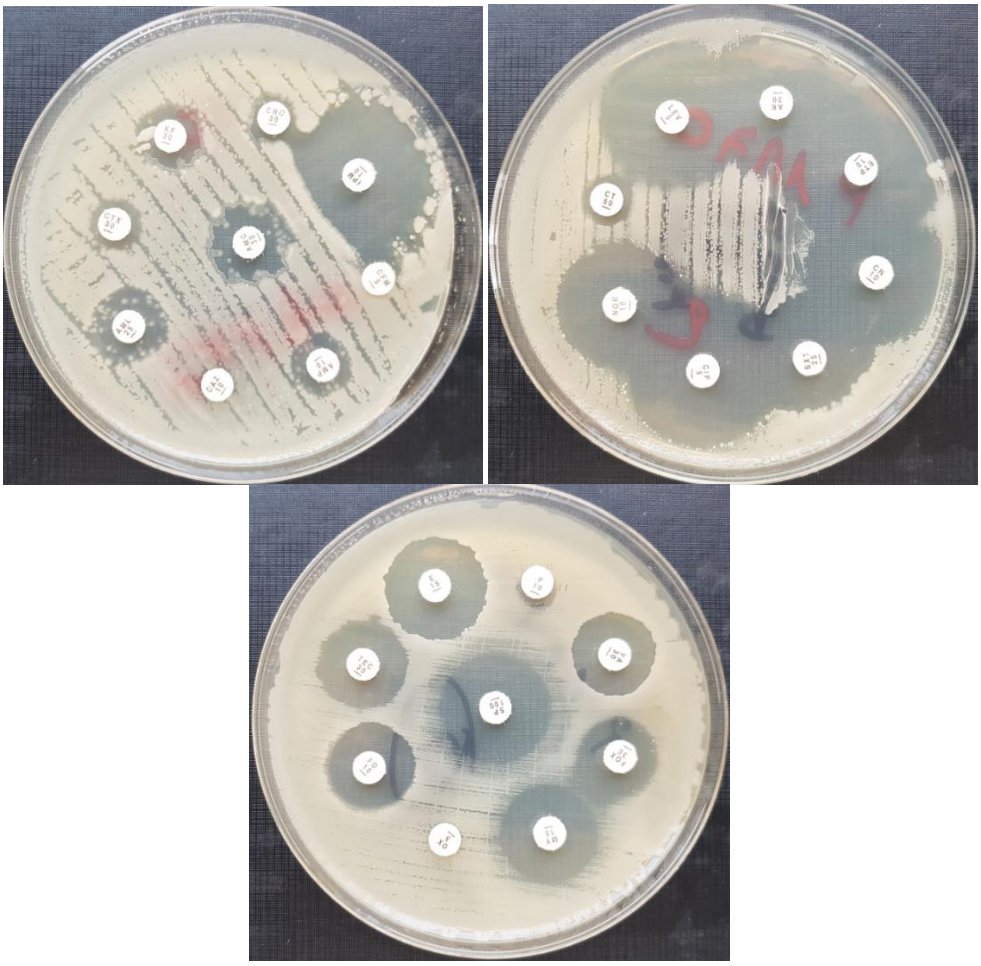

Figure 3: Antibiogram showing Bacillus Cereus resistance to beta-lactam antibiotics and colistin

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