International Journal of Infectious Diseases (2009) 13, 537—542

http://intl.elsevierhealth.com/journals/ijid

Mycobacterium abscessus post-injection abscesses from extrinsic contamination of multiple-dose bottles of normal saline in a rural clinic☆

Jun Yuan[a,b,1], Yufei Liu[b,1], Zhicong Yang[b,*], Yanshan Cai[b], Zhiai Deng[b], Pengzhe Qin[b], Tiegang Li[b], Zhiqiang Dong[b], Ziqiang Yan[b], Duanhua Zhou[c], Huiming Luo[d], Huilai Ma[a], Xinglin Pang[b], Robert E. Fontaine[a,e]

[a] *Chinese Field Epidemiology Training Program, Beijing, China*
[b] *Guangzhou Center for Disease Control and Prevention, Guangdong Province, 510080, China*
[c] *Guangzhou Health Bureau, Guangdong Province, China*
[d] *Guangdong Centers for Disease Control and Prevention, China*
[e] *Centers for Disease Control and Prevention, Atlanta, Georgia, USA*

Received 15 February 2008; received in revised form 27 October 2008; accepted 8 November 2008
Corresponding Editor: Sheldon Brown, New York, USA

KEYWORDS
Mycobacterium chelonae;
Hospital infections;
Disease outbreaks;
Abscess;
Injection

Summary
Background: We investigated an outbreak of gluteal abscesses following intramuscular (IM) injections given at a clinic in rural China to identify the causative agent, source, and method of exposure.
Methods: We defined a case as an abscess that appeared at the site of an injection given since June 1, 2006. We compared case rates by injection route, medication, and diluents. We reviewed injection practices, and cultured abscesses and environmental sites for mycobacteria.
Results: From October through December 2006, 5.8% ($n = 35$) of 604 persons who had received injections at the clinic developed a case. All 35 cases occurred in 184 patients (attack rate = 19.0%) who had received IM injections with various drugs that had been mixed with normal saline (NS); risk ratio = ∞; $p < 0.0001$. No cases occurred in the absence of NS exposure. We identified *Mycobacterium abscessus* from eight abscesses and from the clinic water supply, and observed the inappropriate reuse of a 16-gauge needle left in the rubber septum of 100 ml multiple-dose bottles of NS in the clinic. Fourteen percent ($n = 527$) of the 3887 registered residents of this village had been treated with IM drugs over a three-month period, often for minor illnesses.
Conclusions: This outbreak of *M. abscessus* occurred from exposure to extrinsically contaminated NS through improper injection practices. Frequent treatment of minor illnesses with IM

DOI of original article: 10.1016/j.ijid.2008.11.025.
☆ Presented in part at the 56th Epidemic Intelligence Service (EIS) Conference, Atlanta, Georgia, USA, April 16—20, 2007.
* Corresponding author. Tel./Fax: +86 20 83845403.
E-mail address: yangzc@gzcdc.org.cn (Z. Yang).
[1] These authors contributed equally to this article.

doi:10.1016/j.ijid.2008.11.024

injections of antibiotics was likely an important contributing factor to the size of this outbreak.

Introduction

Injection safety is an enormous global health challenge both in the developing world, where safe injection practices are often lacking, and in developed countries, where new technologies and the transition of clinical practice to less regulated outpatient settings is occurring.[1–3] *Mycobacterium abscessus* and related rapid-growing mycobacteria (RGM) have caused iatrogenic post-injection abscesses as well as a variety of skin and soft tissue infections in these settings.[4–7] Outbreaks of post-injection abscesses from RGM usually result from contamination of injectable solutions or injection equipment in the immediate healthcare setting.[7] They are particularly problematic in that antibiotic treatment is often delayed because RGM are often resistant to multiple antibiotics and require special culture media.[7] In addition to the need for vigilance to interrupt transmission from these extrinsic local sources, there is the concern of intrinsic contamination of a commercially distributed product,[8] with epidemic potential. Therefore, all clusters or outbreaks of these abscesses demand prompt investigation.

In December 2006, we received a request to investigate why abscesses had developed at sites of drug injections given at a rural clinic (clinic Y) serving village Y in Guangdong Province, China. Acid-fast bacilli (AFB) were identified from four of five abscesses. Initial interviews and a review of medical records indicated that all the patients had received cefradine, ribostamycin, dexamethasone, or ribavirin injections. Suspicion was cast on these medications and on normal saline (NS). We began an investigation to identify the causative agent, source, and method of acquiring these abscesses.

Methods

Case finding

We defined a case as an abscess or persistent induration at the site of any injection given between June 1, 2006, and February 1, 2007, at any of the four village clinics affiliated with one township hospital. We found cases by searching medical records in all four village clinics, follow-up of patients who had received intramuscular (IM) and/or intravenous (IV) injections at clinic Y, and a house-to-house search of village Y. Physicians at the local township hospital had performed incision and drainage of abscesses of patients at the time of presentation for clinical care. They had submitted samples of pus to the clinical laboratory that served their hospital. We obtained AFB isolates from the clinical laboratory, determined their antibiotic sensitivities, and identified them using standard biochemical techniques.

Retrospective cohort study

To identify which drug, diluent, or instrument was the source of this outbreak, we identified all orders for IM or IV injections at clinic Y from August to October 2006. From these we determined the patient, medication, diluent, and route of each injection. We then compared rates of abscess incidence for each of these exposures.

Evaluation of injection practices and clinic environment

We reviewed injection procedures in the treatment room. We ascertained the manufacturer and lot numbers of all injectable drugs and the source of other components of each injection. Using standard environmental sampling methods,[9,10] we took environmental specimens of air, materials, surfaces, and water (including well water supply) to culture for mycobacteria.

We undertook this investigation to respond to an acute problem of adverse events. The principal objective was to identify the mode of exposure and source of infection to terminate the outbreak and benefit the affected community. Responses of this nature are not considered research and accordingly do not require institutional review board approval. Moreover, we performed no additional procedures, tests, data collection, or data analysis above those needed to resolve the immediate public health problem.

Results

Case finding and characteristics

We identified 35 cases, including 33 in residents of village Y and two in residents of a neighboring village. All 35 had received injections from clinic Y. The onset of first noticeable symptoms was from October 14, 2006 through January 22, 2007. The antecedent injections had been given from August to October 2006. Ten cases occurred in males and 25 in females. The ages of patients ranged from 8 months to 96 years. All 35 had abscesses and 69% ($n = 24$) also had persistent induration at the injection site. Excluding two patients with upper respiratory symptoms, 21% ($n = 7$) of patients also had fever from $>37\ ^\circ C$ to $38.5\ ^\circ C$. Twenty-six percent ($n = 9$) had inguinal lymphadenopathy. One case patient had abscesses in both buttocks and the rest had abscesses in either the left (49%; $n = 17$) or right (49%; $n = 17$) buttock. Some case patients reported pain or hyperalgesia at the injection site. Chest films were clear for all case patients. Twenty-eight cases were treated by incision and drainage and one by needle aspiration. Two abscesses drained spontaneously. Four patients did not receive treatment. Pus from eight of 26 abscesses yielded *M. abscessus*. All eight isolates were resistant to isoniazid, rifampin, *p*-aminosalicylic acid, levofloxacin, and capreomycin. They were sensitive to clarithromycin, amikacin, and ethambutol.

Retrospective cohort study

During the period of the cohort analysis, August through October 2006, 838 injections were given to 604 patients at