

## Three cases of pulmonary and/or intestinal tuberculosis in adolescents

Jung Hye Byeon, M.D., Yoon Lee, M.D., Jin Chul Lee, M.D., Young Yoo, M.D.,  
Kee Hyoung Lee, M.D., Kwang Chul Lee, M.D., Ji Tae Choung, M.D.,  
Soo Youn Ham, M.D.\* and Chul Whan Kim, M.D.†

Department of Pediatrics, Radiology\*, and Pathology†, College of Medicine, Korea University, Seoul, Korea

Since the tuberculosis (TB) in adolescents has unique clinical characteristics, special attention should be paid to this age group. Adolescents are more susceptible to developing TB disease and more likely to have cavitary pulmonary disease. Also, adolescent patients with TB more frequently present with extrapulmonary disease. We report three adolescents with active pulmonary and/or intestinal TB: one had pulmonary and intestinal TB, another had a pulmonary TB, and the third exclusively had an intestinal TB. Diagnosis was confirmed by pathologic examination of the lung and/or intestines. All three patients were treated successfully without complication. A brief review of the literature has been included. (**Korean J Pediatr** 2007;50:1134-1138)

**Key Words :** Tuberculosis, Adolescents, Pulmonary tuberculosis, Intestinal tuberculosis

### Introduction

Tuberculosis (TB) remains an enormous global health problem, causing morbidity and mortality worldwide. A previous report<sup>1)</sup> has shown that the incidence of tuberculosis in adolescents (12-18 years of age) has increased by 22%, while this has decreased by 38% among children aged <5 years.

Little is known about TB among adolescents, although the protective response against *Mycobacterium tuberculosis* (*M. tuberculosis*) might be less effective in this population<sup>2)</sup>. Previous reports<sup>1,3)</sup> have indicated that TB in adolescents has unique clinical characteristics. The most common clinical presentation of TB in adults is pulmonary disease, whereas adolescents often have pulmonary and extrapulmonary or exclusively extrapulmonary disease. Also, adolescents are more symptomatic and more likely to have cavitary pulmonary disease.

The diagnosis and management of chronic disease in this age group may be complicated by the late presentation and

poor compliance to therapy<sup>4,5)</sup>. The adolescent group has been considered a population at risk for the development of TB disease. A previous study<sup>4)</sup> found that many adolescents with TB presented in advanced stages of disease because of delayed diagnosis.

TB in the adolescent is an aggressive and insidious disease. This demands renewed attention from health care providers. This report is prompted by our experience with three adolescents with pulmonary and/or intestinal TB. Histopathologic evaluation of the specimens obtained by lung and/or intestinal biopsies confirmed TB infection.

### Case Report

#### Case 1

A 12-year-old girl, who was treated for so-called pneumonia for 3 months in a local clinic, was hospitalized with retractable cough, fever, and weight loss (4 kg in 3 months). She also had a three-month history of abdominal discomfort and progressive loss of appetite. There was no family history of TB. Physical examination revealed: weight, 24 kg (below 3 percentile), height, 144 cm (10-25 percentiles), undeveloped secondary sex characteristics, lethargy and wasting (Fig. 1A). She had a Bacillus Calmette-Guérin (BCG) scar. The

접수 : 2007년 9월 4일, 승인 : 2007년 10월 26일  
책임저자 : 유 영, 고려대학교 의과대학 소아과학교실  
Correspondence : Young Yoo, M.D.  
Tel : 02)920-5090 Fax : 02)922-7476  
E-mail : yoolina@korea.ac.kr

tuberculin test revealed a negative result, but the sputum smear was positive for acid-fast bacilli. She was isolated, and treatment for tuberculosis was started. Sputum cultures for *M. tuberculosis* reported positive results.

