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Total Hip Arthroplasty Infection Due to Abiotrophia Defectiva

Research Article

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Abstract

Background: Abiotrophia defectiva is a fastidious gram positive nutritionally variant streptococcus (NVS) and rarely implicated as the causative agent of prosthetic joint infections (PJI). Accurate and quick identification of this organism is important because of its aggressive nature and propensity to cause serious infections. We presented a second case of an infected total hip arthroplasty (THA) with Abiotrophia defectiva.

Case presentation: A 61-year-old Dutch man presented with slowly increasing pain in the right hip ten years after implantation of a hip prosthesis. Debridement of the right hip was performed. The cultures they took shows Abiotrophia defectiva and Staphylococcus epidermidis. Abiotrophia defectiva is rarely seen in orthopedic infections. The patient was treated for three months with clindamycin and a two-stage replacement of the hip prosthesis was performed.

Conclusion: The second case of a patient with an infected total hip arthroplasty (THA) with Abiotrophia defectiva is presented. Two stage revision arthroplasty was successful in treating this infection.

Keywords: Prosthetic joint infection (PJI); Abiotrophia defectiva; Total hip arthrosplasty (THA).

Background

Abiotrophia defectiva is a strain of nutritionally variant streptococc (NVS) which are gram-positive bacteria that need a l-cystein or pyridoxal (vitamin B6) containing medium to support growth [1,2]. This organism can be divided into two types: *Abiotrophia* (*A. defectiva*) and *Granulicatella* (*G. adiacens, G. elegans* and *G. balaenopterae*.

Frenkel and Hirsch were the first who discovered NVS as causative organism in endocarditis and otitis media[2]. NVS take part of the natural human flora in the oropharynx, gastro-intestinal tract and genitourinary system [1]. NVS were found in cases with bacteremia and represent an estimated 4 to 8% of all cases of endocarditis due to viridant group streptococcus-like organisms [3].

Abiotrophia defectiva is a very slow growing bacterium with special nutrition requirements and challenging phenotype testing; hence difficult to identify [4]. However accurate and quick identification of organism is important because of its aggressive nature and propensity to cause serious infections including abscesses, wound infections and meningitis [1]. Isolation of *A. defectiva* is difficult requiring the addition of l-cysteine or pyridoxal to the culture medium. Diagnosis is often aided by 16s rRNA gene sequencing [5]. This method is an expeditious alternative to traditional methods of culture plating affording accurate identification of many bacteria.

Abiotrophia defectiva is rarely implicated as the causative agent of prosthetic joint infections [6]. We describe the second case of an infected total hip arthroplasty (THA) with *Abiotrophia defectiva*.

The patient was informed that data concerning the case would be submitted for publication, and he provided consent.

Case presentation

We present the case of a 61-year old Dutch male patient with progressive pain in the right hip and leg eight years after a initially uncomplicated metal-on-metal THA. No abnormalities were seen on radiography and CT-scan. Two consecutive aspirations of the right hip remained culture negative. Serum metal ions were not elevated.

After six months the patient returned with increasing pain at the right hip and malaise. Laboratory results showed an increased C-reactive protein (CRP 58 mg/L). An open biopsy of the right

hip led to suspicion of an adverse reaction to metal debris was suspected, because a pseudotumor (white, caseous necrosis) was found. This pseudotumor, was debrided (without exchange of modular implant parts). The decision was made to perform a one-stage revision of the THA.

In the three weeks awaiting the revision, the patient developed swelling of the scar on the right hip. At admission the patient was ill with chills and fever. There was a large amount of pus coming from the wound. Despite this clinical presentation, the infection values were low (CRP 8 mg/L, leukocyte count 12.1x 10^9/L). Surgical debridement of the hip was performed and six tissue cultures were taken. In anticipation of the results 1 gram of cefazolin i.v three times daily was administrated.

Despite the antibiotics the temperature of the patient peaked up to 40 degrees Celcius. The CRP level increased (CRP 301 mg/L) and the patient felt ill. There was no leukocytosis. In the following days a fiery redness arose around the scar of the right hip and the hip was more painful and warm. The tissue cultures showed no growth so far. Four days after the first debridement a second debridement followed for load reduction. Again, a large amount of pus relieved during surgery and cultures were taken. Due to clinical deterioration and an unclear bacterial causative agent, antibiotics were switched to 4g/500 mg piperacillin-tazobactam i.v. three times daily.

Five days after the first debridement an *Abiotrophia defectiva* grew in the first tissue cultures. Blood cultures remained negative. The antibiogram showed that *Abiotrophia defectiva* was sensitive for ciprofloxacin and rifampicin, but not for the antibiotics that were given previously. As a result antibiotics were switched into ciprofloxacin 1000 mg and rifampicin 900 mg orally divided into two doses daily. A few days later also a *Staphylococcus epidermidis* grew in the tissue cultures. These bacteria were sensitive for the current antibiotics. With this therapeutic regime the patient's temperature normalized and infection parameters decreased (CRP 98 mg/L, leukocyte count 8.4 x 10^9/L). The redness of the wound improved strongly and the pain decreased substantially.

In consultation with the patient, a two-stage revision of the THA was planned. While waiting for the surgery to be performed, the patient was resigned home in the intervening time. Due to possible antibiotic-resistance, rifampicin was stopped. The tissue cultures of the second debridement also showed an *Abiotrophia defectiva*, but this time it appeared to be sensitive for clindamycin. The decision was made to switch ciprofloxacin into clindamycin 1800 mg orally taken divided into three doses a day.

