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Case of Periprosthetic Joint Infection Associated with *Streptococcus dysgalactiae* subsp. *dysgalactiae*

Streptococcus dysgalactiae subsp. *dysgalactiae* ile İlişkili Periprostetik Eklem Enfeksiyonu Olgusu

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Abstract

Periprosthetic joint infection (PJI) is a serious complication following joint prosthesis implantation. Although *Streptococcus dysgalactiae* subsp. *equisimilis* is increasingly recognized as an emerging human pathogen, *Streptococcus dysgalactiae* subsp. *dysgalactiae* (SDSD) is traditionally considered an animal-associated organism. However, recent reports indicate that SDSD can infrequently cause invasive human infections. SDSD has been linked to PJIs, endocarditis, and cellulitis of the upper and lower extremities. To date, only two cases of SDSD-related PJI have been described in the literature. Here, we present a rare case of late-onset PJI caused by SDSD following knee arthroplasty.

Keywords: Periprosthetic joint infection, *Streptococcus dysgalactiae* subsp. *dysgalactiae*, streptococcal infection

Öz

Periprostetik eklem enfeksiyonu (PJI), eklem protezinin implante edilmesi sonrası ciddi bir komplikasyondur. *Streptococcus dysgalactiae* subsp. *equisimilis*, giderek daha fazla önemli bir insan patojeni olarak tanınırken, *Streptococcus dysgalactiae* subsp. *dysgalactiae* (SDSD) genellikle bir hayvan patojeni olarak kabul edilmektedir. Son yıllarda, SDSD'nin nadiren insanlarda enfeksiyonlara neden olabileceği bildirilmiştir. SDSD, periprostetik eklem enfeksiyonları, endokardit ve üst ve alt ekstremite selüliti ile ilişkilendirilmiştir. Bugüne kadar SDSD ile ilişkili iki periprostetik eklem enfeksiyonu vakası literatürde belgelenmiştir. Bu çalışma, diz protezi cerrahisi sonrasındaki geç dönemde meydana gelen bir SDSD kaynaklı periprostetik eklem enfeksiyonunu sunmayı amaçlamaktadır.

Anahtar Kelimeler: Protez eklem enfeksiyonu, *Streptococcus dysgalactiae* subsp. *dysgalactiae*, *streptokokal enfeksiyon*

Introduction

Periprosthetic joint infection (PJI) is one of the most serious complications of joint prosthesis implantation. Reported incidence rates range from 0.5% to 2% for knee prostheses and from 0.5% to 1.0% for hip prostheses[1]. PJIs are typically classified into three categories: early onset (<3 months postoperatively), delayed onset (3–12 months), and late onset (>12 months)[2]. Early-onset infections are usually linked to perioperative contamination, whereas late-onset infections often present acutely and arise from pathogens originating at sites of compromised skin integrity, following dental or gingival procedures, or through hematogenous spread from the respiratory or urinary tract[3].

The microbiological profile also differs by onset category. Early-onset PJIs are commonly caused by *Staphylococcus aureus*, Gram-negative bacilli, anaerobes, or polymicrobial flora. Delayed-onset infections are frequently associated with coagulase-negative staphylococci, *Cutibacterium* (formerly *Propionibacterium*) spp., or enterococci. Late-onset PJIs are

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most often due to *Staphylococcus aureus*, Gram-negative bacilli, or beta-hemolytic streptococci[4]. Although streptococci are less common than staphylococci, they account for a notable proportion of PJIs (8%–11%)[5].

Streptococcus dysgalactiae causes more than 80% of invasive infections attributed to beta-hemolytic streptococci outside groups A and B[6]. This organism, a Lancefield group C streptococcus, is divided into two subspecies: *Streptococcus dysgalactiae* subsp. *equisimilis* (SDSE) and *Streptococcus dysgalactiae* subsp. *dysgalactiae* (SDSD)[7]. SDSD is a well-recognized cause of bovine mastitis and is traditionally regarded as an animal-associated pathogen. However, rare human infections have been documented, including PJI, septic shock, endocarditis, and cellulitis of the upper and lower extremities[8].

