Case Report

Acute Pasteurella multocida in Total Knee Arthroplasty

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Abstract: Pasteurella multocida is a rare cause of joint sepsis in total joint arthroplasty, and all case reports have identified a distant source of infection from an animal bite that has caused potential hematogenous seeding of the prosthesis. We report a case in which no potential distal wound source was found and the only likely etiology was local wound seeding from an old injury. In that injury, a saddle stirrup had caused a severe traumatic soft tissue injury as a horse had rolled over the patient. We draw attention to the fact that this particular bacteria is virulent in producing septic contamination of a total joint prosthesis, and aggressive treatment is indicated when such infection is identified. Key words: arthroplasty, total knee, infection, Pasteurella multocida, sepsis.

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In a few isolated reports, Pasteurella multocida has been identified as a cause of hematogenous infectious arthritis after total knee arthroplasty (TKA) [1–8]. We identified 14 such examples from literature review, and in every case reported, a distant infectious wound from an animal lead to hematogenous spread to the affected total joint arthroplasty. The case studied in this report was unusual in that acute local seeding of the knee wound occurred during a TKA without evidence of a distant wound source. The purpose of this report is to emphasize the risk potential for Pasteurella multocida to cause direct and hematogenous seeding of a total joint arthroplasty and the need to aggressively treat animal bite wounds, especially in elderly immunocompromised patients.

Case Report

In October 1999, a 63-year-old man underwent an uncomplicated low-contact-stress, rotating-platform mobile bearing TKA (DePuy, Warsaw, IN) for severe tricompartmental osteoarthritis of the left knee. He was healthy with no evidence of any apparent medical diseases and was under no active treatment for medical conditions. Some concern regarding wound closure arose initially because of local skin fibrosis and scar formation over the medial aspect of the knee. The early postoperative course was uncomplicated, with immediate wound healing in the first 7 days and range of motion established to 90° of flexion at discharge.

By the twelfth postoperative day, the patient’s temperature spiked to 103°. He was subsequently seen for evaluation. The wound remained closed, but a large effusion was noted, which was aspirated
under sterile conditions. Two days later, the wound opened, and a copious serosanguinous foul-smelling fluid drained from the wound. Laboratory studies included a C-reactive protein level that was 22 mg/dL and a sedimentation rate of 121 mm/h. Normal values for the hospital laboratory were a C-reactive protein level of 0.6 mg/dL and a sedimentation rate of 20 mm/h. The leucocyte count was 7,500 cells/mL with no left shift.

The patient was immediately admitted and taken to surgery for debridement of the wound. This revealed an inflamed synovial lining with a gram-negative coccolabtillus identified on gram stain and many polymorphonuclear cells per high-powered field on synovial analysis. The cultures grew moderate Pasteurella multocida sensitive to all antibiotics known to have activity against this organism. The skin and soft tissues over the medial proximal tibia were poorly vascularized, and debridement of an area of 2 × 3 cm was performed. The initial systemic antibiotic used was cefazolin, but this was changed to ciprofloxacin and piperacillin-tazobactam after initial cultures were evaluated. Because of the severity of the infection, removal of implants was deemed warranted. After several debridements and wound tissue cultures that proved negative, at 11 days a medial gastrocnemius flap and skin graft were developed to cover the medial soft tissue defect. This healed successfully, and exactly 3 months later, the patient underwent a revision TKA with a PFC Sigma Modular total knee prosthesis (Depuy, Warsaw, IN). By 1 year follow-up evaluation the patient showed no evidence of further infection and had range of motion from 15° to 85° of flexion.

On questioning, the patient noted no open sores of any kind or exposure to a pet scratch, bite, or lick immediately before or within the ensuing 2 weeks after surgery. He has several horses, but had not ridden or maintained the animals for several weeks before the TKA. He has a sheltie collie at home but could recall no contact with the wound and the pet. He had a history of a severe high school football injury in which the knee had dislocated and subsequently was casted for at least 6 weeks. In the mid 1970s, he had undergone knee reconstruction for chronic ligamentous instability of the left knee but had not developed infection. Finally, in 1956, the patient sustained a significant soft tissue wound to the medial proximal tibia when a horse stirrup had been ground into this area when a horse had rolled over him. This wound had required several weeks to granulate closed, leaving dense scar tissue over the underlying damaged bone.

Discussion

Pasteurella multocida is a gram-negative coccobactillus known to be a common flora of many animals and domestic pets such as cats and dogs. It was originally identified as a cause of fowl cholera in 1878 and in humans in 1913 [9,10]. The name “multocida” stems from the idea that multiple different species could be killed by this bacteria [5]. Animal to human transmission has been described, and clinical manifestations include respiratory involvement from oropharyngeal infection, meningitis, and septicemia from hematogenous spread of local skin contamination [11]. Human to human transmission is unlikely but may occur from the respiratory tract [12] or maternal to fetal in a rare case [13]. Serious systemic illness is possible, and patients with endocarditis after pasturella multocida infection have a 50% mortality rate [4].

From review of the literature, 12 cases have been described in which TKA sepsis has occurred caused by P. multocida, and virtually all cases have been correlated with a distant local wound of recent origin caused by an animal bite, scratch, or lick, usually by a dog or cat [1–8,15–19]. In 2 of the case reports, the infections were bilateral involving both TKAs [16,17]. Most cases have responded to joint debridement or delayed prosthetic reimplantation with adjunctive antibiotics. At least one case is noted in which the local bite wound was treated with oral antibiotics beginning the day after the injury, but 2 weeks later total joint sepsis evolved [4]. P. multocida infections are known to be sensitive to benzyl penicillin, amoxacillin, ciprofloxacin, and second- and third-generation cephalosporins [20]. P. multocida is usually resistant to erythromycin, clindamycin, and aminoglycosides. Authors have suggested that total knee sepsis is much more probable than total hip infection because of the proximity to lower leg bites, but at least 2 cases of total hip sepsis have been identified [21,22].

The present case is illustrative because no evidence of a P. multocida distant wound or of local contamination was seen during surgery. This patient was not in contact with any pet or other animal at the time of surgery, nor was he suspected to be a carrier of this bacteria. He was possibly exposed to P. multocida by his dog without any direct trauma because infections in humans are recognized after exposure to animals with trauma or direct inoculation [23]. He continued to ride horses and perform chores with potential exposure to horse secretions until a few weeks before sur-
nous infection is more likely [2,5,22,28,29]. The indications for this management may be 27]. The indications for this management may be warranted, particularly in elderly patients and im-
terwines to detect debridement and irrigation and appropriate cul-
ture. We could further speculate that he may have
developed a local wound contamination and possibly even osteomyelitis of the proximal tibia wound
that resulted from the stirrup injury in 1956. This latent infection was then activated many years later
by the TKA.

Although such prosthetic total knee infections with P. multocida are infrequent, we have seen at
least 2 other cases in which this organism was implicated in total knee sepsis. Both were associated
with distant animal wounds. One case was of a cat bite in the wrist of a farmer who was attempting to
castrate the animal. He developed sepsis in the wrist and in his left TKA and eventually died from septic
endocarditis and shock. The second case was a female total knee patient who developed neuroder-
mattitis and an open sore on her lower leg. Her dog licked this sore, causing local skin contamination.
The adjacent TKA subsequently became involved.

We are concerned by the consistent ability of P. multocida to cause direct and indirect distant seeding
of a prosthetic arthroplasty. Human to human contamination may occur, and we believe that local
contamination was source of infection in this case. The associated TKA subsequently became involved.

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