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Chronic Breast Abscess Caused by Corynebacterium Kroppenstedtii

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Abstract
Corynebacterium is being increasingly isolated in specimens to be proven as a causative organism in clinical disease, especially breast abscesses and mastitis. Specifically, Corynebacterium kroppenstedtii lacks the typical mycolic acids of the cell envelope, requiring lipid rich areas to grow, hence the mammary areas being ideal for its proliferation. Conservative treatment is routinely first line in breast abscess, however commonly prescribed antibiotics such as beta lactams and fluoroquinolones, are hydrophilic and do not penetrate in lipid rich environments such as the breast, thus patients are left partially treated without complete resolution of the disease process. This case report highlights the importance of considering C. kroppenstedtii, especially if recurrent infection is seen. Microbiologists should be alerted to specialized growth conditions and tools for appropriate culture such that clinicians can use a multimodal approach with early surgical intervention alongside antibiotic treatment to maximize clinical cures and reduce recurrence.

Keywords: Breast Abscess, Mastitis, Corynebacterium, C. Kroppenstedtii

1. Background

Corynebacterium's significance as a pathology-inducing organism is debated as it can be dismissed as a skin commensal organism or contaminant in clinical specimens – especially when cultured form a non-sterile site. However, with advancement in DNA sequencing, Corynebacterium is being increasingly isolated in specimens to be proven as a causative organism in clinical disease, especially breast abscesses and mastitis (Lewis, Cecil M Jr et al., 2012; Turnbaugh, P., Ley, R., Hamady, M. et al., 2007). Since 2000, Corynebacterium has been linked with inflammatory breast disease, with a large case series concluding that Corynebacterium was found in the majority of cases of granulomatous mastitis (Taylor, Graeme B et al., 2003). Here we discuss the case of a 41-year old woman, whose samples isolated Cornyebacterium kroppenstedtii as the causative organism for a chronic breast abscess over 2 years. Uniquely, *C. kroppenstedtii* lacks the typical mycolic acids of the cell envelope, that most other members of its genus hold. The lack of mycolic acids caused by gene loss means *C. kroppenstedti* requires

lipid rich areas to grow, hence the mammary areas being ideal for its proliferation (Baumgart, Meike et al.,2013; Collins, M. D., Falsen, E., Akervall, E., Sjoden, B., & Alvarez, A., 1998; Tippelt, A., Mollmann, S., Albersmeier, A., Jaenicke, S., Ruckert, C., & Tauch, A, 2014). This case report recognizes that the unique pathogenic qualities of this bacteria encourage consideration for surgical management, namely incision & drainage, to be considered early for definitive source control.

2. Case Presentation

A 41-year old, South Asian woman presented with a chronic left breast abscess. Her medical history includes previous caesarian section, ovarian ligation and iron deficiency anemia. She is a non-smoker, non-drinker, takes regular iron supplementations and has not breast fed in more than five years. There is no family history of breast or ovarian cancer.

The patient initially presented with symptoms 29 months prior to surgery. She reported a one-week history of redness, pain and swelling of the left breast with no associated fever or other symptoms. Her GP referred her to the breast clinic and initially treated her with a one-week course of amoxicillin/clavulanic acid 500mg/125mg three times daily, which subsided the pain and redness. The patient was seen in breast clinic just after finishing the course of antibiotics. On examination, there was firm lump palpable at 12 o'clock position but no obvious signs of inflammation. Ultrasound scan (USS) demonstrated a small subcutaneous collection 15mm x 6mm at the 12 o' clock position, leading to a larger echogenic area, approximately 6cm. The USS also showed an old well-defined oval anechoic mass measuring 9 mm x 4 mm, in keeping with a cyst. Due to the examination findings, it was decided that the presentation was not typical of mastitis/breast abscess and a follow-up USS and clinic appointment was made for 4 weeks later. In this follow up appointment, the patient complained of no symptoms and refused to be examined as she felt she had no concerns. The repeat USS, done 10 days prior to the follow-up appointment, showed resolution of the subcutaneous fluid collection at the 12 o'clock position with the previously described cyst also no longer being visualised. Subsequently, the patient was discharged from the breast clinic.

26 months after the initial presentation, the GP referred the patient for an urgent 2 week wait clinic as she noted a month's history of a painful lump in her left breast. During this month of symptoms, the patient had completed a one -week course of amoxicillin/clavulanic acid 500mg/125mg three times daily, which had minimal effect on her symptoms. When seen in breast clinic, she noted the tenderness had reduced but the lump persisted. On examination, tender nodularity was felt in the left upper central breast in keeping with mastitis. The right breast examination was normal. The mammogram was normal. An USS showed an area of mixed echogenic textural change in the upper outer quadrant with prominent ducts in the area of the lump. No focal fluid collection was seen in the region. The lower outer quadrant showed a series of branching anechoic tubular structures with internal echoes in keeping with inspissated prominent ducts, the largest measuring 4 mm in diameter. As a result, the patient was started on Flucloxacillin 1 gram, four times daily and Metronidazole 400mg, three times daily for 14 days, in line with local guidelines for the treatment of mastitis. The patient was to have a follow-up USS in 4-6 weeks' time and a clinic appointment.

