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CASE REPORT

Eikenella corrodens from a brain abscess

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Abstract

A 2-year-old boy with underlying congenital cyanotic heart disease presented with seizures and fever and was found to have bilateral parietal cerebral abscesses. Drainage of the pus from the abscesses was done in stages; on the day of admission, four days after admission and 3 weeks after admission. Although the pus from the first drainage did not grow any organisms, the pus from the second drainage on the fourth day of admission yielded a mixed growth of *Eikenella corrodens* and *Streptococcus milleri.* Following the second drainage of pus, the child was noted to have mild weakness (grade 3/5) and increased tone in the left upper limb. Three weeks after admission, due to recurring fever, further neurological signs and findings of an enlarging right cerebral abscess on a repeat CT scan, a third drainage was carried out. However no growth was obtained from this specimen. This patient was managed both surgically and with appropriate antibiotics. Over the next four months, serial CT scans revealed gradual resolution of the abscesses with disappearance of the surrounding oedema. The child showed gradual recovery of his left sided weakness with resolution of tone and reflexes to normal.

Key words: *Eikenella corrodens*; brain abscess

INTRODUCTION

Eikenella corrodens, a Gram negative bacillus which is part of the normal oral and upper respiratory tract flora of man, is also found as normal oral flora of dogs.[1,2] The University Malaya Medical Centre (UMMC) has had no documented reports of *Eikenella corrodens* infections prior to this. A medline search for reports on Eikenella corrodens infection in Malaysia revealed one report of a case of brain abscess due to this organism from the National University of Malaysia.[3] Although previously believed to be non-pathogenic, *Eikenella* spp. has been shown to cause serious human infections, and is associated with dental and periodontal infections, ocular infections, head and neck infections (including cerebral abscess) and pleuropulmonary infections. An extensive review by Paul and Patel[4] has also shown that depending on the site of infection, the treatment of choice of *Eikenella corrodens* infections is a combination of surgery and antibiotics. Generally, broad spectrum antibiotics used in empirical therapy of brain abscess such as ceftriaxone would be effective against this organism. However antibiotics that are typically effective against oropharyngeal flora, such as clindamycin and metronidazole, are ineffective against *Eikenella* spp.[2] Hence identification of *Eikenella corrodens* from a specimen of pus is important, due to the antibiotic susceptibility pattern of the organism.

We report here the first documented case of *Eikenella corrodens* infection at our hospital. A 2-year-old boy with underlying congenital cyanotic heart disease presented with bilateral brain abscesses. This organism was isolated from a mixed culture of pus drained from both abscesses.

CASE REPORT

A two-year-old boy with underlying congenital cyanotic heart disease (congenitally corrected transposition of the great arteries, ventricular septal defect, severe pulmonary stenosis and patent ductus arteriosus) was admitted to the University of Malaya Medical Centre (UMMC) with fever and multiple seizures. The child had initially been admitted to a hospital near his

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home with fever and constipation followed by generalized tonic clonic seizures lasting 15 minutes. He was treated symptomatically and sent home after three days, only to be readmitted six days later with loose stools and complex partial seizures involving the right upper limb. He was intubated, loaded with anticonvulsants and transferred to the UMMC.

At the UMMC, examination revealed the child to be cyanosed with clubbing of the digits. The apex beat was on the right and there was a grade 2/6 ejection systolic murmur at the right sternal edge. His pupils were pin-point and there was hypertonia and hyperreflexia of both lower limbs with a positive Babinski sign bilaterally.

An urgent CT scan of the brain revealed bilateral ring enhancing lesions of different sizes in the parietal lobes suggestive of cerebral abscesses, with surrounding oedema and mass effect. There were no intracardiac vegetations seen on echocardiography. Drainage of the abscesses was performed in stages. On the day of admission, the right parietal abscess was drained via a burr-hole and empirical therapy with intravenous ceftriaxone, gentamicin and metronidazole was started. Two days later, intravenous cloxacillin was added and a repeat CT scan showed a reduction in the size of both abscesses. On day seven of admission drainage of both the abscesses was performed and 7mls of pus was aspirated from each side. Following this the child was noted to be more alert and was extubated the next day. Clinical examination revealed mild weakness (grade 3/5) and increased tone in the left upper limb although all reflexes were normal.

