

Corynebacterium accolens Isolated from Breast Abscess: Possible Association with Granulomatous Mastitis[∇]

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***Corynebacterium accolens* is rarely isolated as a human pathogen. We describe here a case of *C. accolens* isolated from a breast abscess in a patient previously diagnosed with granulomatous mastitis. The possible association of *Corynebacterium accolens* and granulomatous mastitis in this patient is discussed.**

CASE REPORT

A 23-year-old woman presented to the surgical department with a mass in her right breast. The mass had been present for eight months, with a gradual increase in size. The pain was worse upon touching or moving the nipple, but there was no discharge. She had been treated with flucloxacillin with no improvement. She had an 18-month-old son and had stopped breast-feeding 8 months before presentation, after which she noticed the mass in her right breast.

Her past medical history included endometriosis and subsequent adhesions, but otherwise there was no history of diabetes, tuberculosis, sarcoidosis, or immunodeficiency.

Upon examination, she had a tender, hard, and warm swelling in the lower outer quadrant of her right breast. Apart from a raised C-reactive protein level of 48 mg/liter, the results of blood tests, including full blood counts and serum electrolyte tests, were unremarkable. An abdominal ultrasound showed several irregular hypoechoic areas in the right lower outer quadrant, with no definite abscess cavity. Pus that was aspirated from the breast had a moderate number of leukocytes, but no organism was seen after Gram staining. No acid-fast bacilli were seen after auramine O staining. The specimen was plated (i) onto horse blood agar (Oxoid, Basingstoke, United Kingdom) and incubated at 35°C both with 5% CO₂ in air and anaerobically, (ii) onto MacConkey agar (Oxoid) and incubated at 37°C in air, and (iii) onto neomycin blood agar and incubated anaerobically at 37°C. A further horse blood agar plate and a neomycin blood agar plate were inoculated for extended anaerobic incubation of 7 days. In addition, the pus was inoculated into liquid mycobacterial culture medium, *Mycobacterium* growth indicator tube (MGIT) medium (Becton-Dickinson Microbiology Systems, United Kingdom), and incubated for 4 weeks. After 48 h, there was scanty mixed growth of *Streptococcus* and *Corynebacterium* species on the horse blood agar plate incubated at 35°C in CO₂. There was no growth from any of the other plates, including those with extended anaerobic incubation. As the *Streptococcus* and *Coryne-*

bacterium organisms constitute skin flora, no further microbiological work was carried out. Histology from a core biopsy revealed inflammation of the lobules and interlobular tissues, with necrotic foci and one discrete granuloma made up of a group of multinucleate cells. These features suggested a diagnosis of granulomatous lobular mastitis.

Following the needle aspiration and core biopsy, the patient was treated with amoxicillin-clavulanic acid (500 mg and 125 mg, respectively, three times a day). Two days later, her breast swelling had increased and was accompanied by severe pain. Pus (3 ml) was again aspirated, and routine bacteriological culture did not identify any organism, nor were there any acid-fast bacilli isolated on MGIT broth (Becton Dickinson Microbiology Systems, United Kingdom). Nevertheless, as a significant amount of chronic granulomatous mastitis is tuberculous in origin, she was commenced on the antituberculosis regimen of isoniazid, rifampin, pyrazinamide, and ethambutol.

Five weeks after the patient's initial presentation, there was a recurrence of swelling in her right breast. An ultrasound showed a large fluid collection measuring approximately 38 by 40 mm, with another smaller pocket of approximately 25 mm in the left outer quadrant. A 45-ml volume of pus was aspirated but again failed to yield any organism upon culture. She required four additional aspirations, on average once every fortnight. Five months after she first noticed the breast abscess, it appeared to resolve and her antituberculosis treatment was subsequently stopped. In total, she was on quadruple antituberculosis treatment for 4 months and on dual therapy consisting of isoniazid and rifampin for 1 month.