High resolution computerized tomography (HRCT) of the chest revealed extensive bronchiectasis, calcified nodes, multiple cavitary lesions and bullous cavities in left upper lobe (Fig. 1B). Fluoroscopy-guided lung biopsy revealed necrotizing granulomatous inflammation and positive TB-PCR for *M. tuberculosis* (Fig. 1C). Because she suffered from abdominal discomfort and weight loss, colonoscopic biopsy was performed. Histopathology demonstrated granulomatous inflammation with caseous necrosis and positive PCR for *M. tuberculosis* in the terminal ileum. After the initiation of a combination of isoniazid (INH), rifampicin (RIF), pyrazinamide (PZ), and ethambutol (EMB), clinical symptoms and signs improved. She was discharged at 29 days after hospitalization with a fortnightly follow-up for the first 2 months and monthly follow-ups thereafter. Three months later, she presented a complete clinical recovery but chest radiographs showed a residual cavitary pattern.

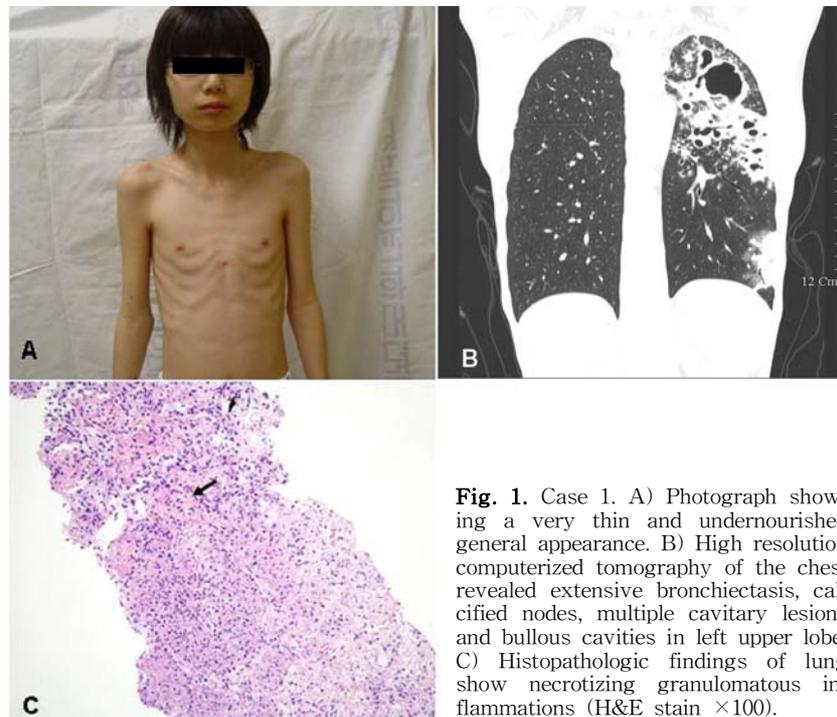
### Case 2

A 14-year-old girl was admitted because of fever, cough, sputum for 5 months and 2 kg of weight loss for 2 months.

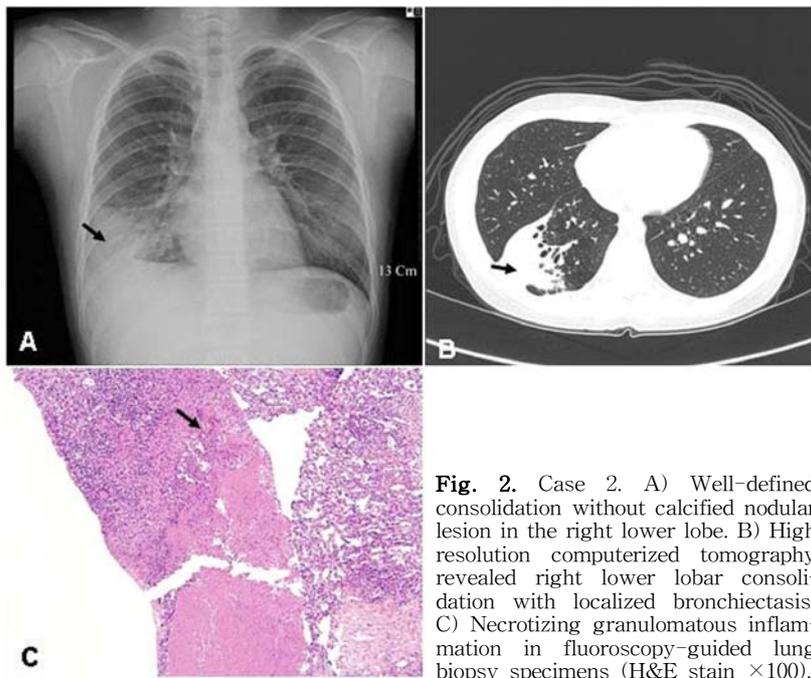
The tuberculin test was positive with a 21-mm induration, but the sputum contained no acid-fast bacilli. She had a BCG scar. Chest radiographs showed a well-defined consolidation without calcified nodular lesions in the right lower lobe (Fig 2A). Under a high suspicion of TB, anti-TB medication was started. After the administration of 4-month INH, RIF along with initial 2-month streptomycin, she became asymptomatic but exhibited nearly unchanged chest radiographs. HRCT and fluoroscopy guided lung biopsy was performed. HRCT revealed right lower lobar consolidation with localized bronchiectasis (Fig. 2B). Aspirated materials had necrotizing granulomatous inflammation and were positive for acid-fast bacilli (Fig. 2C). After PZ and EMB were added to her regimen, a rapid clinical improvement was seen. She remained in good health when seen at regular follow-ups.

