CASE REPORT

Infected total knee arthroplasty due to postoperative wound contamination with *Pasteurella multocida*

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SUMMARY

Pasteurella multocida is a small Gram-negative bacterium comprising part of the normal gastrointestinal and nasopharyngeal flora of domestic pets, such as dogs and cats. It rarely causes infection in humans. Previous reports of *P multocida* causing prosthetic joint infection have described either haematogenous spread of infection from a distant site through a scratch or bite, or reactivation of infection from a previous injury. We report a case of acute total knee arthroplasty joint infection becoming acutely infected by *P multocida*. We postulate that the mechanism of infection was direct contamination of the wound as a consequence of the patient being licked by his pet dog. We discuss the potential role played by thromboprophylaxis as a factor contributing to prolonged wound leak.

BACKGROUND

Pasteurella are small Gram-negative coccobacilli that comprise part of the normal gastrointestinal and nasopharyngeal flora of domestic pets. *Pasteurella* are not normally found in humans and human disease is rare. When described, it is usually caused by *Pasteurella multocida* and tends to be associated with cat and dog bites. Most reported cases involve pneumonia, skin and soft tissue infections and bacteraemia. Other clinical manifestations are much less common and include bone and joint infections, meningitis, endocarditis and intra-abdominal infections.^{1–4}

The most common causative organisms we see in prosthetic joint infection are *Staphylococcus aureus*, coagulase-negative staphylococci and streptococci. Gram-negative infection is considerably less common. *P multocida* is a very rare cause of prosthetic joint infection.^{5–8} Previously reported cases have involved haematogenous seeding of the prosthesis from a distant source.

In our large arthroplasty unit, we report the first case of acute total knee arthroplasty joint infection by *P multocida* in the past decade. We postulate the mechanism was direct contamination of the patient's surgical wound as a consequence of being licked by his pet dog. We also consider the potential consequences of recent changes in the thromboprophylaxis guidelines in leading to prolonged wound leak and infection.

CASE PRESENTATION

A 47-year-old male bus driver underwent a primary total knee replacement (TKR) for the treatment of post-traumatic osteoarthritis. The patient had a medical history of moderate alcohol excess but was

otherwise well. He lived alone with his dog. Following an uneventful procedure and an in-patient stay of 3 days, the patient was discharged home. Our local venous thromboembolic (VTE) disease prophylaxis policy includes low-molecular weight heparin (LMWH) administered subcutaneously as an inpatient and a 10-day course of the oral anticoagulant, rivaroxaban, on discharge. The patient was treated according to this policy.

The patient was readmitted to the hospital 23 days after surgery with an erythematous, partially dehiscent wound, which was discharging purulent, blood-stained fluid. He described a persistent serosanguinous leak from the wound since his discharge from hospital that had been managed with regular dressings by a district nurse. The patient's admission was precipitated by a partial wound dehiscence following deep flexion exercise during a physiotherapy session.

On admission, it was noted the patient had not received any antibiotic treatment for his wound. On assessment he was systemically well with no fever. The knee was swollen, warm and erythematous with evidence of wound dehiscence and leak.

INVESTIGATIONS

Investigation revealed a C reactive protein (CRP) level of 60 mg/L (normal level <10 mg/L) and a white cell count of $10.7 \times 10^9/L$ (normal level $3.5\text{--}9.5 \times 10^9/L$). Radiographs were unremarkable. Superficial wound swabs for methicillin-resistant *Staphylococcus aureus* (MRSA) were negative.

DIFFERENTIAL DIAGNOSIS

A provisional diagnosis of a postoperative wound infection was made and a management decision was taken to surgically treat this in an attempt to salvage the prosthesis.

TREATMENT

At surgery the skin wound was fully reopened and superficial layers thoroughly debrided and washed. The infection appeared superficial and the previous quadriceps repair was found to be intact. In light of these findings, the deep layer was therefore not reopened; however, aspiration of the joint was performed with a single pass of a sterile needle. The patient was allergic to penicillin and described a previous childhood reaction presenting as a skin rash. Intravenous cefuroxime and teicoplanin were therefore started empirically. Chemical VTE prophylaxis was discontinued. Postoperatively, the patient developed a fluctuating temperature.

To cite: Subramanian B, Holloway E, Townsend R, et al. *BMJ Case Rep* Published online: [please include Day Month Year] doi:10.1136/bcr-2013-009973

OUTCOME AND FOLLOW-UP

After 72 h incubation, coagulase-negative staphylococci (*Staphylococcus epidermidis*) and *P multocida* were isolated from all five intraoperative tissue samples and the joint fluid aspirate. CRP climbed from 60 mg/L on admission to 331.9 mg/L 24 h post-wound debridement and aspiration.