She returned 1 year following her last aspiration with a swollen, tender, red right breast. The duration between her first presentation and this occasion was 17 months. She was then 37 weeks pregnant. She had accidentally knocked that breast, after which it had developed a mass that had become progressively painful. This was thought to be a new episode of infection, and she was given amoxicillin (250 mg three times a day) by her general practitioner, but her symptoms failed to improve. Ultrasound showed a 40-mm multilocular abscess cavity in the upper outer quadrant of her right breast.

Upon microscopy, 20 ml of the pus aspirated showed a moderate number of leukocytes. The pus was inoculated onto horse blood agar (Oxoid, Basingstoke, United Kingdom), MacConkey agar (Oxoid), and neomycin agar plates and MGIT

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medium (Becton Dickinson Microbiology Systems, United Kingdom) for mycobacterial culture as was done previously. There was no organism seen upon Gram staining of the specimen, nor were there acid-fast bacilli seen upon auramine O staining. After 48 h of incubation at 35°C in CO₂, there was a moderate level of pure growth of small, gray, nonhemolytic colonies on the blood agar plate. Upon microscopy, these were found to be gram-positive rods with a Chinese letter arrangement (in "palisades" and V shapes) resembling *Corynebacterium* species. The profile generated on API Coryne (bio-Mérieux) was 1000104, which gave a 95.9% identification of *Corynebacterium accolens*, with *T* equal to 0.75, where *T* represents manufacturer-defined variables. The organism was catalase positive and oxidase negative, reduced nitrate, and did not have urease or pyrazinamidase activity. It did not hydrolyze esculin, and fermentation tests showed that it produced acid from glucose only. Using Etests for susceptibility testing, the MIC for vancomycin was found to be 1.0 mg/liter and that for penicillin was found to be 0.5 mg/liter. In the absence of a guide to definitive interpretative criteria at the time of investigation, we used BSAC clinical breakpoints for staphylococci and streptococci (6) and "non-species-related" breakpoints from EUCAST for MICs of penicillin and vancomycin, respectively. According to these sources, the breakpoints for penicillin are 0.12 mg/liter for susceptible organisms and 0.25 mg/liter for resistant organisms and those for vancomycin are 4 mg/liter for susceptible organisms and 8 mg/liter for resistant organisms. Based on these criteria, the organism was susceptible to vancomycin but not penicillin.

The patient then had a formal incision to allow drainage of the abscess at the same time that she was under general anesthesia for an elective caesarean section. She was given a 7-day course of amoxicillin, and she decided not to breast-feed her baby. She had two additional lumps in her right breast in the following 3 weeks, both thought to be galactocele as only milk was obtained upon aspiration. Although she described having tenderness in the lower inner quadrant of her right breast 2 months later, clinically, her breast felt normal and there was no sign of an abscess.

Corynebacteria have been implicated in breast infections. Among those reported are the nonlipophilic species *Corynebacterium striatum*, *Corynebacterium minutissimum* (9), *Corynebacterium amycolatum*, and, most recently, the lipophilic species *Corynebacterium kroppenstedtii*.

Corynebacterium accolens from human clinical specimens (wound drainage, endocervix, sputum, and throat swab specimens) collected over a 30-year period was first described by Neubauer et al. in 1991 (3, 5, 7). It is a gram-positive bacillus and was originally characterized by its satellite growth around a *Staphylococcus aureus* streak on blood agar (5, 7). *C. accolens* is considered an inhabitant of the upper respiratory tract (2). It is a lipophilic species that forms small, gray, transparent, non-hemolytic colonies on sheep blood agar after 48 h of incubation. Typically, *C. accolens* produces good growth in media enriched with a significant amount of lipids (e.g., 0.1 to 1% Tween 80), where it produces colonies like those of *Corynebacterium diphtheriae* or *C. minutissimum*. Nonetheless, it still

grows on routine media such as horse blood agar, as in our case, since most media used in routine laboratories contain minimum amounts of lipids, which results in the growth of small colonies.