Two months later, the patient had a repeat USS which showed new lobulated echogenic fluid collection occupying almost the entire left upper outer quadrant, in keeping with a large left breast abscess. Using ultrasound guided fine needle aspiration, 20ml of pus was aspirated and samples sent for cytological and histological analyses – this demonstrated no growth. At this time, the patient had ongoing inflammation and swelling of the left breast. Antibiotic therapy was changed to amoxicillin/clavulanic acid 500mg/125mg three times daily and Metronidazole 400mg three times daily for further 14 days and re-review in 2 weeks' time.

The patient returned to clinic a month later. The left breast had not responded to antibiotics and symptoms had worsened. On examination, the abscess was red, hot, tender and protruding over the skin surface. The patient was admitted for incision and drainage with a view of taking a biopsy from the abscess wall. The operation finding was a raised fluctuant complex abscess measuring 50mm x 50 mm on the surface, multiple loculations and measuring approximately 50mm x 50mm x 50mm internally. Pus, serous fluid and an abscess wall biopsy was sent for microscopy, culture, sensitivities and histopathological analyses including acid-fast bacilli. The pus cultured by 16S rRNA gene sequencing grew Corynebacterium *kroppenstedtii,* as a monobacterium. The biopsy

microscopically described dense acute and chronic inflammation and granulation tissue suggestive of infections. No granulomas were seen and no evidence of malignancy. No tuberculosis was identified. The patient was discharged post-operatively with a further one-week course of amoxicillin/clavulanic acid 500mg/125mg three times daily.

After the surgical drainage of the abscess, the patient was regularly reviewed in the clinic for wound management. Repeat USS one-week post drainage showed fluid collection in cavity wound and no other separate fluid collections. Thus, a further one-week course of amoxicillin/clavulanic acid 500mg/125mg three times daily was prescribed. At the end of month 29, the fluid collection was resolved, and the wound cavity was healing well with no signs of infection. The patient reported intermittent pain controlled with paracetamol. Later, the patient was seen and discharged from breast clinic, as there were no further symptoms.

3. Discussion

This case report is one of few published on infection by this organism leading to chronic abscesses, although it appears to be an increasingly documented cause of breast abscess. The diagnosis was established by the purulent fluid culture growing pure *C. kroppenstedtii*, with biopsy findings that are typical and consistent for an immune response to an infection by this organism (Renshaw, Andrew A et al., 2011). Interestingly, the gram stain on the biopsy is negative but this is likely secondary to organisms typically residing in cystic spaces rather than inflamed tissues. In terms of antibiotic susceptibility, only a small number of clinical isolates have been tested for antimicrobial susceptibility, and it is likely that recurrent antibiotic use led to sub-detectable levels of isolates and sensitivities (Tauch, Andreas & Fernandez-Natal, M. & Soriano, Francisco.2016; Riegel, P., Liégeois, P., Chenard, M., Mathelin, C., & Monteil, H. 2004; Fernández-Natal, Maria Isabel et al., 2015).

For this patient, multiple anti-microbial agents and non-invasive techniques were initially tried with no avail. Although the patient was systemically well, she had suffered with symptoms on-off for over two years. The commonly prescribed antibiotics such as beta lactams and fluoroquinolones, are hydrophilic and do not penetrate in lipid rich environments such as the breast (Dobinson, Hazel C et al, 2015). This results in partially treated abscess causing a recurrent abscess, as seen in this case study.

Surgical management of breast abscesses is not routinely first-line, unless US guided aspiration of pus and/or catheter drainage alongside a course of antibiotics fails to evacuate the abscess (Kataria, Kamal et al, 2013). However, in this case, source control was only achieved once incision & drainage of the abscess with curettage was completed. This case report suggests that earlier use of surgical interventions in chronic abscesses caused by *C. kroppenstedtii* should be considered.

4. Conclusion

There is limited literature to guide clinicians on the treatment of breast abscess caused by Corynebacterium species. This case study proves the benefit of surgical drainage of an abscess caused by *C. Kroppenstedtii* as definitive source control, compared to empirical antibiotic treatment or ultrasound-guided drainage. Ultimately, when treating a breast abscess, especially if recurrent, infection with *C. Kroppenstedtii* should be considered and multimodal approach of surgical and antibiotic therapy should be given to appropriately treat the causative organism and reduce chances of recurrence.

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