HRCT of Pulmonary Tuberculosis Mimics Malignancy: A Preliminary Report

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Objective: *To evaluate potential predictors of high resolution CT (HRCT) findings of pulmonary mass caused by tuberculosis (Tbc).*

Material and Method: *A retrospective study of chest HRCT was performed in 10 patients diagnosed as pulmonary Tbc. The size, characteristics of lesions, enhancement and mediastinal lymphadenopathy were interpreted. The final diagnosis was reached by laboratory and pathological specimens or clinical improvement from treatment of the Tbc.*

Results: *Of 10 patients, 6 were males and 4 were females. The mean age was 53.5 years old. There were 13 masses analyzed. The mean size of the lesions was 2.3 cm and 53.8% had diameters more than 2 cm. The locations of lesions were right upper lobe (30.8%), right middle lobe (7.7%), right lower lobe (38.5%) and left upper lobe (23.1%). Calcification was found in two lesions. The HRCT findings were spiculated margin (76.9%), lobulated margin (23.1%), smooth margin (7.7%), ground-glass opacity (23.1%), concave border (61.5%), polygonal shape (53.8%), air bronchogram (38.5%), pseudocavity (15.4%), pleural tag (30.8%), distortion of vessels (23.1%), satellite lesions (38.5%), and peripheral subpleural lesion (46.2%). Only 7 cases of enhanced study were available and two cases showed enhancement. Of the 10 cases, mediastinal lymphadenopathy was found in 8(80%) cases. The size of the lymph nodes was less than 2 cm in 6 cases and larger than 2 cm in 2 cases. Other associated findings were pleural thickening or effusion (60%), evidence of volume loss (20%), emphysema (40%), and infiltrations(50%).*

Conclusion: *Many characteristics of Tbc lesion on HRCT mimic reported malignant lesions. Re-evaluation of value of HRCT for controversial lesions is needed.*

Keywords: *HRCT, Tuberculosis, Pulmonary*

Pulmonary tuberculosis is still a major problem in developing countries. The authors are often asked whether the pulmonary lesions are malignancy or from tuberculous infection. Because of higher prevalence of both malignancy and tuberculosis (Tbc.) in the older age group, these two entities can be found in the same patients. The radiographs often cannot differentiate the conditions. Reported literature claimed that high resolution computed tomography (HRCT) in predicting malignancy in solitary pulmonary nodules[1,2]. However, most of them were studied in developed countries where the incidence of pulmonary Tbc is not high. When CT characteristics of malignancy were applied to patients in the population with high Tbc prevalence, the majority of cases ended with tissue diagnosis. In the authors' practical experience, around half of these cases turned out to be Tbc. The purpose of the present study was to evaluate the potential predictors of HRCT findings of pulmonary Tbc to identify the findings of Tbc which might mimic malignancy.

Material and Method

The authors retrospectively analyzed the HRCT of patients who were suspected to have a pulmonary mass and had final diagnosis of tuberculosis by tissue diagnosis or clinical improvement after

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treatment of Tbc. The interpretation of HRCT findings was done separately by two radiologists and finally concluded with consensus. The percentage of each finding was then calculated.

Results

There were 10 cases with complete records of HRCT and clinical information analyzed. Six were males and 4 were females. The mean age was 53.5 years old (range 22-85). Eight of ten cases were pathologically proved to be Tbc and 2 cases were clinically and radio-logically improved after being treated with antituber-culous drugs. Totally 13 masses were analyzed. The mean size of the lesions was 2.3 cm. (range 1.2-4.2 cm). Seven (53.8%) lesions had diameters of more than 2 cm. Most lesions were found in the right lung pre-dominately in the right lower lobe. Calcification was found in two lesions with eccentric location in one case and multiple punctuate calcification in the other case (Fig. 1, 2). The HRCT findings were spiculated margin in 10 (76.9%), lobulated margin in 3 (23.1%) lesions and smooth margin in 1 (7.7%) lesions (Fig. 1, 2). The con-cave border and polygonal shape were found in 8 (61.5%) and 7 (53.8%) lesions respectively (Fig. 2-4). Ground-glass opacity (less than 10% of area of lesion) was found in 3 (23.1%) lesions (Fig. 4). The other find-ings found were air bronchogram in 5 (38.5%), pseudo-cavity in 2 (15.4%), pleural tag in 4 (30.8%), distortion of vessels in 3 (23.1%), satellite lesions in 5 (38.5%), and peripheral subpleural lesion in 6 (46.2%) lesions (Fig. 2-5). The detail of the findings is summarized in Table 1.

