Mycobacterium bovis Peritonitis Mimicking Ovarian Cancer in a Young Woman

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We describe a 27-year-old woman with peritonitis due to Mycobacterium bovis that initially appeared to be ovarian cancer. Clinicians should include this disease in the differential diagnosis of ovarian cancer and should consider laparoscopic diagnosis in the appropriate epidemiologic setting.

Tuberculosis (TB) is caused by 1 of 4 organisms in the Mycobacterium tuberculosis complex: Mycobacterium tuberculosis, Mycobacterium africanum, Mycobacterium microti, or Mycobacterium bovis. M. tuberculosis is by far the most common cause of TB worldwide. In industrialized countries, TB due to M. bovis accounts for 0.1%–7.2% of cases of the disease [1–3]. The relatively low incidence of disease caused by this organism can be attributed to effective programs for control of TB among cattle and to widespread pasteurization of milk before it is consumed by humans [3]. In developing countries, this organism may be a more common cause of TB because of less stringent programs to control disease in animals and because of inadequate pasteurization. The exact prevalence of M. bovis in such countries is difficult to determine, however, because diagnosis of TB is usually based on clinical findings plus the presence of acid-fast bacilli on sputum smears. Mycobacterial cultures are not routinely performed in developing countries, precluding speciation of isolates. We present a case report of a young woman with peritonial TB caused by M. bovis, to illustrate the clinical issues associated with diagnosis and treatment of this disease.

Case report. The patient, a 27-year-old woman, presented to her local physician with a 3-month history of nausea, vomiting, abdominal pain, and increased abdominal girth without weight gain. She had also experienced irregular menstrual cycles for the 2 months prior to presentation. She denied having any fever, chills, cough, or leg swelling.

Abdominal ultrasound demonstrated no abnormalities of the gallbladder or liver but detected marked ascites. CT of the abdomen was performed on the same day that ultrasound was performed (figure 1). The CT scan showed marked ascites, bilateral complex adnexal masses, and omental thickening with infiltration—findings that are consistent with peritoneal carcinomatosis. The patient was referred to the gynecologic oncology service at Duke University Medical Center, Durham, North Carolina, with a presumptive diagnosis of disseminated ovarian carcinoma.

The patient’s medical history was notable only for excision of a benign giant cell tumor of the left proximal tibia 2 years prior to presentation. Six years before presentation, she had moved to the United States from a small town in Mexico, where she had casual exposure to domestic and farm animals. She did not recall having consumed any unpasteurized milk or raw meat in Mexico, but she did frequently eat soft cheese (“queso fresco”) made from unpasteurized cow’s milk. As part of an employment examination, she had recently undergone a Man-

Figure 1. CT scan of the pelvis with oral and iv contrast. Note multiple adnexal masses (arrows) apparently adherent to the uterus, a finding that is suggestive of ovarian carcinoma.
The results of an examination done at our medical center were remarkable only for minimal epigastric tenderness without any palpable abdominal mass or fluid wave. The chest radiograph showed no abnormalities. Blood counts, values derived from serum chemistry analysis, levels of blood urea nitrogen and creatinine, and results of liver function tests were all within normal limits. Serum β-human chorionic gonadotropin test results were negative, and the serum level of CA 125 was markedly elevated at 1853 U/mL (normal level, <35 U/mL). The results of antibody testing for HIV were negative.

Because the patient’s demographic profile was unusual, compared with that of patients with primary ovarian malignancy, diagnostic laparoscopy was chosen instead of laparotomy. Laparoscopy revealed multiple peritoneal implants that were consistent with carcinomatosis (figure 2) and copious mucinous fluid. Intraoperative frozen-section analysis revealed granulomas but no evidence of carcinoma. Biopsy specimens of the anterior abdominal wall and peritoneal implant were obtained. Both of the biopsy specimens contained noncaseating granulomas; the peritoneal implant specimen also demonstrated a single acid-fast bacillus. There were no malignant cells in either biopsy specimen or in the peritoneal fluid. A Mantoux skin test performed on the day of the surgery showed positive results (induration, 22 mm) 48 h later.

The patient began receiving treatment with isoniazid, rifampin, pyrazinamide, and ethambutol. The mycobacterial culture of the peritoneal implant specimen yielded an organism that was identified as *M. tuberculosis* complex by DNA probe. The organism was susceptible to streptomycin, isoniazid, ethambutol, and rifampin but was resistant to pyrazinamide. The organism was further evaluated by biochemical testing and high-performance liquid chromatography, which revealed it to be a non-BCG strain of *M. bovis*. The patient completed a 9-month course of treatment with isoniazid and rifampin, and her symptoms resolved completely.

