

Case Report

A case of abscess after BCG vaccine in an immunocompetent child without other clinical signs

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Introduction: Bacille Calmette–Guérin (BCG), an attenuated strain of *Mycobacterium bovis*, is a rare cause of infection, with few published cases in immunocompetent individuals.

Case presentation: We present the case of a cutaneous abscess in an immunocompetent infant returning from Morocco, where he received a BCG vaccination. The abscess developed at the site of inoculation in the forearm (a non-recommended site) in the absence of lymphadenopathy or systemic signs. The lesion did not recur after aspiration of the abscess and further treatment was not required.

Conclusion: Infections caused by *M. bovis* BCG may be difficult to diagnose without systemic signs or lymphadenopathy but should be suspected in children returning from regions where BCG vaccination is widely applied. The present report suggests that abscess formation after BCG vaccination is a continuing problem, particularly in tuberculosis-endemic areas and when recommendations concerning dosage or injection techniques are not followed. Moreover, we highlight here the importance of combining phenotypic and genotypic methods for quick identification of *Mycobacterium bovis* BCG in abscess drainage fluids.

Keywords: Abscess; BCG vaccine; erythematous skin lesion; mycobacteriosis; *Mycobacterium bovis* BCG abscess; needle aspiration; swelling.

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Introduction

Bacille Calmette–Guérin (BCG), an attenuated strain of *Mycobacterium bovis*, is the main component of the tuberculosis vaccine, which was first used in humans in 1921 (Guérin, 1957) and is administered worldwide to prevent tuberculosis (Gyldenløve *et al.*, 2012; Lotte *et al.*, 1984). Local or systemic side effects due to primary BCG vaccination are relatively uncommon, and are mostly seen in cases of overdose, fortuitous revaccination or poor injection techniques. Only a few cases have been reported in the literature (Cuchet *et al.*, 2004; Diniz *et al.*, 2014; Lussier *et al.*, 1999; Murphy *et al.*, 1989; Okazaki *et al.*, 2005; Zaïem *et al.*, 2014). In Italy, because the general population is at low risk for acquiring tuberculosis infection, BCG vaccination for the entire population is not presently recommended. However, since 1970, BCG has been administered to children aged 6–9 years in some provinces, and to tuberculin-skin-test-negative high-risk groups such as army soldiers, children infected with hepatitis C virus,

and children in contact with tuberculosis patients or living in high prevalence areas. We report the case of a localized cutaneous abscess in an infant who had previously received a BCG vaccination in Morocco. A strain of *M. bovis* BCG was identified using multiplex PCR of the regions of difference (RD) (Nakajima *et al.*, 2010). This case highlights the importance of considering BCG-induced infection in the differential diagnosis of cutaneous lesions occurring in non-immunocompromised patients returning from areas where BCG vaccination is widely administered.

Case report

A female infant (1 year old) was brought by her parents to the Unit of Pediatric Surgery of the University of Messina Polyclinic 'G. Martino' for evaluation of an inflammatory lesion on her right forearm. She was born and raised in Italy but had travelled to Morocco with her parents 2 months before the consultation. In Morocco, she received a BCG vaccination in the internal aspect of her right forearm, which is not a recommended site. She had no past

Abbreviations: BCG, bacille Calmette–Guerin; RD, regions of difference.

medical history and no known contact with tuberculosis. Information on the vaccine manufacturer and technique of inoculation was not available. Six weeks later, she developed a painful swelling, and an erythematous and infiltrated skin lesion at the injection site. There were no associated systemic signs or symptoms and no lymphadenopathy. At presentation, there was a circular erythematous swollen area of 2 cm diameter with indurated margins at the site of the inoculation (Fig. 1). A needle aspiration of the lesion was performed and 2 ml pus was collected. As a cause of the lesion, the parents suggested vaccination, and BCG-induced abscess was immediately suspected. A Gram stain and routine bacterial culture were not performed. A Ziehl–Neelsen stain showed acid-fast bacilli (Fig. 2), and mycobacteria were grown after 14 and 18 days in an MGIT system (Becton Dickinson) and on Löwenstein–Jensen medium, respectively. The micro-organism was identified by multiplex PCR of the RD (Behr *et al.*, 1999; Parsons *et al.*, 2002) as *M. bovis* BCG. The strain was negative in a pyrazinamidase test, an assay that is often used for the presumptive differentiation between *M. tuberculosis* and *Mycobacterium bovis*. As the latter species does not produce pyrazinamidase and is resistant to pyrazinamide, the result of this test was compatible with *M. bovis*/BCG. The abscess was disinfected and treated with gentamicin sulfate ointment daily for 2 weeks to prevent secondary bacterial infection. No treatment with isoniazid or other antituberculosis drugs was considered to be required. The lesion improved considerably within 1 month and was completely cleared



Fig. 1. Erythematous and infiltrated skin lesion at the injection site on the right upper arm at the vaccination site.

