



Case report

Diarrheal illness and prosthetic joint infection caused by *Campylobacter coli* following consumption of undercooked chicken wings



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ABSTRACT

Campylobacter species are common causes of diarrheal illness following consumption of contaminated food or unpasteurized dairy products, but subsequent dissemination and joint space infections are rare. We describe a patient who consumed undercooked chicken wings, with subsequent development of a febrile gastrointestinal illness marked by copious, watery stool output. This was followed by acute onset of pain and inability to bear weight on his right hip and leg where he had undergone prior arthroplasty. Synovial fluid cultures revealed *Campylobacter coli*, identified utilizing matrix-assisted laser desorption/ionization time-of-flight mass spectrometry. The patient made a full recovery following hip joint space debridement with prosthesis retention, coupled with sequential intravenous and oral ciprofloxacin therapy. This case highlights both the potential for prosthetic joint infection with *Campylobacter coli* following diarrheal illness, as well as challenges in reducing *Campylobacter* contamination within commercially distributed chicken wings.

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Introduction

Campylobacter species are common causes of gastrointestinal illness following consumption of contaminated food or unpasteurized dairy products, but subsequent dissemination and joint space infections are rare. Here we describe what is to our knowledge the first case of diarrheal illness and subsequent prosthetic joint infection caused by *Campylobacter coli* following consumption of undercooked chicken wings.

Case report

The patient was a 63-year-old man who had undergone total arthroplasty of his right hip 8 years prior to presentation. Although he required revision arthroplasty unrelated to infection one year after the original surgery, he had otherwise suffered no complications or limitations of activity for the ensuing 7 years. His other

past medical history included atrial fibrillation, hypertension, gastroesophageal reflux, nephrolithiasis, and gout, and he was receiving rivaroxaban, lisinopril, metoprolol, and pantoprazole. As a corporate pilot providing charter flights to a variety of destinations in the U.S., he was staying overnight in Florida and attended a reception at the hotel, consuming several of what he described as undercooked chicken wings, as well as raw carrots and celery. The following morning, approximately 12 h after this meal, he noted the onset of copious watery, non-bloody diarrhea accompanied by lower abdominal cramping. This was followed approximately 8 h later by the onset of chills, and together these symptoms were unremitting over the next 48 h. Thereafter, his stool output began to slow and his chills resolved. Within 24 h of improvement in these symptoms, he noted the relatively sudden onset of right hip pain exacerbated by weight-bearing or active motion in any direction. He described this as unusual for him; his gout flares typically occurred in his big toes with no inflammatory arthritis of his hips in the past, and he exhibited no pain or swelling in joints in his toes at that time. The hotel arranged for transportation to a local hospital, where his initial temperature was 102 °F. On physical examination, he exhibited significant pain with passive range of motion of his right hip with no other remarkable findings. Initial laboratory assessment revealed a peripheral white blood cell count of 12,200 cells/mm [3], with

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normal hemoglobin and platelet counts, as well as normal chemistries other than a serum sodium of 130 mmol/L and CO₂ of 21 mmol/L. Inflammatory marker assessment revealed an erythrocyte sedimentation rate (ESR) of 69 mm/hr and C-reactive protein (CRP) of 15.6 mg/L. Two sets of blood cultures obtained prior to antimicrobial administration revealed no growth. Also prior to antimicrobial administration, he underwent ultrasound-guided aspiration of the right hip joint, with recovery of 80 mL of thin, dark fluid exhibiting 185,700 white blood cells/mm [3], 90% of which were neutrophils. He subsequently received intravenous vancomycin, but within 48 h, Gram-negative rods were reported from joint fluid cultures prompting discontinuation of vancomycin and initiation of intravenous ciprofloxacin. Four days after admission, he was transferred to a hospital in North Carolina near his home for surgical intervention by his orthopedist while remaining on IV ciprofloxacin. On arrival, he exhibited a temperature of 37.8 °C with a peripheral white blood cell count in the normal range. Laboratory assessment otherwise revealed a hemoglobin of 12.9 g/dL, normal platelet count, serum sodium of 134 mmol/L, albumin of 2.6 g/dL, and normal renal function. Two sets of blood cultures were once again obtained and again revealed no growth. A radiograph of the right hip revealed normal prosthesis alignment and no other bone abnormality, and intravenous ciprofloxacin was continued. Following hospital transfer, the initial joint fluid cultures collected in Florida revealed growth of *Campylobacter coli* identified utilizing matrix-assisted laser desorption/ionization time-of-flight mass spectrometry (MALDI-TOF MS), and the isolate was susceptible to ciprofloxacin (Kirby-Bauer method). The patient was taken to the operating room in North Carolina, and following skin incision there was immediate expression of a large amount of dark brown, thick, purulent fluid which extended from the joint space to the pseudocapsule overlying the iliotibial band. About 500 mL of fluid were removed, and the hip prosthesis was retained given no intraoperative evidence of loosening and at the patient's request. Cultures from this procedure ultimately revealed no growth of bacteria, fungi, or acid-fast bacilli. He recovered well post-operatively and after 72 h was transitioned from intravenous ciprofloxacin to ciprofloxacin given orally 750 mg twice daily. One month after surgical debridement, he reported minimal pain in his right hip and he had returned to part-time work as a pilot. Two months after surgery, surveillance blood work revealed normal complete blood count and chemistries, ESR 19 mm/h, and CRP 6.6 mg/L. Three months after surgery, he reported only mild stiffness in his right hip with full range of motion, and surveillance blood work revealed ESR 3 mm/h and CRP 2.9 mg/dL. He had returned to work full-time. Oral ciprofloxacin was to be continued for an additional three months to complete a total post-operative antimicrobial course of six months.