### Case 3

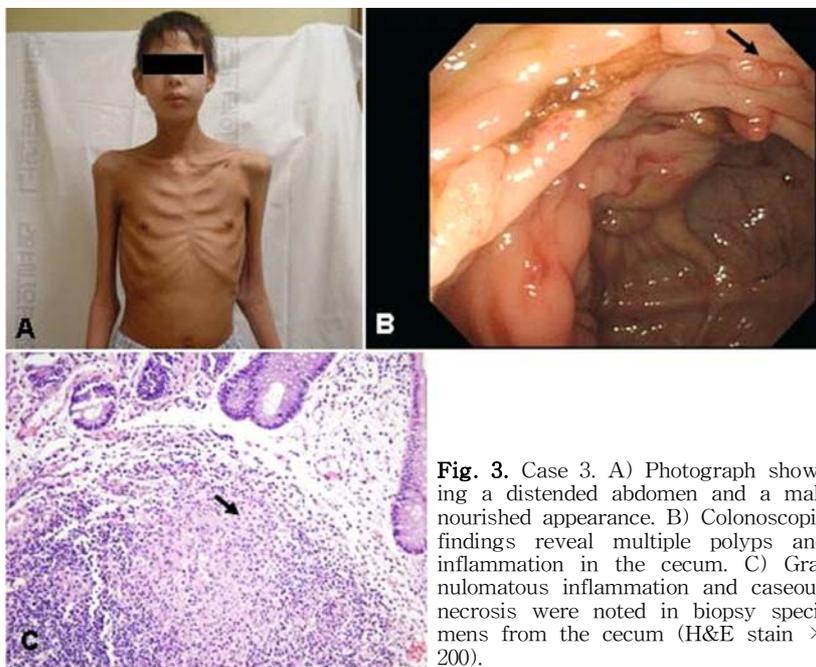
A 17-year-old boy was admitted because of abdominal pain and abdominal distension for 3 weeks and bloody diarrhea for 2 days. His body weight was 34.3 kg (below 3 percentile). Physical examination revealed a cachexic appearance, abdominal distension, and generalized abdominal tenderness (Fig. 3A). A large abscess in the pelvic cavity, diffuse infiltration of inflammatory cells into the omentum



**Fig. 1.** Case 1. A) Photograph showing a very thin and undernourished general appearance. B) High resolution computerized tomography of the chest revealed extensive bronchiectasis, calcified nodes, multiple cavitary lesions and bullous cavities in left upper lobe. C) Histopathologic findings of lung show necrotizing granulomatous inflammations (H&E stain  $\times 100$ ).



**Fig. 2.** Case 2. A) Well-defined consolidation without calcified nodular lesion in the right lower lobe. B) High resolution computerized tomography revealed right lower lobar consolidation with localized bronchiectasis. C) Necrotizing granulomatous inflammation in fluoroscopy-guided lung biopsy specimens (H&E stain  $\times 100$ ).