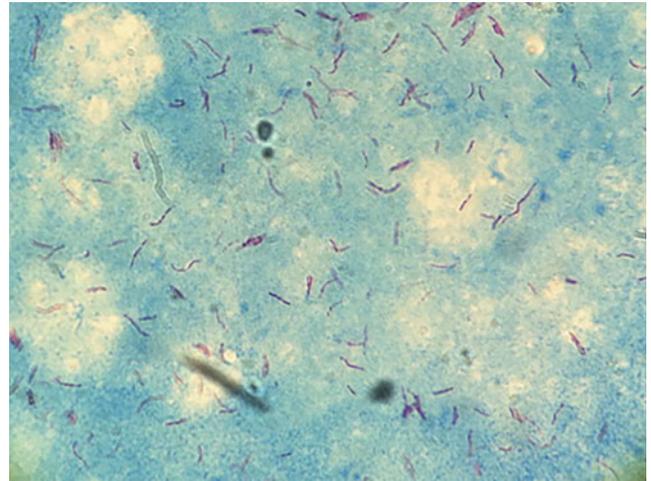


Fig. 2. Acid-fast bacilli in a Ziehl–Neelsen stain of needle aspiration material from the lesion.

within 3 months. No relapse has been observed after 4 months of follow-up.

Discussion

Tuberculosis remains a global public health problem affecting both humans and animals. The estimated worldwide incidence rate was 127 cases per 100 000 of the population in 2013 (WHO, 2014). Tuberculosis was second only to human immunodeficiency virus/AIDS as the greatest killer worldwide in 2013. Indeed, 9 million people fell ill and 1.5 million died from the disease (WHO, 2014). BCG vaccination can significantly reduce the overall risk of tuberculosis and is particularly effective against disseminated forms of the disease. Abscess formation at the site of BCG vaccination is uncommon if injection is performed intradermally at the recommended sites (in the deltoid region or in the upper external part of the thigh) using the indicated dosage and hygienic techniques. Thus, in the case presented here, it is possible that abscess formation was the result of injection at a non-recommended site and/or subcutaneous, instead of intradermal, inoculation. Differential diagnosis of a cutaneous lesion in a patient arriving from endemic areas includes a number of different conditions ranging from a variety of infections to tumours. For example, differential diagnosis should include staphylococcal abscess, spirotrichosis, nocardiosis, chromomycosis, leishmaniasis, tertiary syphilis, hidradenitis and all forms of panniculitis, to name only a few. Differential diagnosis with cutaneous tuberculosis is fundamental in patients from underdeveloped countries, particularly in high-risk populations such as immigrants from endemic region. The BCG vaccine is rarely administered in developed countries, so it is not easy for clinicians to diagnose any complication related to the administration of this vaccine. Therefore, health

professionals should consider BCG as possible cause of cutaneous lesions developing in patients returning from areas where BCG vaccine is widely administered.

The clinical diagnosis must always be confirmed by histopathology and microbiological cultures.

In our case, with the exception of local swelling and erythema, there were no general or local signs of infection. A diagnosis of abscess caused by BCG was suspected, as the site of lesion corresponded to that of the BCG inoculation. For quick identification of the species, we ran a PCR assay in which three primers were used to detect the RD1, RD9 and RD10 regions. The strain we isolated lacked all three regions and was therefore identified as a BCG strain (Parsons *et al.*, 2002). Non-BCG strains of *M. bovis* may display one or all three of these regions, while *M. tuberculosis* strains display all three (Behr *et al.*, 1999). BCG vaccines consist of live attenuated strains of *M. bovis*. They were first used for immunization against tuberculosis in 1921 and are considered safe. Ninety per cent of the vaccines are produced from four different strains of *M. bovis*: Pasteur 1173P2, Danish 1331, Glaxo 1077 and Tokyo 1729. These BCG strains differ in their immunogenicity, efficacy and side effects (Starke & Connelly, 1994). Transitory adverse reactions arising from the use of BCG vaccine occur in 0.1–1.7 % of cases in immunocompetent infants (Lotte *et al.*, 1984). In addition to ulceration and abscess formation, rare adverse reactions to BCG vaccination include keloid formation and regional lymphadenitis. Localized abscesses without regional lymphadenopathy in immunocompetent hosts, such as the one reported here, are relatively uncommon (Fitzgerald & Duclos, 1991).

The pathogenesis is not clear, and causes might include technical errors in vaccine administration including overdosing. There are variable recommendations for management of post BCG abscess and suppurative lymphadenitis. These range from no treatment to needle aspiration, drug treatment, surgical drainage, surgical excision or a combination of these. Some authors suggest that needle aspiration is the management of choice, although this is not always effective and additional therapy may be required (Lussier *et al.*, 1999; Okazaki *et al.*, 2005). A similar case to one described here was reported by Lussier *et al.* (1999) in a young woman. In their case, in contrast to ours, the lesion did not resolve after needle aspiration and treatment with isoniazid was required. Similarly, a 3-month isoniazid course was necessary in the case reported by Okazaki *et al.* (2005) in which a BCG-derived abscess developed in a region some distance from the vaccination site. The management of BCG-induced abscess with erythromycin is highly controversial (Murphy *et al.*, 1989). In conclusion, healthcare personnel should be aware that extensive utilization of the BCG vaccine in many countries has increased the occurrence of BCG-derived complications and that these should therefore be considered in the differential diagnosis of patients arriving from tuberculosis-endemic areas.

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