Case Report

**Rhodococcus equi** granulomatous mastitis in an immunocompetent patient

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A 37-year-old immunocompetent woman was evaluated for progressive swelling of her left breast. Magnetic resonance imaging (MRI) showed multiple hypo-intense solid lesions and could not exclude breast cancer. Tissue biopsy was suggestive of granulomatous mastitis without any evidence of malignancy. Culture of the specimen in brain heart infusion broth grew *Rhodococcus equi*. The patient responded well to combination therapy with ciprofloxacin and azithromycin, and the lesions regressed in follow-up MRI. To the best of our knowledge, this is the first report of *R. equi* granulomatous mastitis. Accurate identification of this rare pathogen is necessary to provide appropriate treatment in granulomatous mastitis.

**Introduction**

Unilateral breast swelling is usually a manifestation of breast cancer and the prognosis is guarded. It is important to recognize non-malignant causes of breast lump as the treatment and outcome are different. Chronic infections are important in this scenario. We describe a breast abscess caused by *Rhodococcus equi* in a young woman, which clinically mimicked breast cancer, and discuss the clinical and radiological features and histopathological and bacteriological diagnosis.

**Case report**

A 37-year-old multiparous, immunocompetent woman was evaluated for a progressively enlarging breast lump of 5 months’ duration. Examination showed a 3 × 3 cm soft cystic swelling in the left breast with axillary lymph node enlargement, which was clinically diagnosed as an abscess of the left nipple areolar complex and she was subjected to incision and drainage. On review after 2 weeks, a 2 × 2 cm firm non-tender lump persisted in the same location. The skin over the swelling was involved, but there was no discharge from nipple. She was evaluated with the possible diagnosis of breast cancer with these findings. Her mammogram showed a BI-RADS IV lesion. Examination showed solid hypo-echoic lesions, some with well-circumscribed margins and some with spiculated margins. Magnetic resonance imaging (MRI) revealed 15–20 irregular T1 and T2 hypo-intense lesions of varying sizes in the left breast (1.5–2 cm in size). Larger lesions showed restricted diffusion. On post-contrast study, all these lesions showed thick irregular peripheral enhancement (Fig. 1a). Multi-phase post-contrast dynamic study showed a plateau/washout pattern. Enhancement kinetic curves obtained from most of these lesions were of type II to type III (indeterminate to malignant) pattern. A few small axillary nodes were seen on the left side. Minimal peri-areolar skin thickening was also noted in the left breast. A guided fine needle aspiration biopsy was taken and sent for cytology, culture and sensitivity tests. Cytology revealed dense collections of polymorphs along with focal collections of histiocytes in a background of blood and cellular debris. No ductal epithelial cells were noted. Culture of the aspirate was also sterile after incubation for 48 h. As diagnosis could not be established, the patient underwent wide excision of the left breast lump and the tissues were analysed.

The excised tissue was subjected to microbiological analysis to isolate the infective organism. Gram-stain of the operative specimen showed moderate pus cells but no organism. No acid-fast bacilli were seen. The specimen was inoculated onto sheep blood agar, MacConkey agar and brain heart infusion (BHI) broth and incubated at 37 ºC aerobically. In addition, the pus was also inoculated on to Lowenstein-Jensen medium and Sabouraud’s dextrose agar to isolate mycobacterial and fungal pathogens. There was no growth in any of these media other than BHI broth. Gram staining from the BHI broth showed short branching filamentous Gram-positive rods. A subculture was made onto blood agar, which grew small colonies at 24 h and a
salmon pink pigmentation was noticed after 4 days of incubation. Gram staining of the colonies from blood agar showed Gram-positive coccus-bacillary forms. Modified Kinyoun stain showed weakly acid-fast bacteria. The organism was non-motile, non-fermentative, positive for catalase, urease and CAMP test and was negative for oxidase, indole, citrate assimilation, nitrate reduction and aesculin hydrolysis. It was identified as *Rhodococcus equi* based on the colony characters with typical salmon pink colour and biochemical reactions (Verville et al., 1994; Conlin et al., 2000). The organism was susceptible to erythromycin, azithromycin, clarithromycin, ciprofloxacin, levofloxacin, rifampicin, amikacin, meropenem, imipenem and vancomycin and resistant to co-trimoxazole. Blood culture was sterile. It is well known that the majority of human isolates are vap B-positive *R. equi*. However we could not evaluate the virulence of the organism due to the lack of a PCR facility. The available VITEK 2 automated identification and sensitivity system does not have cards for identification of *Rhodococcus* spp.

