CASE REPORT

'Barely a scratch': *Capnocytophaga canimorsus* causing prosthetic hip joint infection following a dog scratch

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SUMMARY

Capnocytophaga canimorsus is a commensal organism commonly found in the oral cavity of cats and dogs. Infections with this organism are rare and can affect both immunocompetent and immunocompromised individuals. The authors present a case of *C. canimorsus* causing indolent prosthetic hip joint infection in a healthy 66-year-old woman following a history of being scratched by her pet dog. The patient had an atypical history of chronic, low-grade infection which is unusual, as this organism is more frequently associated with acute presentations and fulminant sepsis. This patient was treated successfully with a two-stage exchange of her hip prosthesis and broad-spectrum antibiotics. *C. canimorsus* is a very rare cause of prosthetic joint infection but an important pathogen to consider, particularly in culture-negative joint infections and a history of animal exposure.

BACKGROUND

Capnocytophaga canimorsus is a slender, fusiform gram-negative bacillus that constitutes the oral flora in dogs and cats.^{1,2} It is increasingly being recognised as a pathogen causing human disease and tends to be associated with animal bites, scratches and licks.¹⁻⁴ Immunocompromise is a major risk factor, although up to 40% of infections occur in previously healthy patients.^{1,5,6}

Prosthetic joint infection with *C. canimorsus* is an extremely rare event, with only two cases being reported in the literature to date.^{1,7} One case was in a middle-aged man immunocompromised by chemotherapy, long-term steroid treatment and alcohol use.¹ The second case was in an elderly patient with a periprosthetic knee joint infection that was managed with long-term antibiotics and retention of the prosthesis.⁷ We report a case of total hip arthroplasty infection by *C. canimorsus*, which presented in a chronic, indolent fashion in a previously healthy patient.

CASE PRESENTATION

A 66-year-old woman presented to the orthopaedic clinic with a 4-month history of right groin and buttock pain. The patient had a medical history of a right cemented total hip replacement for osteoarthritis in 1997, L5/S1 degeneration, osteoporosis and migraine. She was otherwise fit and well with no known immunocompromising factors. On

examination, she had a right antalgic gait, painful reduced range of movement of the right hip and a positive right Trendelenburg's sign. She was systemically well. Imaging and clinical history were suggestive of infection of the prosthetic joint, and the patient had two hip biopsies to investigate this further.

INVESTIGATIONS

Initial investigations revealed a white cell count of $10.3 \times 10^9/L$ ($3.5-9.5 \times 10^9/L$), a neutrophil count of $6.3 \times 10^9/L$ ($2.5-7.5 \times 10^9/L$), C reactive protein (CRP) of 51 mg/L (normal level <10 mg/dL) and an erythrocyte sedimentation rate (ESR) of 58 mm/hour (normal range for women: age (years) + 10/2). Radiographs demonstrated cortical erosion in the medial aspect of the proximal femur, suspicious of infection.

The patient subsequently had a hip biopsy where 5 mL of turbid fluid was aspirated. One out of seven hip aspirate specimens collected in theatre under sterile conditions grew a gram-negative bacillus, which could not be reliably identified at the local microbiology laboratory. A second hip biopsy was performed 3 months later. This again yielded a gram-negative bacillus, in one out of three samples. Both these organisms were sent to the specialist microbiology reference laboratory for further identification. Repeat imaging at this stage, 14 months after the patient first presented, showed significant cortical destruction in the proximal part of the femur in keeping with infection of the prosthesis (figure 1).

The reference laboratory used 16S PCR to identify the gram-negative bacillus as *C. canimorsus*. Further history from the patient revealed that she had a pet dog at home, and she recalled being scratched at the back of her hand, 9 months prior to her initial presentation to the orthopaedic clinic.

TREATMENT

Following the second hip biopsy, the patient underwent a two-stage revision of her right total hip arthroplasty. At the first-stage surgery, findings were in keeping with chronic low-grade infection—turbid joint fluid, a loose acetabular cup with thick membrane between cement and bone and a femoral defect at the lesser trochanter were found. The

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Figure 1 Preoperative imaging demonstrated loosening of the acetabular cup (blue arrow), osteolysis (green arrow), periosteal reaction (red arrow) and progressive cement–bone lucency (yellow arrow) highly suggestive of infection of the prostheses.

Figure 2 Postoperative imaging demonstrates a new hip replacement and a long stem to bypass intraoperative fractures augmented with cables.

prosthesis was removed, and a Biomet Spacer was inserted into the area to maintain soft tissue tension to facilitate the reimplantation procedure.

