A complication of BCG vaccine: A case of localized cutaneous abscess due to *Mycobacterium bovis*

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The attenuated bacille Calmette-Guérin (BCG) vaccine is administered to prevent tuberculosis. Complications of vaccination are uncommon. A case of cutaneous abscess due to BCG is presented in a 24-year-old woman. The abscess developed at the inoculation site four weeks after vaccination. Routine Gram stain and bacterial cultures of the pus were negative. The auramine stain was positive. Mycobacterial cultures were positive after 14 and 18 days, using the BACTEC 12B bottle and Löwenstein-Jensen media, respectively. The mycobacteria were identified as *Mycobacterium bovis*, vaccinal strain by high-performance liquid chromatography and DNA probe assays.

Key Words: BCG vaccine; Complications; Cutaneous abscess

Complication ancienne du vaccin BCG : abcès cutané localisé à *Mycobacterium bovis*

RÉSUMÉ : Le vaccin atténué du bacille Calmette-Guérin (BCG) est administré pour prévenir la tuberculose. Les complications de la vaccination sont rares. On présente ici un cas d'abcès cutané dû au BCG chez une femme de 24 ans d'origine marocaine. L'abcès s'est développé au point d'inoculation, quatre semaines après la vaccination. Les cultures bactériennes et la coloration de Gram du pus se sont révélées négatives. La coloration à l'auramine s'est révélée positive. Les cultures mycobactériennes étaient positives après 14 et 18 jours avec le flacon BACTEC 12B et le milieu Löwenstein-Jensen respectivement. La mycobactérie, *Mycobacterium bovis* de souche vaccinale, a été identifiée par chromatographie liquide de haute performance et sonde d'ADN.

The attenuated bacille Calmette-Guérin (BCG) vaccine is administered worldwide to prevent tuberculosis. In Canada, however, because the general population is at low risk for acquiring tuberculosis infection, a BCG vaccination policy for the entire population was abandoned more than 20 years ago, and only exposed tuberculin skin test-negative infants and children, and groups with an excessive rate of new infections are offered vaccination (1,2). In Quebec, large scale vaccina-

tion was implemented from 1926 to 1975, with a mean of 123,973 vaccines administered yearly from 1950 to 1975. Since then, there has been a major decrease in BCG vaccine use with only 133 vaccines given in 1989, the last year for which data are available (personal communication). Consequently, BCG vaccine complications estimated at 0.5% are rarely seen nowadays. We report a case of *Mycobacterium bovis* vaccinal strain cutaneous abscess at the site of inoculation.

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CASE PRESENTATION

A 24-year-old woman was referred to the out-patient clinic for the evaluation of an inflammatory lesion on her left forearm. She was born and raised in Morocco, and came to Canada as a student eight months before consultation. She had no past medical history and no known contact with tuberculosis. During a visit to Morocco in July 1997, because of a negative purified protein derivative skin test, she was administered a BCG vaccine into the internal aspect of her left forearm. Information on the vaccine manufacturer and the technique of inoculation was not available. Four weeks later, she developed painful swelling with central fluctuation at the vaccination site. There were no associated systemic signs or symptoms. On examination, the patient looked well. On the internal aspect of the left forearm, at the site of the BCG inoculation, there was an erythematous swollen area of 3 cm with indurated margins and central fluctuation. There were no signs of lymphangitis or lymphadenopathy. A needle aspiration of the lesion was performed, and 1 mL of pus was collected. Gram stain showed numerous polymorphonuclear leukocytes but no microorganisms, and the routine bacterial culture was negative. The auramine stain showed one acid-fast bacillus per high-powered field. Mycobacteria were detected after 14 days and 18 days in the BACTEC 12B radiometric system (Becton Dickinson and Company, Maryland) and on Löwenstein-Jensen media (Laboratoires Quelab), respectively. Inclusion of *p*-nitro-*-*acetylaminio-*-*hydroxypropylphenone inhibited the growth of the organisms. The organisms were niacin-negative and did not reduce nitrates. The pyrazinamidase test was negative. The high-performance liquid chromatography profile and DNA probe assay results confirmed the organism as *M bovis*, vaccinal strain. Three weeks after drainage, an ulcer developed and significant inflammatory signs persisted. Isoniazid 300 mg daily was prescribed. Despite many recalls, she was lost to follow-up.

