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Tuberculosis

The Diagnostic Role of Gastric Aspiration in Cases without Sputum and in Smear - Negative Patients with Suspected Pulmonary Tuberculosis

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Abstract

Setting: Tuberculosis clinic of a chest disease and chest surgery education and research hospital. **Objective:** Determination of the reliability of acid-fast stain and culture of gastric aspiration in diagnosis of patients who cannot expectorate sputum and in smear-negative patients. **Design:** 1115 patients were hospitalized for pulmonary tuberculosis between 1 January 1995 and 31 December 2003. From these patients, results of gastric aspiration of 55 patients who had clinical and radiological evidence of pulmonary tuberculosis without sputum complaint and 60 smear-negative pulmonary tuberculosis cases were evaluated retrospectively from the laboratory records. **Results:** Of 55 patients with no sputum, gastric aspiration smears were positive in 17 (30.9%) and gastric aspiration cultures were positive in 24 (43.6%) patients. Twenty-nine (52.7%) patients had either positive acid-fast stain or culture. Of the 60 smear-negative pulmonary tuberculosis patients, gastric aspiration smears were positive for acid-fast bacilli in 14 (23.3%) and gastric aspiration cultures were positive in 10 (16.7%) patients. Nineteen (31.7%) of the gastric aspiration specimens were positive for acid-fast bacilli on either smear or culture. **Conclusion:** Examination of gastric aspiration for acid-fast bacilli is an important diagnostic tool for smear-negative pulmonary tuberculosis patients or in patients with the suspicion of pulmonary tuberculosis who cannot expectorate sputum.

Keywords: tuberculosis, gastric aspiration, smear-negative

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INTRODUCTION

The diagnosis of tuberculosis is based on the detection of *Mycobacterium tuberculosis* on clinical specimens with different methods. Even though there are many sophisticated techniques, such as molecular methods and direct examination of clinical specimens on light microscopy, cultures are superior among them [1]. The most commonly used and reliable specimen for bacteriological examination is sputum for the diagnosis of pulmonary tuberculosis. When the patient cannot expectorate sputum, several methods, such as laryngeal swab, sputum induction, gastric aspiration, and bronchoscopic lavage, can be used to obtain specimens for smear or culture examination for acid-fast bacilli (AFB). Gastric aspiration is an easy and economic method, and it does not require sophisticated instrumentation. For these reasons, gastric aspiration can be done before more complicated methods.

Acid-fast stain and culture of gastric aspiration specimens is mainly used in pediatric patients. In this article, it is suggested that gastric aspiration can be used for patients who cannot expectorate sputum and in adult smear-negative pulmonary tuberculosis patients. The acid-fast staining of sputum is routinely performed for all suspected tuberculosis cases in our setting. Sputum examinations for AFB were done on three consecutive days if each of the stains was negative. If all three smears were negative, gastric aspiration was performed. If gastric aspiration was negative, fiberoptic bronchoscopy was performed. But, the results of fiberoptic bronchoscopy were not documented in this study.

MATERIALS AND METHODS

The records of 1115 pulmonary tuberculosis patients who were followed in our clinic between 1 January 1995 and 31 December 2003 were reviewed retrospectively. The cases evaluated in this report were classified in two categories.

Group A: Patients with symptoms and radiological evidences related with pulmonary tuberculosis but who failed to produce sputum.

Group B: Patients with symptoms and radiological evidences related with pulmonary tuberculosis but whose smear examinations were negative at least three times. These patients were defined as "smear-negative pulmonary tuberculosis" based on the World Health Organization definition. According to these criteria, sputum smear-negative pulmonary tuberculosis includes: At least three sputum specimens negative for AFB, radiographic abnormalities consistent with active pulmonary tuberculosis, no response

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Table 1. Results of gastric aspirations of patients having no sputum (Group A)

		Culture		Total
		+	-	
Smear	+	12	5	17
	-	12	26	38
Total		24	31	55

Table 2. Results of gastric aspiration in smear-negative patients (Group B)

		Culture		Total
		+	-	
Smear	+	5	9	14
	-	5	41	46
Total		10	50	60

to a course of broad- spectrum antibiotics, and decision by a clinician to treat with a full course of antituberculosis chemotherapy.