**Fig. 3.** Case 3. A) Photograph showing a distended abdomen and a malnourished appearance. B) Colonoscopic findings reveal multiple polyps and inflammation in the cecum. C) Granulomatous inflammation and caseous necrosis were noted in biopsy specimens from the cecum (H&E stain  $\times 200$ ).

and mesentery, and ascites were noted on CT scans of the abdomen. Colonoscopy revealed multiple polyps and inflammation in the cecum (Fig. 3B). Biopsy specimens that were obtained by colonoscopy were reported to be caseous necrosis with positive TB-PCR (Fig. 3C). After the initiation of INH, RIF, PZ and EMB combination, he progressively improved. He began to gain weight and survived without

any complaints during the 6-month follow-up period.

## Discussion

In this report, we presented three adolescents with active pulmonary and/or intestinal TB. Diagnosis was established by a positive *M. tuberculosis* culture or PCR, consistent

clinical presentation, consistent histology and responses to anti-TB therapy.

It is well known that the demographic and clinical characteristics of adolescents with TB differ from those of adults and children<sup>1)</sup>. Adolescents are more susceptible to developing TB disease than younger children because of the hormonal changes and the altered protein and calcium metabolisms associated with adolescent growth<sup>6)</sup>. Extrapulmonary TB occurs in as many as 27% of all patients with TB disease<sup>7)</sup> whereas a high proportion of adolescent patients presented with extrapulmonary disease<sup>1,3)</sup>. In our patients, extrapulmonary disease occurred in two subjects; one of them exclusively had an extrapulmonary disease.

It is difficult to diagnose and treat of TB in adolescents because of the difficulty in obtaining reliable sputum specimens. The low incidence of positive sputums or gastric washings in children is well known. In case 2, we obtained positive TB cultures from biopsy specimens but not from sputum specimens. Medication noncompliance has been shown to be more than 4 times greater in adolescents than in adults<sup>8)</sup>. Thus, TB control in adolescents includes a thorough examination of the pulmonary and extrapulmonary systems and regular follow-up by experienced physicians. The success of chemotherapy in adolescents can be achieved when there is no progression of the existing infection or disease during therapy.

We presented two adolescents (cases 1 and 3) with intestinal TB in this report. In our two patients, both of them had fever, weight loss, and abdominal discomfort, and one of them had ascites and bloody diarrhea. However, none of these symptoms are specific for the intestinal TB disease. Due to the non specific symptoms and rare incidence, the delay in diagnosis increases the mortality and morbidity rates of intestinal TB<sup>9)</sup>. Special attention should be paid to adolescents with vague, unexplained abdominal symptoms. Our two patients were diagnosed with intestinal TB by colonoscopic biopsy. Positive radiological findings were helpful but not sufficient to rule out other diseases. Thus, for a definite diagnosis of intestinal TB, a histopathologic evaluation of the specimens is usually required.

Adolescents appear to have INH-resistant strains more frequently than children<sup>10)</sup>. Drug resistance among adolescents, who often have highly infectious cavitary lesions, may have important public health implications. Fortunately, our three patients had no INH-resistant TB.

Malnutrition is common in patients with TB<sup>11)</sup>, and

immunological and epidemiologic studies suggest that malnutrition contributes to TB susceptibility<sup>12,13)</sup>. Although we could not assess the nutritional status of our patients, in the two patients (cases 1 and 3) showed a cachexic and undernourished appearance, and their body weight was <3 percentile at admission. They rapidly gained weight after treatment. Nutritional supplementation strengthens anti-TB immunity and has been thought to accelerate the patient's recovery from TB<sup>14)</sup>.

A large percentage of adolescents fail to finish TB medication. Medication noncompliance is greater in adolescents than in adults. Thus, TB control in adolescents should include adherence to the prescribed therapy for a considerable amount of time.

This is a case report of a few patients. Despite this limitation, this report highlights some important clinical observations in active pulmonary and/or intestinal TB in adolescents where there is scant literature. This report addresses that the clinical characteristics of adolescents with TB may differ from those of adults and children. A specific approach to the prevention and treatment of TB in adolescents is absolutely necessary.