C. accolens reduces nitrate but does not hydrolyze esculin or produce urease. Like most other corynebacteria, *C. accolens* is pyrazinamidase positive, but alkaline phosphatase is not produced. It ferments glucose, with some strains fermenting sucrose and/or mannitol. Isolates of this species have been susceptible to penicillin, cephalosporins, erythromycin, clindamycin, tetracycline, and the aminoglycosides, but they are resistant to sulfamethoxazole (5).

With reference to the patient described above, the breast abscess from which *C. accolens* was isolated was very close to—almost overlying—the area that was thought to have granulomatous mastitis. Granulomatous lobular mastitis is an inflammatory breast disease of unknown etiology that generally affects women of child-bearing age within a few years of giving birth (8). Clinically, it may present as a hard mass resembling a malignancy or as a firm, red, tender lesion suggestive of an abscess. Histologically, the granulomas are centered on lobules, are often suppurative, and may be associated with microabscess formation. The granulomas may also surround empty spaces, consistent with dissolved lipid. Other causes of mammary granulomas, such as tuberculosis and sarcoidosis, must be excluded (11). The pathogenesis of granulomatous mastitis is unknown, though there is a suggestion of a continuum from subclinical mastitis to mastitis and finally to a breast abscess (9). Various theories have been postulated regarding the etiology of granulomatous mastitis, including autoimmune and hypersensitivity processes, an association with the oral contraceptive pill, a reaction of extravasated luminal secretions, trauma, and infection, but they have not been substantiated (11). Taylor et al. recently published a review suggesting a link with *Corynebacterium* infection, particularly with *C. kroppenstedtii*. Their study also suggested that breast-feeding for lactating women is a significant risk factor in the pathogenesis of inflammatory breast disease in view of their predisposition to develop static secretions (11).

For the patient described above, we are unable to confirm the presence of *C. accolens* in the original aspirate, as no definitive identification was carried out on the mixed growth of the *Corynebacterium* and *Streptococcus* species. In addition, histological examination did not show gram-positive rods. However, it is possible that the presence of *C. accolens* was the cause of her initial symptoms, which, over time, resulted in another abscess following trauma. Another possibility is that there is no association between her original diagnosis of granulomatous mastitis and the *C. accolens* isolated. It is likely that the organisms isolated, initially reported as skin flora, were indeed nonpathogenic and hence insignificant. The mild trauma she sustained on her breast prior to her second presentation could have been incidental or it could have resulted in the entry, most probably through her nipple, of the causative organism, leading to a deep infection.

As corynebacteria constitute part of the normal skin flora, it can be difficult to distinguish between infection, colonization, and contamination with these organisms (8). Despite the uncertainty, it is important to consider *Corynebacterium* species causative organisms in abscesses, especially when isolated as a

pure or predominant growth of $>10^4$ CFU/ml. Funke et al. proposed that the presence of gram-positive bacilli associated with polymorphonuclear cells in the clinical specimen is strong evidence for a causal role. Pure cultures support a possible disease association, and the predominance of coryneform bacteria in material from normally sterile sites should also be considered an indicator for a possible disease association (4). Microbiological tests should include identification to the species level and susceptibility testing.

There are few data on standardized methodology regarding corynebacterial susceptibility testing and breakpoints. Soriano et al. published the antimicrobial susceptibilities of various *Corynebacterium* species to 18 antimicrobials using the agar dilution method with Mueller-Hinton agar (Oxoid, Basingstoke, United Kingdom) that was supplemented with 5% sheep blood (10). There was no United Kingdom interpretative guide for breakpoints or zone diameters for corynebacteria specifically until recently, when the BSAC published breakpoints for corynebacteria using BSAC susceptibility methods (1). According to these breakpoints, the *C. accolens* strain was resistant to penicillin but susceptible to vancomycin. When the patient was given a penicillin-based drug on a few occasions, she failed to respond. Although she was given amoxicillin following the final incision and drainage, she does not appear to have relapsed up to the time of writing.

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