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Case report

Pasteurella multocida in total knee prosthetic joint infection caused by cat scratches and bites in a liver transplant recipient

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ABSTRACT

Pasteurella multocida is a small facultative anaerobic Gram-negative coccobacillus. Bites or scratches from cats or dogs are common transmission route causing zoonotic infections in humans. The pathogen rarely cause prosthetic joint infection. We report the first case, to our knowledge, of a prosthetic joint infection in a patient underwent liver transplantation caused by this pathogen. Pasteurella multocida is a high pace growing pathogen. Physician should raise awareness with related history especially in patients with immunosuppressive status. Management with the proper antibiotics administration in conjunction with timely surgical intervention could prevent devastating complications and preserve the artificial joint.

Introduction

Pasteurella multocida (P. multocida) is an extremely rare cause of prosthetic joint infection. P. multocida can be found in the nasopharynx or gastrointestinal tract in wild animals, cats or dogs. Dog or cat bites or scratches distal to the affected joint causing direct tissue inoculation and contiguous dissemination result in prosthetic joint infection(PJI) [1]. PJI is a devastating complication following total joint replacement [2]. Solid organ transplantation (SOT) recipients are more vulnerable to infection due to the immunocompromised status. We represent a case with a history of liver transplantation suffered from P. multocida total knee prosthetic joint infection due to cat scratches and bites.

Case report

A 52-year-old male presented with pain, swelling and erythema of the right knee, calf and ankle region. He had a history of liver transplantation 6 years ago due to HBV liver cirrhosis and was under Mycophenolate mofetil and tacrolimus at the time of present. Right total knee replacement for osteoarthritis was done 6 months ago in our department with an uneventful postoperative course. He had gouty arthritis controlled under colchicine. He recalled a cat attack about 2 weeks ago. He went to a local clinic on the day of the cat bite. Local wound care, cephalexin for three days, vaccination of tetanus and analgesics agents were given. There are obviously healed scratching wounds and biting marks at the right ankle upon arrival (Fig. 1).

Symptoms initially occurred at the wound site and gradually upward migration was noticed. He had restricted range of motion of the knee due to pain. Soreness and numbness were also reported. He had mild general malaise but there was no fever or chillness, no tachycardia and he was normotensive. Upon examination, there is swelling, warmth and red streaks extending from ankle, calf to knee. Attempted passive range of motion of the right knee elicited pain. There was tense joint effusion. Arthrocentesis was done in aseptic fashion and yellowish, cloudy fluid aspiration about 20 ml was aspirated. Laboratory investigation revealed no leukocytosis(5.97 ×10^3/μL) with normal neutrophils (55.9%), elevated ESR (73 mm/hr) and CRP(3.31 mg/dL). Uric acid is in normal range(7.5 mg/dL). Radiography of the right knee showed optimal position and no lucency around the implant. The joint aspirate revealed elevated white blood cell count(47,560/cmm) and neutrophilia (99%). Culture later revealed Pasteurella multocida growth (Fig. 2).

Blood culture was negative. We commenced antibiotics with ampicillin/sulbactum. Immunosuppressive agents were discontinued on day 4 of antibiotics used. The total antibiotics course was 4 weeks. During admission, a fever episode was noticed with BT 37.9′C on day 3, two blood culture samples were obtained which showed no bacteria growth. There was significant clinical improvement in the appearance and range of motion of the knee. Serial blood test revealed a decreasing CRP (2.02 mg/dL upon 2 weeks of antibiotics treatment). He was discharged on oral antibiotics and reported pain free and full range of motion identical to pre-infective level, immunosuppressant agents were resumed. Regular clinical follow-up was arranged for lab check and