In light of a proven deep joint infection, further debridement, washout and change of the prostheses' polyethylene liner was performed. Intravenous cefuroxime and teicoplanin were continued for 2 weeks to treat *Pasteurella* infection and *S epidermidis* infection, respectively. At this point, the patient had no fever and his inflammatory markers had reduced significantly. The patient was discharged and monitored at regular outpatient follow-up appointments. He completed a 6-week course of oral antibiotics: doxycycline for *Pasteurella* and *Clindamycin* for *S epidermidis* on the basis of in vitro susceptibility data and taking note of the patient's allergy to penicillin. At his last review, the patient had a healed wound, was mobilising independently and had returned to work. He is on our waiting list to have the other knee replaced.

In light of the highly unusual microbiology findings, the patient was questioned further about his home circumstances. The patient admitted that he occasionally shared a bed with his Jack Russell dog and was frequently licked by the pet. The patient could not specifically recall the dog licking his knee wound, but conceded that this was probable while he was under the influence of alcohol.

DISCUSSION

Prosthetic joint infection is an uncommon but devastating complication of arthroplasty surgery.⁹ This unusual case provides further evidence for the existence of *P multocida*-prosthetic joint infection and demonstrates a new mechanism of contamination.

We feel that the transmission of infection in this case is likely to be direct inoculation of *P multocida* into a persistently leaking wound which may be related to the chemical thromboprophylaxis. Prior to 2011, our VTE prophylaxis regime was LMWH as an inpatient only. In 2011, we adopted National Institute of Care Excellence (NICE) guidance and changed the regime to include 10 days extended prophylaxis for TKR using the oral factor Xa inhibitor rivaroxaban. Allied to this change in VTE prophylaxis, we have adopted an enhanced recovery programme for hip and knee arthroplasty patients. Since introducing these changes there has been anecdotal concern of a higher incidence of wound haematoma and leakage across a wide range of different patients.

Pooled analysis¹⁰ of the four prospective, randomised, multicentre RECORD (REgulation of Coagulation in ORthopedic Surgery to Prevent Deep Venous Thrombosis and Pulmonary Embolism) studies show that the incidence of treatment-emergent haemorrhagic wound complications (the composite of non-major clinically relevant excessive wound and surgical-site bleeding), postoperative wound drainage and postoperative wound infection with rivaroxaban regimens were low and similar to those using enoxaparin regimens. Despite the RECORD findings, a large Arthroplasty Unit in the UK reported an increased incidence of wound haematoma with rivaroxaban use and that this reduced when the thromboprophylactic regimen reverted from rivaroxaban back to enoxaparin.¹¹ A recent trial randomising 8101 acutely ill medical patients to receive either a 10-day subcutaneous enoxaparin, or 35-day oral rivaroxaban thromboprophylaxis regime found the rivaroxaban regime to be non-inferior in terms of

preventing thromboses but that it was associated with an increased risk of clinically significant bleeding.¹² We are aware of other UK arthroplasty units who have abandoned the use of rivaroxaban due to concerns related to wound haematoma. Our unit's approach was to introduce rivaroxaban at a point distant from the patient's surgery by using it only on discharge. The results of further blinded, randomised control trials in this difficult area are awaited.

We routinely counsel patients preoperatively in a 'Joint School'. As part of this counselling we advise that a persistent postoperative wound leakage should prompt medical review. In consideration of this case, we now question the need to specifically counsel patients to avoid contact with pets that may be tempted to lick a surgical wound and in particular prevent pets from licking a discharging wound.

Learning points

- ▶ *Pasteurella multocida* prosthetic joint infection is a rare but serious complication of arthroplasty surgery.
- ▶ The prompt diagnosis of an acutely infected joint replacement is imperative if the joint is to be saved. Early signs of infection range from increasing pain, erythema and swelling to frank wound discharge and breakdown, or systemic upset. Any concerning features should prompt urgent orthopaedic review.
- ▶ The mechanism of infection with *P multocida* in this patient is likely to be licking of the surgical site by his pet dog.
- ▶ Thromboprophylaxis with rivaroxaban may have contributed to prolonged wound leak and the development of wound infection.
- ▶ Preoperatively, patients should be counselled in a 'Joint School' to guard against direct contact of their surgical wound with pets, and in particular to prevent pets from licking wounds.

Contributors BS participated in interviewing the patient, in the writing of the case report and conducting literature search on the infection and microbiological aspects of the case. EH contributed in the writing of this report and conducting a literature search, with particular emphasis on the surgical aspects of this patient's management and complications, and obtained patient consent for case submission. RT identified the case as an unusual infection occurring as a complication of knee replacement with recognition of the risk factors for acquisition. He contributed to the editing, planning and conduct of the case report. PS contributed in the editing of the report, particularly on the surgical aspects of this case and the key lessons to be learnt to prevent future occurrences. He has managed the patient's postoperative care and also obtained informed consent from the patient for case submission.

Competing interests None.

Patient consent Obtained.

Provenance and peer review Not commissioned; externally peer reviewed.

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