Only 7 cases of enhanced study were avail-able and two cases showed enhancement. Of the 10

Table 1. HRCT findings of pulmonary tuberculosis(13 masses)

Findings	N (%)
Location: Right upper lobe	4 (30.8)
Right middle loe	1 (7.7)
Right lower lobe	5 (38.5)
Left upper lobe	3 (23.1)
Margin: spiculated	10 (76.9)
lobulated	3 (23.1)
smooth	1 (7.7)
Distortion of vessels	3 (23.1)
Concave border	8 (61.5)
Polygonal shape	7 (53.8)
Ground-glass component (less than 10% area)	3 (23.1)
Pseudocavity	2 (15.4)
Air bronchogram	5 (38.5)
Satellite lesions	5 (38.5)
Pleural tag	4 (30.8)
Subpleural lesion	6 (46.2)

cases, mediastinal lymphadenopathy was found in 8 (80%) cases. The size of the lymph nodes was less than 2 cm in 6 cases and larger than 2 cm in 2 cases (Fig. 3).

Other associated findings were pleural thick-ening or effusion in 6(60%), evidence of volume loss in 2 (20%), emphysema in 4(40%), and infiltrations in 5 (50%) cases.

Discussion

Lung cancer is still a major problem in Thailand. In 2003, the Siriraj Institute of Cancer reported the
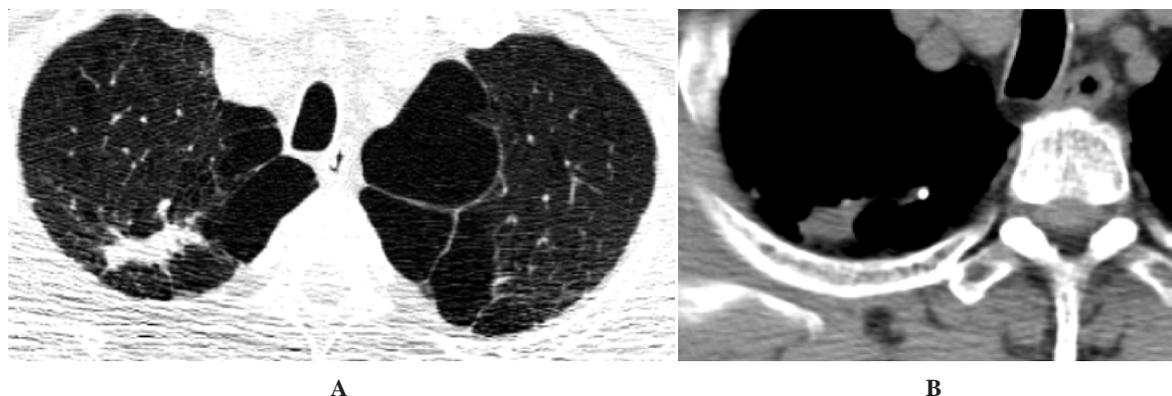