The patient was subsequently afebrile but a week later the temperature recurred with spikes of more than 39ºC. This was initially attributed to pharyngitis. However he subsequently developed brisk left upper limb reflexes and loss of ability to grip with his left hand. The child was also noted to have brisk lower limb reflexes and difficulty walking steadily. A repeat CT scan revealed that the right abscess had increased in size with perifocal oedema, mass effect and midline shift which were not present previously. A burr hole drainage of the right parietal abscess was performed three days later following which the temperature settled. Subsequently, the child showed gradual recovery of his left sided weakness with resolution of tone and reflexes to normal.

Since then the child has remained well apart from intermittent episodes of self-limiting viral upper respiratory tract infections. Serial CT scan over the next four months showed gradual resolution of the abscesses with disappearance of the surrounding oedema. In summary, this child received 58 days of ceftriaxone, 47 days of intravenous penicillin, followed by six weeks of oral penicillin and short courses (about eight days from the day of admission) of metronidazole, gentamicin and cloxacillin until culture results were known.

Microbiology

The initial pus drained from the right abscess on the day of admission did not reveal any organism on gram stain and also had no growth after 48 hours in $C0_2$ and anaerobic incubation. However, the second pair of specimens of pus from the right and left brain abscesses taken four days after admission yielded a mixed growth of *Streptococcus milleri* and *Eikenella corrodens*. All blood cultures drawn from this patient were negative. The *Streptococcus milleri* grew on blood agar and chocolate agar, was alpha hemolytic and was identified by the API 20 STREP (BIO Mérieux SA). The second organism, which was later confirmed as *Eikenella corrodens* was oxidase positive and grew on blood agar and chocolate agar with $C0_2$ but not on Mac Conkey agar. The colonies were not noticed initially, and only the streptococci were visible after 24 hours of incubation. However, after the streptococcus was identified the primary culture plates were re-examined at 96 hours as brain abscesses are known to have mixed cultures. The second organism was then noticed. The pus had been also put into thioglycollate broth and when subcultured out, the gram negative rods also grew from this enrichment culture. Colonies were small and some of them appeared to be pitted. According to the literature[1], about 50% of isolates of *Eikenella corrodens* may 'pit' the agar as they grow with both pitting and non-pitting variants observed in the same culture. They may later develop a spreading edge, and the corroding appearance is said to be due to the twitching motility of the bacilli which causes them to disturb and embed themselves in the surface of the agar.[5] This unusual 'jerking' or 'twitching' motility is dependent on its possession of contractile, fimbria-like filamentous appendages. It lacks flagella and does not have swimming-type motility.[5] The culture had an odor suggestive of sodium hypochlorite (Chlorox bleach), and this is reportedly a feature of the organism.[4] On Gram stain they appeared as regular, slender

Gram negative bacilli or coccobacilli with rounded ends. We tested the organism for factor X (haemin) and factor V (nicotinamide adenine dinucleotide) dependency, and found that when grown on nutrient agar, it grew around factor X and also factor X+V but not around factor V. In order to exclude a *Haemophilus* species, the API 20NH (bioMérieux) test was carried out, but failed to identify the organism. However the API 20NE (bioMérieux) system identified the organism as *Pasteurella* species 47.9% (low discrimination), with the comment 'possibility of *Eikenella corrodens'*. At this point, the case for the organism being *Eikenella corrodens* was convincing based on its growth characteristics, pitting behaviour, oxidase positive, catalase negative property, and characteristic smell. Other features also seemed to fit the identification of the organism described in the Color Atlas and Textbook of Diagnostic Microbiology, 5th Edition.[1] For example, *Eikenella corrodens* is also known to grow around factor X but not factor V (haemin is necessary for aerobic growth), reduce nitrate, not produce acid from carbohydrates and give negative urease and indol reactions, all of which this organism fulfilled. Having had no previous experience with this organism, the culture was sent to the Gribbles Laboratory in Australia for confirmation. The report came back a month later as *Eikenella corrodens*. Although there are no NCCLS approved zone diameters for disk susceptibility testing, we applied general zone sizes as for non fermentors, by which the isolate was found to be sensitive to ceftriaxone. The isolate was also susceptible to penicillin based on zone sizes for streptococci.