Smear examination and culture results were gathered from laboratory records [2].

Procedures

Gastric aspiration: Gastric aspirations were performed in the early morning just after an overnight fast before the patient left the bed. The gastric juice was aspirated with a 50-ml syringe through a polyethylene nasogastric tube without giving any fluid.

Bacteriological examinations: Specimens submitted for smear and culture were decontaminated with 4% NaOH for 10 minutes. The specimens were centrifuged at 3000xg for 10 minutes, and were then stained with Ziehl-Neelsen stain and examined under the light microscope for smear examination. The specimens were inoculated to Lowenstein Jensen media for culture after homogenization.

RESULTS

The data were obtained from service records and laboratory records of the patients retrospectively. All of the patients had clinical and radiological suspicion of tuberculosis. The patients were selected from the group which was known to have received antituberculosis therapy until discharge. No other pulmonary disease was found in any of the patients. The clinical follow-up after discharge was not included in the study. One hundred and fifteen of 1115 cases were either patients without sputum complaint having tuberculosis suspicion or smear-negative pulmonary tuberculosis patients. All were male with mean age (±SD) of 36.76 (±15.0) years.

Group A: There were 55 male patients without any antituberculosis treatment history. Seventeen (30.9%) had positive gastric aspiration smears and 24 (43.6%) had positive gastric aspiration cultures. Twenty-nine (52.7%) patients had either positive smear or culture (Table 1).

Group B: There were 60 smear-negative male patients without any antituberculosis treatment history. Fourteen (23.3%) of the 60 smear-negative patients had positive gastric aspiration smears and 10 (16.7%) had positive cultures. Nineteen (31.7%) of the gastric aspiration specimens were positive with either smear or culture (Table 2). In three of nine patients (33.3%) with a positive smear and negative culture, sputum cultures were positive.

DISCUSSION

The diagnosis of tuberculosis is primarily based on the isolation of *Mycobacterium tuberculosis* by acid-fast stain or culture of sputum. In clinical practice, even patients with typical clinical and radiological signs of pulmonary tuberculosis can present without sputum complaint. Such cases are problematic for physicians in the differential diagnosis in clinical settings. When deciding to start antituberculosis treatment, AFB positivity is gold standard, so to obtain any positive specimen all of the noninvasive diagnostic methods must be used. There are some diagnostic methods, such as gastric aspiration, sputum induction and fiberoptic bronchoscopy [1]. After these efforts, decision of antituberculosis treatment can be taken according to clinical and radiological findings.

In our clinic, gastric aspiration is used first for diagnosis of tuberculosis in adult patients without sputum complaint and also in patients with negative sputum smear examinations for AFB.

Evaluation of gastric lavage researches in the medical literature presents some difficulties since different methodologies and case definitions are used. Examination of gastric aspirates for tuberculosis is a common technique in pediatric patients, but it is not commonly used for adult cases. There are few reports investigating the value of this method among adult patients. Rizvi and his colleagues [3] investigated adult cases with tuberculosis suspicion who could not produce sputum. They determined an 80% diagnostic yield of direct smear examination of gastric aspiration and improved their success to 90% with a second examination of gastric aspirates of patients without sputum complaint.

John and his colleagues [4] used gastric aspiration among adult renal allograft recipients. They showed 36% (9/25) positive for AFB on direct examination of gastric aspirates of renal allograft patients with suspected pulmonary

tuberculosis. They found 17.3% positive smears of gastric aspirates among cases who could not produce sputum.

Norman and colleagues [5] investigated the value of gastric lavage in 63 patients in whom tuberculosis could not be excluded. Twelve (19.0%) patients had proven disease of *Mycobacterium tuberculosis* and two had *Mycobacterium avium-intracellulare* with culture. Seven (11.1%) gastric lavage results of cases had positive culture for mycobacteria. Two of them were *Mycobacterium avium-intracellulare* and five were *Mycobacterium tuberculosis*.

In a recent study, Okutan and colleagues [6] detected 61.2% (30/49) positive smears and 30.6% (15/49) positive cultures in patients with clinical and radiological diagnosis of tuberculosis who could not expectorate sputum.