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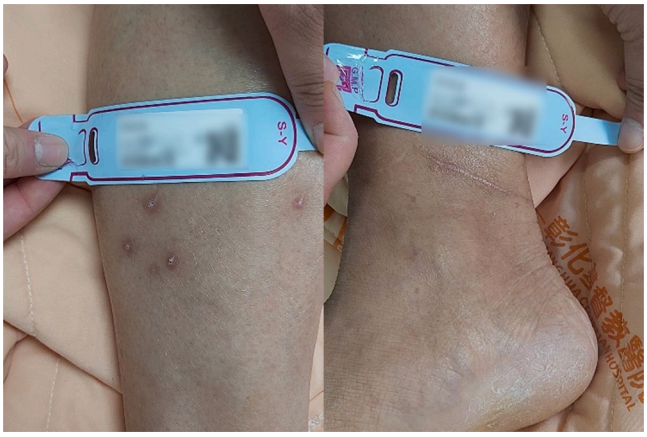

Fig. 1. Photograph showing healed scratching wounds and biting mouse at right lower limb.

Fig. 2. Pasteurella multocida growth on culture medium.

spare recurrent infection convincement. He was asymptomatic with normal white count and inflammatory factors. He is currently under regular follow up.

Discussion

Solid organ transplantation (SOT) recipients under immunosuppressive drugs are at higher risk of PJI [3,4]. Similar to the general populations, common pathogens are staphylococci and streptococci [2]. However, rare organisms can occur especially in those immunocompromised groups, previously reported agent include Mycobacterium avium complex and Anaerobiospirillum. P. multocida is a small facultative anaerobic Gram-negative coccobacillus. It is part of the normal flora of respiratory tracts and gastrointestinal tracts in animals. Particularly high carriage rate was shown in domestic cats and dogs which humans contact frequently. Cats scratch, cats bite and dog bite cause direct inoculation of the pathogen. Though dog bite occur more frequently, cat bites have a higher P. multocida infection rate, probably due to higher colonized rate [1].

Dog bites account for 85–90% and cat bites account for 5–10% of all animal bites [5]. While Pasteurella species are the most common isolates, Streptococci, Staphylococci, Moraxella, Neisseria and anaerobic bacteria are also common pathogens associated with dogs and cats bites [6]. P. multocida is a major pathogen from animal bites. It is a high pace growing infection. Symptoms could manifest within 12–24 h. Most literatures defer routine use of antibiotics with animal bites [7]. Prophylactic antibiotics showed benefit in high-risk wounds such as hand bite, cat bite, underlying lymphatic/venous drainage compromise, puncture wound, wound treated closed, deep joint/periosteum penetrating wound and bite near to prosthetic joint. Host factors such as immunocompromised status, asplenic, advanced liver disease also warrant prophylactic antibiotics. Amoxicillin/Clavulante(Augmentin) or 2nd generation cephalosporin is considered the agent of choice [8–11].

P. multocida zoonotic transmission causes localized wound infection, cellulitis. Local complications include tenosynovitis and abscess formation. Direct spread or indirect dissemination forms more severe conditions such as osteomyelitis, septic arthritis and septic bacteremia [1]. P. multocida septic joint infection seems to have a predilection involvement in degenerative, rheumatic and prosthetic joints. P. multocida prosthetic joint infection is quite rare, representing only 0.1% of all prosthetic joint infection [12]. Symptoms include classic signs of septic arthritis include pain, heat, erythema and swelling of the affected joint, systemic manifestation such as fever or general malaise. Ipsilateral injury could usually be found distal or on the joint causing direct inoculation or spread possibility through lymphangitis [4]. It is important to recognize the pathogen as standard treatment for prosthetic joint infection such as vancomycin is not appropriate for this species and antibiotics selection is a crucial part of management.