Fig. 1 An asymptomatic male with right upper lobe mass from chest roentgenogram. HRCT shows spiculated margin with concave border (A). The mediastinal window (B) shows eccentric calcification. Note the emphysematous change of both upper lobe. The mass was removed with histology proven to be tuberculosis
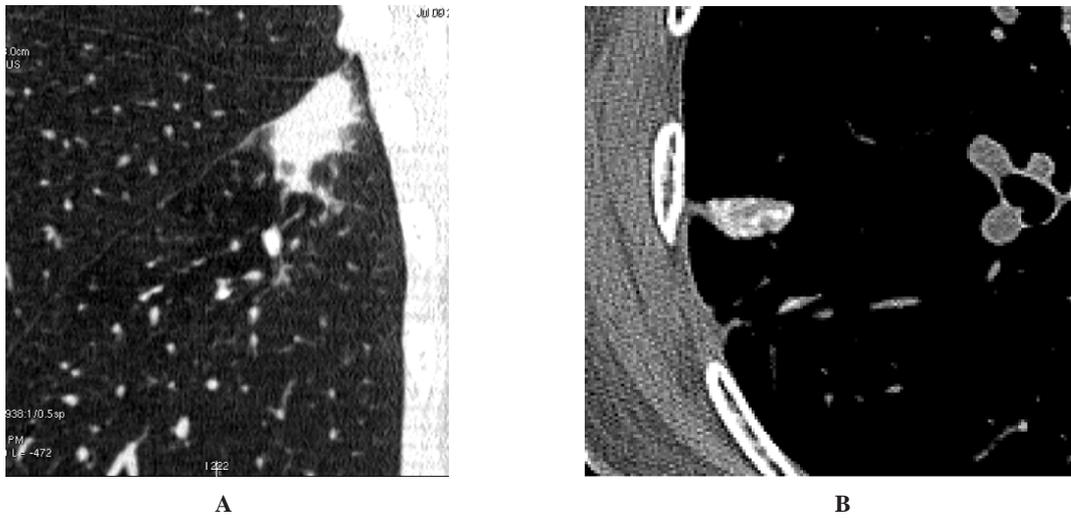
Fig. 2 (A): Sagittal reformatted HRCT shows a spiculated mass at superior segment of right lower lobe with polygonal shape. (B): multiple punctate calcification is demonstrated. The mass was pathologically proved to be tuberculosis
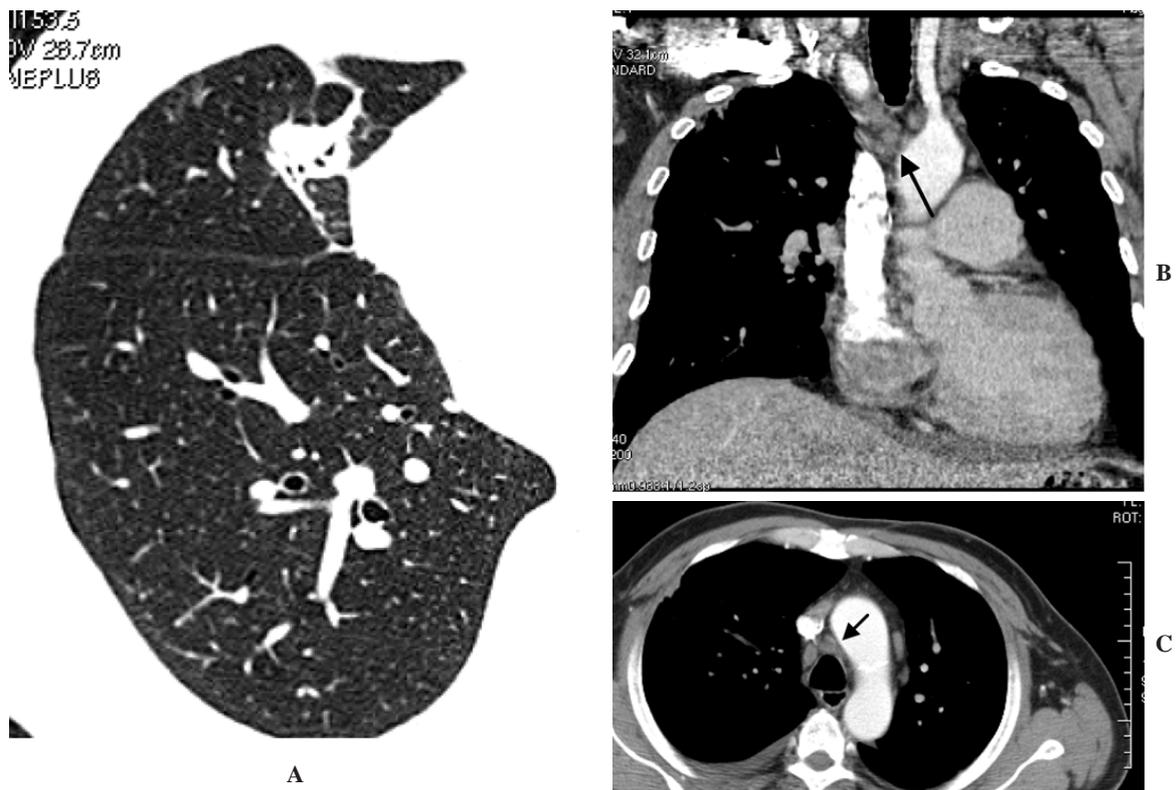