In this study, among smear-negative adult patients in Group B, 23.3% (14/60) had positive concentrated smears and 16.7% (10/60) had positive cultures of gastric aspirates; 31.7% (19/60) had positive gastric aspiration on smear or culture. The patients who could not produce sputum (Group A) showed higher positive rates [30.9% (17/55) for direct examination and 43.6% (24/55) in culture]; 52.7% (29/55) had either positive smear or culture. Our setting is a reference hospital; many of the patients may have been elected when they admitted. Bias should be considered and positive bacteriological rates may be slightly higher than the general patient population.

False-positive results can be seen in gastric aspiration smears because of acid-resistant saprophytic bacilli. Edwards and Palmer [7] showed presence of atypical mycobacteria in saliva and sputum in healthy individuals, so there is a common assumption that oral cavity and gastric content may have atypical mycobacteria. The reliability of positive results is thought to be low due to possible misinterpretation. There are conflicting results in some studies about false-positive rates. Pratt and Atwell [8] demonstrated that the reliability of gastric smears regarding evaluation of typical mycobacteria compared with cultures was high. Klotz and Penn [9] demonstrated that positive acid-fast staining of gastric aspirate smears has a highly positive relationship with typical mycobacterial existence in cultures. On the other hand, some authors state that smears of gastric aspirates are unreliable because of the occurrence of saprophytic mycobacteria, which produces false-positive results. Strumpf et al. [10] found false-positive smears in 33% when acid-fast stains were done on concentrates of gastric aspirate.

Especially in smear-negative patients with clinical and radiological suspicion of tuberculosis, a false-positive result can lead the clinician to diagnose the patient as tuberculosis and to begin antituberculosis treatment without further analysis, such as fiberoptic bronchoscopy, to exclude other diseases in the differential diagnosis.

Obtaining only 14 positive results in the concentrated smear of gastric aspirate out of 60 smear-negative cases in group B and 17 positive results of concentrated smear of gastric aspirate out of 55 non-expectorating cases seems to be low, but if culture is added to the investigation, the overall mycobacterial recovery rate is improved to 23/60 in group B and 36/55 in group A.

Generally, the positivity rate of gastric aspiration cultures is less than that of smears. It can be related with false-positive smears or false-negative cultures. Many of the smear-positive, culture-negative specimens were from patients receiving antituberculosis therapy [9]. Gastric aspirations should undergo laboratory examination within four hours, or be stored in a refrigerator after a neutralization procedure with sodium carbonate to maintain pH at 7,0. The acidity and amount of gastric secretions may influence it. The volume of gastric secretions may vary among individuals and may result in dilution [6]. Processing with alkaline solutions may also decrease the growth rate in cultures. If specimens are improperly decontaminated, mycobacteria may be entrapped in mucin and thus not available for culture [3]. In our study, lower culture yield was thought to be related with laboratory problems. It may be related with the absence of a neutralization procedure in our laboratory.

Both smear- and culture-positive results were obtained in 12 of 55 (21.8%) cases in group A and 5 of 60 (8.3%) cases in group B in this study. We had five smear-positive but culture- negative cases out of 55 among group A and nine out of 60 in group B. Processing of gastric aspirates with alkaline solutions may prevent the growth of mycobacteria in the culture medium.

A search for bacilli in the smear or culture of gastric aspirations taken early morning before eating from patients who are unable to expectorate enough and swallow sputum at night will provide important data which will support the empirical treatment decision.

In conclusion, in patients with clinical suspicion of pulmonary tuberculosis who cannot expectorate sputum or in smear-negative pulmonary tuberculosis patients, gastric aspiration can be used prior to sputum induction or fiberoptic bronchoscopy for bacteriological confirmation. If the acid-fast stain is combined with culture, the rate of isolation for *Mycobacterium tuberculosis* will increase. Gastric aspiration is a simple and relatively non-invasive method that does not require expensive instrumentation. Especially in light of the 52% detection rate of *Mycobacterium tuberculosis* in smear or culture in patients with clinical and radiological evidence of pulmonary tuberculosis without sputum com-

plaint (Group A), we wanted to emphasize that gastric aspiration can be an important diagnostic choice in low-income countries and can facilitate the treatment decision.

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