DISCUSSION

This is the first reported case in UMMC of a brain abscess involving *Eikenella corrodens.* In a previous study by Puthucheary and Parasakthi[6] of brain abscesses over 10 years at our hospital, no isolates of *E. corrodens* were encountered although the organism has well been described in the literature as an aetiological agent in brain abscesses. In this study, 30 patients had positive cultures of which 16 were pure cultures and 14 had mixed growth, *S. milleri* being the commonest organism isolated. In another study from the National University of Malaysia[3] on the microbiology of cerebral abscesses in 75 patients over a four-year study period pure cultures were reported in 66.7% while 13.3% had sterile cultures. In this series, *Eikenella corrodens* was found in a pure culture from one patient with underlying cyanotic congenital heart disease.

Our patient had underlying cyanotic congenital heart disease and although the primary cultures were sterile, those taken at the second operation on day three of admission to our hospital grew *Eikenella corrodens* and *Streptococcus milleri*. Reports have stressed on the importance of minimum delay between collection, transport and processing of pus samples.[6,7.] A delay in this process could have affected the results of the initial cultures from this patient. As the colonies take about 48 hours to grow, it is possible that the organism may have been present in specimens in the past, but was overgrown by other less fastidious organisms.

Bacteremia and endocarditis due to this organism have also been reported, mainly in immunocompromised hosts, intravenous drug abusers or individuals with previous valvular damage and recent extensive dental work, as well as in prosthetic valve endocarditis. When saliva is used to lubricate needles for injection of drugs (skin popping), cutaneous and subcutaneous abscesses may result.[1] The organism has also been implicated, along with other obligately anaerobic species (*Actinomyces* and *Arachnia*) in the pathogenesis of chronic diffuse sclerosing osteomyelitis, a mixed infection of the mandible which occurs primarily in young women. In a review of *Eikenella corrodens* infections in children and adolescents, Paul and Patel[4] found that the organism could be a serious pediatric pathogen especially when there is exposure to human oral secretions. The most frequent sites of *E. corrodens* infections were the head and neck (40.7%), and only six patients (11%) had CNS infections (cerebral abscess, cavernous sinus thrombosis, epidural abscess, subdural empyema). The majority (63.8%) of cases for which microbiological data were known were polymicrobial infections, with 50% of the cultures containing streptococci. The authors suggested there might be synergy in the pathogenicity of *Eikenella spp*. and streptococci.[4]

Most strains of *E. corrodens* are known to be sensitive to ampicillin, ticarcillin, carbenicillin, tetracycline and chloramphenicol and resistant to the penicillinase resistant penicillins - methicillin, dicloxacillin, nafcillin. They are also known to be resistant to clindamycin, lincomycin, vancomycin, erythromycin, metronidazole, and the aminoglycosides.[1] Penicillin susceptibility however may vary from strain to strain and

sensitivity to the first generation cephalosporins is unreliable.[1] The organism is reportedly susceptible to cefoxitin, cefuroxime, ceftriaxone, ciprofloxacin and to the carbapenems.[1] Although rare, beta lactamase producing strains of *E. corrodens* have been reported; the beta-lactamase demonstrates little activity against cephalosporins and is reportedly strongly inhibited by clavulanic and sulbactam.[1] Goldstein and Citron[8] reported that the mechanism of resistance to many cephalosporins remains undetermined. They recommend that the susceptibility pattern of *E. corrodens* should be considered in choosing empirical therapy because of variable susceptibility of some strains especially to the first generation cephalosporins and that susceptibility testing of isolates should be performed whenever a cephalosporin is to be used.[8] However the NCCLS does not provide specific interpretative criteria for testing of *Eikenella* species.

In conclusion, *Eikenella corrodens* should be looked for in specimens of pus especially when exposure to oral flora is likely, keeping in mind that the organism takes about 48 hours to grow, and may be missed if culture plates are not examined at 48 hours. The identification of this organism is especially important in the treatment of oral infections, as the usual antibiotics used such as metronidazole and clindamycin would not be effective if this organism were present.

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