Histopathological examination of the breast tissue showed a dense inflammatory infiltrate composed of lymphoplasmacytic cells and macrophages. Granulomas composed of epithelioid cells, giant cells and lymphocytes were also noted, which was suggestive of granulomatous mastitis (Fig. 2). Fungal stains were negative. There were no malignant cells. The lymph nodes histology was also suggestive of chronic inflammation. Serological evaluation for anti-human immunodeficiency virus antibody was negative.

The patient was started on combination therapy of oral ciprofloxacin 750 mg twice daily and azithromycin 250 mg daily, which was continued for 4 weeks with good clinical response. Repeat MRI after 6 weeks showed complete resolution of the peripherally enhancing left breast lesions seen in the previous study (Fig. 1b). No recurrences were observed in the 5-month follow-up.

Retrospectively, the patient gave a history of contact with farm animals but denied skin injury.

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**Fig. 1.** (a) Sagittal post contrast T1W MRI showing multiple irregular peripherally enhancing lesions with speculated borders in left breast. (b) Complete resolution of the lesions after therapy.

**Fig. 2.** Histopathological section showing granuloma composed of giant cells and histiocytes (haemotoxylin and eosin stain, magnification ×200). Inset showing magnified view of the granuloma (magnification ×400).
Discussion
The infective causes of chronic granulomatous mastitis include tuberculosis, non-tuberculous mycobacterial infections, actinomycosis, melioidosis, Corynebacterium infections, cat scratch disease, tularaemia, mycotic infections and parasitic infestations and signs may mimic breast cancer (Osborne, 1989). R. equi has not been included in the aetiology of granulomatous mastitis previously.

*R. equi*, a partially acid-fast aerobic actinomycete, which primarily causes zoonotic infections, is becoming increasingly recognized as an important pathogen for immunosuppressed human hosts since the first human case was reported in 1967. Infections in immunocompetent patients are extremely rare: only 19 cases in immunocompetent hosts have been reported. Most *Rhodococcus* human infections have been caused by *R. equi* (Scott et al., 1995). Infections in immunocompetent patients have a wide range of manifestations, from localized infections secondary to trauma to fatal systemic infections (Kedlaya et al., 2001). Localized infections represent nearly 50% of reported cases. Pulmonary infections, mainly necrotizing pneumonia, account for 42% of infections in immunocompromised hosts, compared with 84% of infections in immunocompromised hosts (Kedlaya et al., 2001). Extrapulmonary infections include wound infections, subcutaneous abscesses, brain abscess, meningitis, pericarditis, osteomyelitis, cervical adenopathy, endophthalmitis, lymphangitis and mastoiditis. Infection with *R. equi* can be fatal, even in immunocompetent hosts (Verville et al., 1994). Infections in both animals and humans are thought to be acquired through inhalation or ingestion of the organism. Inoculation into a wound can also lead to infection. Exposure to farm animals, soil or manure has been reported in many human cases (Prescott, 1991).

Our patient was a housewife with exposure to farm animals, such as cows and goats, and was exposed to soil and manure. Even though she denied direct skin injury, it is possible that organisms from her hand might have got inoculated into the breast, resulting in an abscess.

A common feature of human *R. equi* infection is delay in diagnosis. The insidious course of disease contributes to delay, as does failure to identify the organism. Cultures of *R. equi* grow easily under aerobic conditions on non-selective media. Large, irregular, highly mucoid colonies usually grow optimally at 30 °C and turn to a salmon-pink colour within 48 h. Further incubation leads to release of its red pigment leading to its characteristic salmon-coloured colonies. It is non-fermentative, which differentiates *Rhodococcus* from *Corynebacterium*. *R. equi* is catalase and urease positive, and oxidase negative (Guerrero et al., 2011). The appearance of *R. equi* as a Gram-positive, weakly acid-fast, diphtheroid-like organism may lead to confusion with a component of the normal flora or a contaminant (a diphtheroid, a micrococcus or a Bacillus sp.). On the basis of acid-fast staining results, it can be mistaken for *Mycobacterium* (Borghi et al., 2008). It is important to have a high index of suspicion and close cooperation between the surgeon, pathologist and microbiologist for the diagnosis of this potentially curable infection, which may otherwise be fatal.

References