After three weeks the first stage of the two stage revision arthroplasty was performed. A vancomycin-gentamicin loaded spacer was placed. Tissue cultures were taken again, resulting in growth of *Staphylococcus epidermidis* (1 out of 6) and *Acinetobacter species* (2 out of 6). Six weeks later the reimplantation of the new hip prosthesis took place. In total, patient received daily ciprofloxacin 1000mg divided into two doses for six weeks (until two weeks after implantation) and clindamycin 1800 mg divided into three doses, for seventeen weeks (until six weeks after reimplantation). Tissue cultures taken during reimplantation remained negative and signs and symptoms of infection did not return after removal of the total hip prosthesis. The patient remained stable throughout the hospitalization and was discharged five days after reimplantation. A two years follow up, no signs of reinfection were present.

Discussion and conclusion

Abiotrophia defectiva is a fastidious gram positive nutritionally variant streptococcus (NVS) and take part of the human normal flora in the oropharynx, gastro-intestinal tract and genitourinary system [1]. Systemic infections with *Abiotrophia defectiva* can result in bacteremia and endovascular pathology. It represents an estimated 4 to 8% of all cases of endocarditis due to NVS [3]. Accurate and quick identification of this organism is important because of its aggressive nature and because endocarditis caused by NVS carries greater morbidity and mortality than endocarditis caused by other streptococci [1].

Infections with *Abiotrophia defectiva* are rare, often associated with a concomitant dental procedure or endovascular infection [7]. This infection has only been reported three times for prosthetic joint infections. Knowing that an infection with *Abiotrophia defectiva* is associated with endocarditis, we wonder whether we should have investigated the patient on endocarditis despite the patient had no signs and symptoms of this. In addition, we didn't know whether the patient had undergone dental surgery in advance.

Gephart and Washington [8] found rifampicin to be the most active antibiotic they tested for NVS, and Stein and Libertin [9]

Table 1. Antibiogram from *Abiotrophia defectiva (1)* and *staphylococcus epidermidis (2)* strains taken at first debridement THA.

S= sensitive, I= intermediate, R= Resistant, X= not tested

Antibiotic	Susceptibility	Susceptibility
Amoxicillin/ clavulanic	X	S
Acid	X	R
Azithromycin	X	S
Cefazolin	X	S
Cefotaxime	X	S
Ceftriaxone	X	S
Cefuroxime	S	S
Ciprofloxacin	X	R
Clarithromycin	X	S
Clindamycin	R	S
Cotrimoxazole	X	S
Doxycycline	X	R
Erythromycin	X	S
Flucloxacillin	X	S
Fusidic acid	X	S
Gentamicin	X	S
Linezolid	S	S
Rifampicin	X	S
Teicoplanin	X	S
Tobramycin	X	S
Vancomycin	X	S

provided evidence for vancomycin-rifampicin synergy against NVS in time-kill studies. After removal of the total hip prosthesis, a vancomycin/gentamicin loaded-spacer was chosen in present. The patient was treated with clindamycin up to six weeks after reimplantation. Studies have shown that the most common NVS strains are susceptible to clindamycin, vancomycin, erythromycin and chloramphenicol [8-12]. So, the chosen antibiotic regime can be considered adequate in present case.

Table 2. Antibiogram from *Abiotrophia defectiva* (1) strains taken at second debridement THA

S= sensitive, I= intermediate, R= Resistant

Antibiotic	Susceptibility
Clindamycin	S
Ciprofloxacin	S
Rifampicin	S

Susceptibility of *Abiotrophia defectiva* in present case was only tested for ciprofloxacin, rifampicin and clindamycin. During the first debridement of the THA, the cultures with *Abiotrophia defectiva* were resistant to clindamycin (Table 1). However, during the second debridement, the cultures with *Abiotrophia defectiva* were surprisingly sensitive to clindamycin (Table 2). Therefore, the patient was initially treated with ciprofloxacin and after the second debridement of the THA with clindamycin. The question is whether in this case clindamycin has been the right choice since the *Abiotrophia defectiva* would be resistant to clindamycin. But because the patient was no longer ill and the infection values decreased on this antibiotic regime, we can conclude that treatment with clindamycin has been successful.

In present case *Abiotrhopia defectiva* was identified by culture (of six tissue samples). Newer techniques, such as 16S rRNA gene sequencing have recently been utilized in diagnosing infection with this fastidious microorganism, often misidentified using traditional identification methods. Only after five days *Abiotrophia defectiva* growth became visible in the tissue cultures. Possibly, an earlier identification by 16S rRNA technique, could have introduced the correct treatment earlier and faster.

In conclusion, PJI caused bij *Abiotrophia defectiva* is rare, but because of its aggressive nature it is important to identify this organism accurately and in a timely manner. A two stage revision arthroplasty resulted in a good clinical outcome.

List of abbreviations

NVS; nutritionally variant streptococcus

THA; total hip arthroplasty

PJI; prosthetic joint infection

CT; computed tomography

CRP; c-reactive protein

Mg; milligram

i.v; intravenous

Declarations

Ethics approval and consent to participate

The patients consent was obtained for publication of this case report.

Consent for publication

Written consent to publish this information was obtained from study participant.

Availability of data and materials

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

MS is major contributor in writing the manuscript. MN and DT drafted and critically reviewed the manuscript. MN performed the clinical follow-up of the patient. All authors read and approved the final manuscript.

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