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Campylobacter coli Prosthetic Hip Infection Associated with Ingestion of Contaminated Oysters[▽]

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This report describes the first reported case of a prosthetic hip joint infection due to *Campylobacter coli*. The infection presumably resulted from ingestion of contaminated raw oysters. Issues regarding original smear interpretation, culture isolation, and susceptibility testing are presented.

CASE REPORT

A 60-year-old man was admitted to the hospital with severe right hip pain (8 on a scale to 10) and fever of 101 to 103°F which started the day prior to admission. His medical history is positive for borderline obesity, hypertension, and a total right hip replacement 6 years previously due to severe arthritis with complete loss of joint space. Pertinent negative findings include no chest pain, diarrhea, vomiting, headaches, sore throat, or cough.

After examination in the emergency room, there was immediate concern for the possibility of a septic hip. A complete blood count showed leukocytosis, and two sets of blood cultures were drawn at this time. Radiographs were taken of the right hip which revealed a well-seated prosthetic device and some surrounding arthritic changes but no acute process. The orthopedic department was contacted to arrange for an aspiration of the hip with fluoroscopic guidance through radiology. No antibiotics were given pending results of the aspiration. Purulent fluid (white blood cell count, 22,500/mm^3 with 96% neutrophils) was aspirated from the hip and sent for Gram stain and culture. The patient was felt to have an acute onset of infection in the right hip and was scheduled for surgery with the plan to do an irrigation and debridement and exchange of the head and acetabular liner.

During surgery, some granulation-type tissue was noted which protruded through the abductor at the site of a previous incision. Cloudy, turbid fluid was seen in the joint, as was significant granulation-type tissue around the acetabulum, although the implants themselves appeared to be fixed and stable. Joint fluid and tissue were submitted for culture.

The original aspirate and two of the four surgically collected joint and tissue specimens were culture positive for growth of a "campylobacter-like" organism. All five specimens initially had Gram stains that demonstrated the presence of polymorphonuclear cells but no organisms. Upon review of the Gram-stained smears from the five specimens, one of the three with growth upon culture was positive for a few, faintly staining, curved gram-negative bacilli with "gull-wing" formations. Upon interview with an infectious disease physician, the patient disclosed eating raw oysters ~10 days prior to admission with subsequent fever and diarrhea which lasted 24 h and resolved spontaneously and with no further gastrointestinal symptoms or fever.

Blood cultures from this patient remained negative after 5 days of incubation. However, it should be noted that bacteremia with *Campylobacter* species is a frequent cause of joint infections, and looking for the organism in blood cultures is a prudent activity. Although it cannot be guaranteed bacteria will be found at all times and points, blood should certainly be collected prior to the start of antibiotic therapy to optimize the chances of culturing these organisms from blood.

Campylobacter coli was subsequently identified in the three culture-positive specimens. This organism grew on blood agar, chocolate agar, and campylobacter selective agar (Campy CVA agar; Becton Dickinson and Co., Franklin Lakes, NJ), at both 35°C and 42°C, and had the typical "gull-wing" appearance on Gram stain from culture plates. The organism was catalase positive, hippurate negative, and cephalothin resistant. These differential characteristics distinguish *C. coli* and *Campylobacter lari* from all of the other *Campylobacter* species. Excellent identifications from two separate and unique methodologies, the Vitek-2 NH biochemical card (bioMerieux, Durham, NC) and the gas-liquid chromatography Sherlock microbial identification system (MIDI, Inc., Newark, DE) confirmed the identification of the isolate as *C. coli*. PCR testing by both the Oregon State Public Health Laboratory and the Centers for Disease Control and Prevention identified the organism as *C. coli*. Susceptibility testing was performed using the Sensititre GPN2F panel (Trek Diagnostic Systems, Magellan Biosciences, Cleveland, OH) and the organism tested susceptible to ciprofloxacin (≤0.5 μg/ml), erythromycin (≤0.25 μg/ml), and tetracycline (≤2 μg/ml) (4).

The patient was placed on ticarcillin-clavulanic acid with intent to treat for 6 weeks. As the isolate tested susceptible to ciprofloxacin, the patient was transitioned to oral ciprofloxcin for 3 weeks once discharged from the hospital. The patient did well and fully recovered from his infection.

Although this organism initially grew within 48 h of incubation as small colony growth on chocolate agar and pinpoint colony growth on blood agar, it grew quite well after overnight incubation once subcultured onto selective media for *Campylobacter* isolation (Campy CVA agar), and incubated at 42°C. Most microbiology laboratories should be able to recover this organism from sterile sources if specimen cultures are held a

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minimum of 2 full days. The ability of even experienced microbiologists to see this organism on the initial specimen Gram stain, however, is more problematic. Our initial Gram stain smears for all five specimens submitted were reported as no organisms seen. Review of these initial smears revealed that for one of the three positive culture specimens, faintly staining curved bacteria could be seen that were consistent with *Campylobacter* species morphology. Microbiologists should be aware of the possibility of organisms such as *Campylobacter* and other faintly staining species on initial specimen Gram stains, especially when smears from sterile sites show the presence of polymorphonuclear cells but the absence of organisms. Careful examination of such smears may prove to be the key to early identification of such organisms.

Most infections with *Campylobacter* species do not require that antimicrobial susceptibility testing be performed as most infections are self-limited and do not require treatment. However, when isolated from sterile or surgically collected sites, susceptibility testing should be considered. The CLSI M45-P guideline outlines a method that may be used in such situations (4). This method requires broth microdilution using Mueller-Hinton broth with lysed horse blood (which can be purchased commercially). Recommendations are for incubation at 24 h at 42°C or 48 h at 36 to 37°C. We elected to test with 24 h of incubation at 42°C so that results could be released as quickly as possible. Resistance among two species of *Campylobacter* (*C. jejuni* and *C. coli*) to both ciprofloxacin and erythromycin is known to occur with rates as high as 40% and 11%, respectively, depending on the country of residence (4). Our isolate tested susceptible to both of these agents.

C. jejuni and *C. coli* are the most prevalent causes of acute bacterial gastroenteritis diarrhea in the industrialized world (8). Poultry meat has been reported as a major source of human infection, and contaminated chicken is estimated to cause between 55 and 71% of human cases. In addition, studies have estimated that between 8 and 14% of human cases are attributable to cattle and a further 14 to 16% to sheep within the United Kingdom (6). An additional recent article by Sheppard et al. and a chapter by Fitzgerald and Nachamkin also review the recent epidemiology of *Campylobacter* organisms (7, 10). *Campylobacter* species have also been reported to contaminate water sources and have also been associated with the ingestion of raw clams (2). Mussels and oysters have been shown to harbor species of *Campylobacter* (primarily *C. lari*, but also *C. jejuni*, *C. coli*, and *C. upsaliensis*) in The Netherlands and presumably may be a source for human infections (11). However, *Campylobacter* species (*C. fetus*, *C. jejuni*, and *C. lari*) have only rarely been reported in association with prosthetic hip and knee infections (1, 3, 5, 9, 12, 13). Our case is unusual in that it is the first reported case of a prosthetic hip infection caused by *C. coli* with ingestion of contaminated raw oysters from the Pacific Northwest, United States, as the presumed source. Again, we reinforce the need for microbiologists to be aware of the possibility of these organisms in specimens other than stool and blood.

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