Prosthetic joint infection bears high comorbidity, medical expenditure and pose great mental stress on patients and physicians. Standard prosthetic joint infection treatment include: 1. Sole antibiotics treatment 2. Antibiotics with repeated arthrocentesis or arthroscopic washout 3. Open lavage, debridement and liner exchange. 4. Two-stage prosthetic joint replacement surgery with fixed or mobile antibiotics spacer. Biofilm formation is a key pathogenesis of PJI. Though there is evidence that P. multocida can produce biofilm in vitro [13], the biofilm formation capability of P. multocida in vivo is still questioned. Of the 33 P. multocida PJI cases found in the literature, about half (16) of the cases underwent Two-stage joint revision treatment. However, it is assumed that P. multocida PJI can mostly be treated with fixed implant retention if timely intervention is given [12,14]. Resistance to P. multocida isolate is rarely reported. They are susceptible to penicillin, amoxicillin, amoxicillin/clavulanic acid, fluroquinolones, co-trimoxazole [15,16]. Treatment strategy for PJI P. multocida has not been established. Guideline suggests 4–6 weeks of pathogen-specific intravenous antibiotics following chronic oral antimicrobial suppression in non-staphylococcus PJI [17]. Previous reports had successfully treated P.multocida PJI with third generation cephalosporin, beta-lactam/beta-lactamase inhibitor or fluroquinolone in addition to surgical intervention in the mainstream. Some authors adopted dual antibiotics treatment strategy including penicillin-based antibiotics with fluroquinolone or doxycycline though superiority over single antibiotics is not proved. Open debridement, joint lavage and replacement of the insert is the majority in respective to surgery [4,12,18]. In our case, patient reported rapid relief of symptoms after arthrocentesis and antibiotics administration. Serial blood test and clinical status improves gradually. So surgical intervention was not necessary.

Few literatures were reported for PJI in transplantation recipients. In a retrospective case control study, 12 PJI cases were found in a 367-patient group with both SOT and prosthetic joint surgery. All patients were receiving maintenance immunosuppressive regimens. Most of the pathogenic organisms are staphylococcus and streptococcus. Two of them are mycobacterium species [19]. The most common non-steroid immunosuppressant utilized in SOT recipients are cyclosporine, tacrolimus and sirolimus which inhibit T-Cell activation. Serum level of the drug is monitored in order to prevent toxic level and prevent rejection. It

is an issue whether benefit of temporary withdrawal of immunosuppression to restore immunity outweighs the risk of graft rejection. However, few studies deal with adjustment recommendation of immunosuppressant during active infections and guidelines are lacking. Decisions are usually based on clinical experience [20]. In acute PJI, several condition may worth consideration of cessations of immunosuppressant. 1. Opportunistic infections requiring immune response for clearance (e.g., Tuberculosis, NTM, fungal invasive infection) 2. Life threatening infection (septic arthritis leading to sepsis). In most common bacterial and fungal infection susceptible to antibiotics treatment, reduction of immunosuppression may be unnecessary. However, therapy may be prolonged in SOT.

To our knowledge, this is the first case report of P.multocida PJI in SOT recipients. The immunosuppressive status and overwhelming result of PJI may warrant both physicians and patient to be alert on patients who were attacked by cats and dogs. In our case, though antibiotics with cephalexin which showed susceptibility to the P. multocida isolated was given at the date of bite, pathogen dissemination with PJI still presented, probably due to limited bactericidal capability and short duration of administration. We recommend antibiotics administration with Amoxicillin/clavulanic acid every 12 h and rapid follow-up until infection signs subsided in immunocompromised or prosthetic joints patients encountered with cats and dogs bite. These may impede spread of the pathogenic pathogens. If P.multocida PJI is diagnosed. Prompt intravenous antibiotics administration is necessary. Timely surgical treatment with arthroscopic washout or debridement and implant retention may avoid prolong and suffering two-stage revision arthroplasty.

To our knowledge, this is the first reported case of total joint infection caused by P. multocida in a SOT recipient. Increased awareness in patient and physician is warranted if cats or dogs bites occur in patients with prosthetic joint especially in SOT recipients. Amoxicillin/clavulanic acid is the treatment of choice to avoid devastating complications. P. multocida PJI could happen under this circumstances and timely intravenous antibiotics and surgical management is necessary.

Author contribution

Chiu-Yu Shih: Study design, Data collection, Data analysis, Data interpretation, Manuscript writing. **Hsin-Yao Chen:** Figures, Manuscript revising.

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Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images.

Declaration of Competing Interest

No conflicts of Interest.

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