**Discussion.** The case presented in this report illustrates the difficulties inherent in diagnosing peritoneal TB. The results of both the radiographic study and the test for CA 125 suggested the initial diagnosis of ovarian cancer. A case-control study [4] that compared 11 patients who had tuberculous peritonitis with 20 healthy adult control subjects revealed that serum levels of CA 125 were significantly elevated in all of the patients with TB (mean serum level, 316.6 IU/L for patients with TB vs. 13.2 IU/L for control subjects). Assessment of CA 125 serum levels as a means of diagnosing ovarian cancer may lead to initial misdiagnosis of ovarian cancer and unnecessary invasive surgical procedures, such as hysterectomy and oophorectomy. The clinical presentation of peritoneal TB resembles that of ovarian cancer; the most common symptoms include abdominal swelling, fever, weight loss, and abdominal tenderness [5]. Peritoneal

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**Figure 2.** Multiple laparoscopic views of the peritoneum. The peritoneal surface is studded with nodular lesions that proved to be granulomatous. This appearance is typical of tuberculous peritonitis.
TB is much less common than ovarian cancer, with only 136 cases reported in the United States in 1999 [6], compared with an estimated 26,800 cases of ovarian cancer reported in 1997 [7]. Making this distinction is crucial for the surgeon because laparoscopy is 85%–95% sensitive for the diagnosis of peritoneal TB and is relatively safe, compared with the more invasive laparotomy that usually would be performed to diagnose and stage ovarian cancer [5].

In recent years, an increasing proportion of cases of TB in the United States has been attributable to individuals born in other countries [6]. An unknown proportion of these patients are infected with *M. bovis*, although in San Diego, 2.6% of cases of culture-proven TB were caused by this organism [8], and a startling 34% of pediatric cases of TB in this same region were a result of *M. bovis* infection [9]. The patients described in these series were overwhelmingly Hispanic (80%–90%; primarily Mexican). The most likely means of exposure for this cohort was via consumption of unpasteurized dairy products, such as milk or cheese, or undercooked meat from cattle infected with *M. bovis*. Queso fresco is popular in Mexico and among people of Mexican descent. It has been linked to cases of *Salmonella typhimurium* infection in northern California [10] and to cases of *M. bovis* disease in San Diego (K. Moser, personal communication). Unpasteurized milk and cheeses are likely vectors for *M. bovis*; 16% of a recent random sample of 2500 Mexican dairy cattle from the 6 primary dairy regions of Mexico had lesions that were typical of bovine TB [11].

*M. bovis* infection presents 2 challenges to clinicians in addition to those posed by *M. tuberculosis*. The first challenge is the organism’s universal resistance to pyrazinamide [3]. Monoresistance to pyrazinamide in a mycobacterial isolate that has been identified as *M. tuberculosis* complex by DNA hybridization strongly suggests *M. bovis* infection and should prompt further testing of the isolate to determine the exact species. There is no well-defined standard course of therapy for TB caused by *M. bovis*, but clinicians usually treat the disease for 9–12 months [1, 12]. The requirement of an increased duration of treatment increases the cost of medical care and may reduce overall compliance with therapy. The second challenge is the organism’s predilection to infect extrapulmonary sites. From 50% to 95% of children [1, 3, 9] and ~50% of adults [1, 3, 8] have only extrapulmonary disease with this pathogen. Some of this variation with regard to site of disease has been attributed to the mode of infection. Patients in countries with long-standing programs for control of TB among cattle seem to be more likely to have pulmonary reactivation or to acquire their infection from other persons who have reactivation of latent *M. bovis* pulmonary disease. On the other hand, patients who acquire their infection as a result of consumption of contaminated foodstuffs are likely to have primary infection in the gastrointestinal tract, including the mesenteric lymph nodes and the peritoneum. Although isolated peritoneal TB is a rare manifestation of *M. tuberculosis* disease, it has been reported in 0%–10% of cases of *M. bovis* disease [1, 2, 8, 9]. Furthermore, in a series of 26 cases of abdominal TB among children from San Diego, including 9 cases of peritonitis, 80% of cultures were positive for *M. bovis* [12].

In summary, we describe a young Mexican woman with peritonitis caused by infection with *M. bovis*. This is a rare disease entity in the United States and is one with which many doctors may not be familiar. It presents a particular diagnostic dilemma because it is easily mistaken for ovarian carcinoma, resulting in unnecessarily invasive surgery and attendant complications. Poor control of *M. bovis* in developing countries, combined with the large number of people immigrating to the United States from such countries, make it likely that clinicians in the United States will see more cases of this disease in the future. Physicians and surgeons should remember that peritoneal TB may mimic carcinomatosis, and they should use information from the patient history and demographics to guide the diagnostic approach.

**References**