Discussion

Campylobacter species are rare causes of prosthetic joint infection. Reported cases have generally been associated with diarrheal illnesses following consumption of undercooked meat or shellfish, or with animal exposure in the case of *Campylobacter fetus* infections [1–6]. Despite its commonality as a cause of human gastrointestinal illness, to our knowledge *Campylobacter coli* has only been implicated in one other case of prosthetic joint infection associated with consumption of contaminated oysters [3]. Gastrointestinal illnesses caused by *Campylobacter* typically arise 2–7 days following exposure, and may be followed by chronic immunopathogenic sequelae including Guillain-Barré syndrome, reactive arthritis, and functional bowel syndromes [7–9]. Our patient's prosthetic joint infection was distinguished from reactive arthritis by the growth of *Campylobacter coli* in cultures from joint

fluid. Despite a relatively short incubation time, the patient attributed his diarrheal illness to undercooked chicken wings consumed at a hotel reception approximately 12 h prior to illness onset. Of note, he denied consumption of other undercooked meat, shellfish, or unpasteurized dairy products over a 2-week period prior to the hotel reception.

Campylobacter species are rarely isolated from fresh produce [10,11]. However, they are commonly isolated from poultry products since the majority of poultry contain *Campylobacter* species, including *Campylobacter coli*, in their gastrointestinal tracts [12–14]. Available data indicate that chicken wings improperly stored (above –20 °C) are contaminated with higher *Campylobacter* colony counts [15], although higher colony counts may persist in chicken juices even despite long-term storage at lower temperatures [16]. Also of interest, and unique among microaerophilic bacteria, *Campylobacter coli* exhibits aerotolerance. This refers to its ability to produce oxidative stress response proteins allowing for survival in more aerobic environments associated with stressful processing and food storage conditions [17]. Concern for *Campylobacter* infection following ingestion of undercooked chicken wings has led to research to determine whether various additives and marinades reduce colony counts during processing and prior to their consumption. Interestingly, marinades containing acetic acid may optimally reduce colony counts [18]. *Campylobacter coli* has also been isolated from bovine sources associated with human infection [19]. Interestingly, it is found more commonly in beef livers relative to other cuts of meat. This may be due to cross-contamination associated with pooling of livers from multiple animals prior to sale, or to bile contamination of livers [20].

For patients with Gram-negative prosthetic joint infections, debridement, prosthesis retention, and oral fluoroquinolone therapy lead to favorable outcomes, with approximately 80% long-term, disease-free survival reported [21]. Ciprofloxacin dosed 750 mg twice-daily achieves bioavailability of 60–80% and bone penetration of approximately 40–50% of serum levels. With effective debridement and prosthesis removal, use of oral ciprofloxacin may result in even better outcomes, with 2-year disease-free survival reportedly greater than 90% [22]. Our patient preferred prosthesis retention to the two-stage approach, thereby justifying more prolonged antibacterial therapy. Risks of prolonged ciprofloxacin therapy include tendinopathy [23–25] and *Clostridioides difficile* infection, especially with concurrent proton-pump inhibitor therapy [26,27]. Our patient had been receiving pantoprazole and was encouraged to stop taking this at least temporarily while receiving ciprofloxacin. Fluoroquinolone resistance rates among *Campylobacter coli* isolates may approach 70% from beef or other sources including chicken meat, and is generally higher than for *Campylobacter jejuni* [20,28]. Therefore, determining susceptibilities is especially important for all *Campylobacter coli* isolates from joint fluid and other sterile sites to ensure administration of appropriate antimicrobials.

In summary, we report a rare case of *Campylobacter coli* prosthetic joint infection preceded by consumption of undercooked chicken wings and diarrheal illness. This case underscores the importance of taking a careful history related to food or animal exposure in patients with symptoms potentially suggestive of prosthetic joint infection. It also highlights the potential consequences of consuming undercooked meat, shellfish, and unpasteurized dairy products for patients with prosthetic joints. The case further supports the use of oral fluoroquinolone therapy to achieve successful outcomes with prosthetic joint infections involving *Campylobacter coli*, even with prosthesis retention.

Patient consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

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CRedit authorship contribution statement

Andres Suarez: Conceptualization, Methodology, Data curation, Writing - original draft. **Christopher Parsons:** Conceptualization, Methodology, Formal analysis, Investigation, Writing - original draft, Resources, Writing - review & editing, Visualization, Supervision. **Eveline Parsons:** Investigation, Resources, Writing - original draft. **Ivan Gowe:** Formal analysis, Writing - original draft, Writing - review & editing. **Stephen Vickery:** Investigation, Formal analysis, Writing - original draft, Writing - review & editing, Visualization, Supervision, Project administration.

Declaration of Competing Interest

The authors report no financial conflicts

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