## 한글 요약

### 청소년의 폐 및 폐외 결핵 3례

고려대학교 의과대학 소아과학교실,  
영상의학교실\*, 병리학교실†

변정혜 · 이 윤 · 이진철 · 유 영 · 이기형  
이광철 · 정지태 · 함수연\* · 김철환†

최근 결핵 유행률이 청소년기에 다시 증가하고 있으며, 이 시기의 결핵은 성인이나 어린 소아와는 다른 임상적 특징을 가지고 있다. 결핵 감염에서 질병으로 쉽게 발전되거나, 폐외 결핵의 발생 빈도가 높고, 폐결핵에서 공동이 잘 생기며, 항결핵제에 내성이 있는 경우가 많아 치료실패율이 높기 때문에 조기 진단과 치료를 위해 의료진의 보다 적극적인 관심과 노력이 필요하다. 저자들은 최근 청소년에서 조직검사로 확진된 폐 및 폐외 결핵 3례를 경험하였기에 보고하는 바이다.

## References

- 1) de Pontual L, Balu L, Ovetchkine P, Maury-Tisseron B, Lachassinne E, Cruaud P, et al. Tuberculosis in adolescents: A French retrospective study of 52 cases. *Pediatr Infect Dis J* 2006;25:930-2.
- 2) Nemir RL. Perspectives in adolescent tuberculosis: Three

- decades of experience. *Pediatr* 1986;78:399-405.
- 3) Kam A, Ford-Jones L, Malloy P, Khan K, Kitai I. Active tuberculosis among adolescents in Toronto, Canada: Clinical features and delays in diagnosis. *Pediatr Infect Dis J* 2007;26:355-6.
  - 4) Didilescu C, Ibraim E, Tigau M. The epidemiological profile and current evolutionary trends in tuberculosis in adolescents (15-19 years old) in the capital. *Pneumoftiziologia* 1997;46:193-9.
  - 5) Morisky DE, Malotte CK, Ebin V, Davidson P, Cabrera D, Trout PT, et al. Behavioral interventions for the control of tuberculosis among adolescents. *Public Health Rep* 2001; 116:568-74.
  - 6) Wilcox WD, Laufer S. Tuberculosis in adolescents: A case commentary. *Clin Pediatr* 1994;33:258-62.
  - 7) McIntosh ED, Isaacs D, Oates RK, Ryan MD, Mansour A, Falk MC. Extrapulmonary tuberculosis in children. *Med J Aust* 1993;158:735-40.
  - 8) Rianthavorn P, Ettenger RB. Medication non-adherence in the adolescent renal transplant recipient: a clinician's viewpoint. *Pediatr Transplant* 2005;9:398-407.
  - 9) Akcam M, Artan R, Yilmaz A, Cig H, Aksoy NH. Abdominal tuberculosis in adolescents: Difficulties in diagnosis. *Saudi Med J* 2005;26:122-6.
  - 10) Lobato MN, Cummings K, Will D, Royce S. Tuberculosis in children and adolescents: California, 1985 to 1995. *Pediatr Infect Dis J* 1998;17:407-11.
  - 11) Onwubalili JK. Malnutrition among tuberculosis patients in Harrow, England. *Eur J Clin Nutr* 1988;42:363-6.
  - 12) Hanekom WA, Potgieter S, Hughes EJ, Malan H, Kessow G, Hussey GD. Vitamin A status and therapy in childhood pulmonary tuberculosis. *J Pediatr* 1997;131:925-7.
  - 13) Davies PD. A possible link between vitamin D deficiency and impaired host defence to *Mycobacterium tuberculosis*. *Tubercle* 1985;66:301-6.
  - 14) Karyadi E, West CE, Schultink W, Nelwan RH, Gross R, Amin Z, et al. A double-blind, placebo-controlled study of vitamin A and zinc supplementation in persons with tuberculosis in Indonesia: Effects on clinical response and nutritional status. *Am J Clin Nutr* 2002;75:720-7.