The spacer was made in a mould at the time of surgery using four mixes of Copal G+C bone cement (cement with 1g gentamicin and 1g clindamycin per mix), and a further 2g of vancomycin and 2g meropenem were added to each mix as per microbiology advice. The aim of this is to deliver antibiotics locally, targeted against the pathogen, in addition to systemic antibiotics.

All theatre samples from the first-stage revision yielded no significant growth. The patient received 10 days of intravenous co-amoxiclav 1.2g three times a day and clindamycin 450mg four times a day and completed a 3-month course of ertapenem 1g once a day, intravenously and ciprofloxacin 500mg twice daily, orally, based on *in vitro* susceptibilities of the organism. Her postoperative recovery was complicated by a peripherally inserted central catheter (PICC) line infection and fractured cement spacer.

Following a month off antibiotics and normal inflammatory markers (CRP: 5 mg/L, ESR: 4 mm/hour), the patient underwent the second-stage surgery. An uncemented hip replacement was implanted. Our patient sustained an intraoperative femoral fracture due to disuse osteoporosis which was treated with a long-stem implant bypassing the fracture (figure 2). She was discharged on day 7 and had an uneventful postoperative recovery. All seven intraoperative specimens showed no growth on culture.

OUTCOME AND FOLLOW-UP

At her last review 15 months following the second-stage surgery, she is functioning well with a pain-free hip. Inflammatory markers remain normal (white cell count $6.4 \times 10^9/L$, CRP <5 mg/L).

DISCUSSION

Capnocytophaga canimorsus was first discovered in 1976 and initially named ‘dysgonic fermenter 2’ owing to its slow growth.^{4 8 9} This organism thrives in CO₂-rich environments and produces smooth and convex colonies on blood and chocolate agar, often requiring 48–72 hours to grow.^{10 11} Canine exposure

is reported in a majority of cases, but one study found up to 20% of patients had no known exposure.¹² Persons at risk of developing *C. canimorsus* infections include patients with haematological malignancies, on chemotherapy, asplenia, alcohol abuse, long-term steroids and immunosuppressive therapy although infection in immunocompetent patients such as our patient is reported in 40% of cases.^{1–6} Reported clinical manifestations include septicæmia, meningitis, empyema, peritonitis, infective endocarditis, ocular infections, and bone and joint infections.^{6 10 12}

Capnocytophaga species are broadly susceptible to most antibiotics, apart from trimethoprim-sulfamethoxazole, aminoglycosides, colistin, first-generation cephalosporins and aztreonam.^{1 10} As some strains produce β-lactamase, a penicillin-β-lactamase

Patient's perspective

- ‘When I was referred for a scan by the orthopaedic team, my first thought was that the team were looking for cancer; such was my pain by this time. But, when I saw them next, they were able to assure me that this was not the case. However, the orthopaedic consultant was certain I had some sort of infection, and a biopsy would be necessary to determine what was going on. Unfortunately, the biopsy results were inconclusive, and I had to undergo a second biopsy several months later. All this time, the pain was becoming worse, and I was becoming increasingly frightened by what might actually be happening to me.
- I don't know right now what the future might bring but I would hope that, if the need arose, I would be in the hands of such capable, caring people. But the worry never goes away, the fear that something similar could happen again is always at the forefront of my mind’.
- When I eventually went into hospital and was operated on, despite postop discomfort, the relief that the horrendous pain was no longer present was indescribable. Throughout my hospital stay the team kept me informed and the care I received was excellent.

Learning points

- ▶ *Capnocytophaga canimorsus* is a gram-negative bacillus that constitutes the oral flora in cats and dogs. It is an important pathogen to consider in infections following dog or cat exposure.
- ▶ Infections with *C. canimorsus* can affect immunocompetent and immunocompromised patients. Those at higher risk of developing infection with this organism include those with haematological malignancies, splenectomy, recent chemotherapy, steroid treatment and immunosuppressive drugs.
- ▶ *Capnocytophaga canimorsus* can cause prosthetic joint infections, and this case highlights that this infection may present in a chronic, indolent manner without features of systemic upset.

combination or a third-generation cephalosporin is the drug of choice.^{13–15}

Our case report is unique for several reasons. This is only the third case of prosthetic joint infection with *C. canimorsus* to be reported in the literature and illustrates that this pathogen can affect healthy individuals. It is an important organism to consider in patients with animal exposure, particularly in those with culture-negative prosthetic joint infections. This case also highlights the usefulness of 16S PCR, particularly with *Capnocytophaga* which can be difficult to grow and identify due to its fastidious nature. Our case illustrates that *C. canimorsus* can present with chronic, insidious infection without evidence of systemic illness or overwhelming sepsis that is frequently reported in the literature.^{1–15}

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