This case report describes a rare late-onset PJI caused by SDSD following knee arthroplasty.

Case Report

A 68-year-old man presented to the emergency department with a two-day history of swelling, left knee pain, and inability to bear weight on the affected limb. He reported no recent respiratory or urinary tract infections, dental procedures, or other events that might predispose to bacteremia. His medical history was notable for total knee arthroplasty performed two years earlier for gonarthrosis.

On examination, the patient was alert, oriented, cooperative, and in good general condition. Vital signs were within normal limits: temperature, 36.8 °C; blood pressure, 130/80 mmHg; and heart rate, 80 beats/min. The left knee demonstrated mild erythema, swelling, marked tenderness, and increased warmth. Range of motion was painful, and no sinus tract was observed.

Laboratory investigations revealed a hemoglobin level of 12.1 g/dL, white blood cell count of 13,890/mm³, erythrocyte sedimentation rate of 30 mm/hour, C-reactive protein level of 23.4 mg/dL, and procalcitonin level of 0.9 ng/mL. Anteroposterior radiographs of the knee showed no osseous abnormalities. Superficial ultrasonography demonstrated a loculated joint effusion measuring approximately 1 cm in maximum diameter.

Given the patient's symptoms, elevated inflammatory markers, and ultrasonographic findings, arthrocentesis of the left knee was performed, yielding 50 mL of purulent fluid. Synovial fluid analysis showed a leukocyte count >125,000/mm³ with 80% polymorphonuclear leukocytes. Gram staining revealed Gram-positive cocci and numerous leukocytes. The synovial glucose level was undetectable, while the simultaneous blood glucose level was 155 mg/dL.

According to the 2021 European Bone and Joint Infection Society criteria, the patient was diagnosed with prosthetic joint infection. Empirical therapy with levofloxacin 750 mg/day and teicoplanin 400 mg/day was initiated after synovial fluid samples were sent for culture. On the second day of treatment, the erythema around the knee progressed, raising concerns regarding possible levofloxacin resistance; therefore, ceftriaxone 1 g twice daily was added.

Culture of the synovial fluid identified SDSD using the Vitek® MS MALDI-TOF (BioMérieux) system. Antibiotic susceptibility testing demonstrated sensitivity to vancomycin, teicoplanin, trimethoprim–sulfamethoxazole, clindamycin, and penicillin; resistance to tetracycline; and intermediate susceptibility to levofloxacin. Based on these results, empirical therapy was revised: levofloxacin and teicoplanin were discontinued, and ceftriaxone 1 g twice daily was continued.

The orthopedic team confirmed the diagnosis of prosthetic joint infection and recommended a two-stage revision procedure. During the first stage, the prosthesis was removed and extensive debridement of soft tissue and bone was performed. Antibiotic-loaded bone cement was then implanted. At least three periprosthetic tissue specimens were obtained intraoperatively, although culture remained negative, likely due to the prior initiation of antibiotics.

By the third week of ceftriaxone therapy, the patient demonstrated marked clinical and laboratory improvement. Before discharge, the antimicrobial regimen was transitioned to oral amoxicillin–clavulanic acid (1 g twice daily) to complete a six-week treatment course.

DISCUSSION

Streptococcus dysgalactiae is a virulent organism capable of causing severe infections such as cellulitis, necrotizing soft tissue infections, and streptococcal toxic shock syndrome, often presenting with clinical features similar to those of Streptococcus pyogenes[9]. In 1996, Vandamme et al.[10] reclassified *Streptococcus dysgalactiae* into two subspecies: SDSE, predominantly a human pathogen, and SDSD, traditionally regarded as an animal pathogen[10]. SDSE is increasingly recognized as a significant pathogen in humans and is associated with pharyngitis, skin and soft tissue infections, bacteremia, endocarditis, and septic arthritis[11,12]. Although SDSD is primarily linked to bovine mastitis, sporadic human infections have been described in recent years[12].