DISCUSSION

Since 1921, the year the BCG vaccine was put into use in humans, there has been widespread use of the vaccine by the majority of countries in the world with the exception of The Netherlands and the United States, countries where immunization has traditionally been restricted to specific indications (3-6).

Unresolved questions about BCG vaccination include its overall efficacy, the duration of protective immunity and the effect of age at vaccination on protection (6). Ninety per cent of the vaccines are produced from four different strains of *M bovis*: Pasteur 1173P2, Danish 1331, Glaxo 1077 and Tokyo 172 (6). In Quebec, the Montreal strain developed at the Institut de Microbiologie et d'Hygiène de l'Université de Montréal, has been extensively used (7). All these strains of BCG differ in terms of their immunogenicity, efficacy and side effects (6). It is generally believed that vaccines derived from strains with the lowest concentration of viable bacilli per dose are stronger inducers of immunity but are more likely to be associated with side effects (8,9). The Pasteur 1173P2 and the Danish 1331 strains are considered as strong strains whereas the Glaxo

1077, the Tokyo 172 and the Montreal strains are considered as weak strains (6). Two BCG vaccines are licensed in Canada: Connaught strain (Pasteur Mérieux Connaught) and Montreal strain (Biochem Pharma).

Vaccine performance in prospective trials has ranged from 0% to 80% protective benefit (10). In a recent meta-analysis of the literature on the efficacy of BCG vaccine in the prevention of tuberculosis, Colditz et al (11) concluded that, on average, BCG vaccine significantly reduces the risk of tuberculosis by 50%. Protection against death from tuberculosis (78% protective effect), meningitis (64%) and disseminated disease (78%) is higher than for total tuberculosis cases.

The BCG vaccine is injected intradermally into the deltoid region or the upper external part of the thigh. The usual response to the vaccine is a red indurated area measuring 5 mm to 15 mm; the centre is soft for four weeks, and a crust is formed. The crust falls off between the sixth and 10th week and a scar remains (2,12).

The BCG vaccine is generally safe when administered to immunocompetent individuals. Complications include local reactions in 0% to 5% of recipients and, very rarely, systemic complications such as osteitis and disseminated *M bovis* infections (1,2,6,12,13). Factors associated with the development of local complications include the type, dose and strength of the vaccine strain, technique of inoculation, age, race, immune status of the recipient and previous positive tuberculin skin reaction (6). Muzy de Souza et al (14), in a study of 117,533 vaccinees, reported an incidence of local complications of 0.04% (51 patients), with 55% of these being abscesses. Other adverse reactions were ulcer formation, lymphangitis, suppurative adenitis and cheloid. Local reactions occurred as early as two weeks after vaccine administration in 30% of patients but could be seen as late as 90 days after the procedure.

Although the diagnosis of these complications can usually be made on clinical grounds, microbiological and histopathological examinations may be helpful. In the few studies reporting on the laboratory diagnosis, the sensitivities of the acid-fast smear (auramine-rhodamine) have ranged from 33% to 75%; cultures are positive in about two-thirds of patients (15,16).

It is unclear whether antimycobacterial treatment should be administered to treat local abscesses (6,12,17). In a controlled study, Caglayan et al (18), compared no therapy with therapy with either isoniazid alone or isoniazid and rifampin and found no statistical difference.

In our patient, following a negative purified protein derivative skin test, the BCG vaccine was administered into the anterior surface of the forearm, a faulty location. We do not know what type of BCG vaccine she received nor her human immunodeficiency virus (HIV) status because she was lost to follow-up. There were, however, no predisposing factors, high risk behaviours or physical findings that would suggest an increased risk for HIV infection. Interestingly, the auramine-rhodamine and Ziehl-Neelsen stains showed acid-fast bacilli, and the culture both on Löwenstein-Jensen and in the BACTEC radiometric system was positive, despite the known fastidious growth patterns of the live-attenuated *M bovis* strains (19).

BCG vaccine is very rarely administered in Quebec, so not surprisingly the complication was encountered in an individual having received medical care abroad. It is important for these cases to be reported to the public health authorities. Conservative management is indicated for most cases.

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