Reports in the literature have documented SDSD-associated prosthetic joint infections, endocarditis, and both upper and lower extremity cellulitis[10]. Zoonotic transmission is believed

to play a key role, particularly among individuals with occupational or environmental exposure to fish, livestock, or other animals, as well as among immunocompromised patients[13]. Koh et al.[12] described three cases of SDSD-related soft tissue infection following injuries sustained while handling raw seafood. Nathan et al.[10] reported a case of septic shock secondary to SDSD-related upper extremity cellulitis in 2021. The first published case of SDSD-related prosthetic joint infection was reported by Park et al.[13] in 2012, followed by a second case reported by Afacan et al.[14] in 2024, in which animal contact and chronic comorbidities were identified as potential risk factors.

In the present case, the patient had no history of direct animal exposure or contact with seafood; however, he resided in a rural area and regularly consumed unpasteurized milk. Additionally, the patient was receiving disease-modifying antirheumatic drugs for rheumatoid arthritis, which may have contributed to immune compromise. Given these factors, we suspect that consumption of unpasteurized milk could have been a plausible route of exposure, supporting the view that SDSD may act as an opportunistic pathogen in susceptible hosts.

The optimal management of human infections caused by *Streptococcus dysgalactiae* has not been fully established[15]. Given the phenotypic similarity between SDSE and SDSD strains, it is hypothesized that treatment strategies effective for SDSE may also be applicable to SDSD-related infections[15]. *Streptococcus dysgalactiae* is generally susceptible to penicillin, and standard therapy often involves penicillin or third-generation cephalosporins. In cases of bacteremia, ceftriaxone is recommended, whereas vancomycin is preferred in patients with severe beta-lactam allergies[16]. Although *Streptococcus dysgalactiae* rarely develops resistance to penicillin or cephalosporins, resistance to quinolones and macrolides has been reported[10].

Previous reports illustrate diverse treatment approaches. Afacan et al.[14] described a prosthetic joint infection treated with surgical debridement, followed by intravenous teicoplanin (400 mg daily for six weeks) and sequential oral therapy with fusidic acid (500 mg three times daily) and levofloxacin (500 mg daily); the patient remained asymptomatic during one-year follow-up. In Park et al.[13] case of SDSD-related prosthetic joint infection, vancomycin (2 g/day) was administered for seven weeks due to oxacillin-resistant SDSD, followed by a two-stage reimplantation. Postoperative reassessment revealed increased warmth, pain, and elevated acute-phase reactants, prompting an additional six-week course of secapene pivoxil hydrochloride (300 mg/day), after which no clinical deterioration was observed over six months[13]. In the cellulitis cases reported by Koh et al.[12], ciprofloxacin and clindamycin were successfully used in patients with documented cephalosporin allergy.

Conclusion

In summary, the optimal duration, selection, and combination of antibiotics for SDSD-related prosthetic joint infections remain controversial. In the present case, levofloxacin demonstrated intermediate susceptibility; therefore, therapy was continued with ceftriaxone (1 g twice daily). After three weeks, marked clinical improvement allowed transition to oral amoxicillin–clavulanic acid (1 g twice daily) to complete a six-week course. The patient was subsequently discharged in stable condition.

Ethics

Informed Consent: Written informed consent was obtained.

Footnotes

Authorship Contributions

Surgical and Medical Practices: E.S., S.A.T., Z.B.Y., Concept: E.S., S.A.T., Z.B.Y., Design: E.S., S.A.T., Z.B.Y., Data Collection or Processing: E.S., S.A.T., Z.B.Y., Analysis or Interpretation: E.S., S.A.T., Z.B.Y., Literature Search: E.S., S.A.T., Z.B.Y., Writing: E.S., S.A.T., Z.B.Y.

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