Fig. 3 A 50 year old male with dyspnea and intermediate probability of V/Q scan for pulmonary embolism. The HRCT was requested to exclude pulmonary lesion. (A)The right middle lobe nodule shows air-bronchogram sign, pleural tag and concave anterior margin. The post-contrast coronal reformatted (B) and axial (C) images show multiple precarinal lymphadenopathy larger than 2 cm (arrow in B, C). The histology from transbronchial biopsy was chronic granulomatous lesion
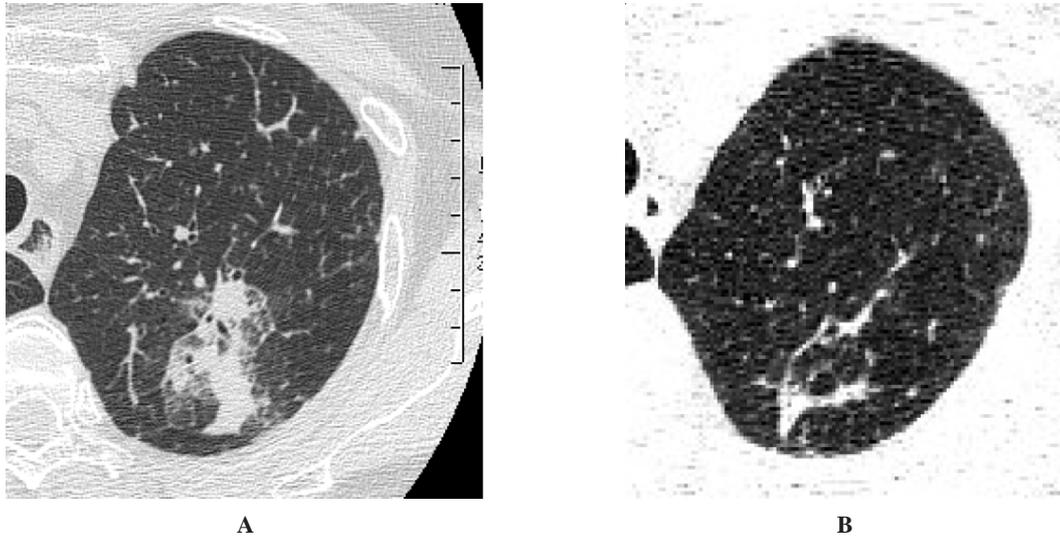
Fig. 4 (A): HRCT of left upper lobe lesion shows ground-glass component. Note polygonal configuration of the lesion and air bronchogram inside. This patient was treated with antituberculous drugs and the follow up film (B) shows resolving of the lesion
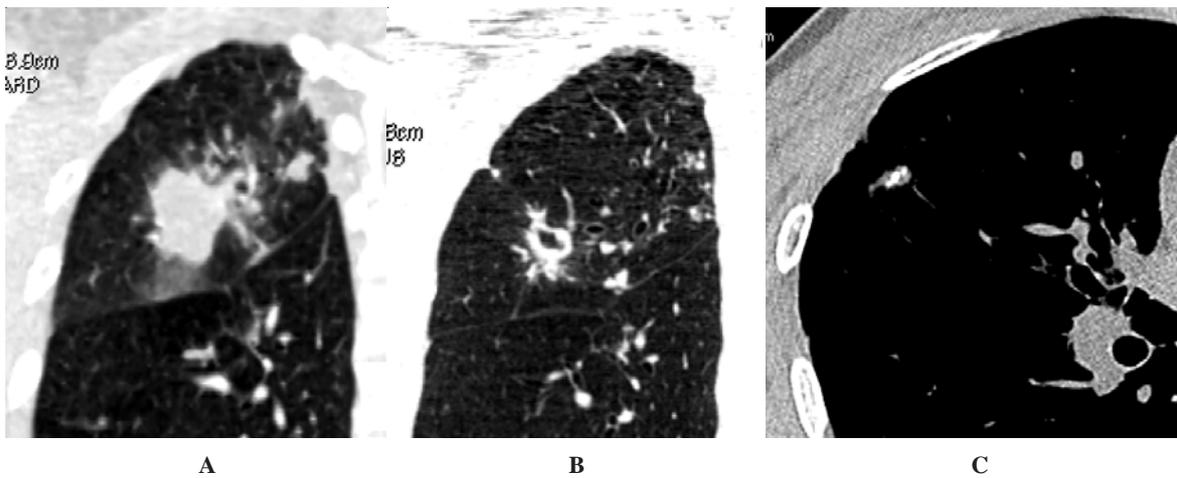

Fig. 5 A 29 years old woman with chronic cough had positive AFB from transbronchial biopsy. (A): Initial coronal reformatted HRCT shows right upper lobe mass with lobulated margin and satellite lesions. (B): After 6 months of treatment with antituberculous drugs, the size of the lesion was decreased and cavity was developed in the lesion with thick irregular wall. (C): One year from (A), the typical calcification of granuloma was demonstrated

incidence of lung cancer about 6.46% of new cancer patients in our hospital[3]. It is the fifth leading cause of cancer death. In the United States, approximately 90% of new cases diagnosed will die as a result of the disease over the course of the next year[4,5]. Overall survival was very poor over the past 20 years and 5-year survival has improved from 14.5% to only 16.3%[6]. It is because of late presentation of the patients with advanced disease. The TNM staging is very important

for prognosis with 5-year survival up to 80% in stage 1A[7]. Therefore, it would be desirable to identify patients with early stage lung cancer. It has been accepted at a certain level that HRCT is useful in this purpose. Generally, the smaller the nodule, the more likely it is to be benign. Previous studies reported 80% of benign nodules are less than 2 cm in diameter[1]. The features of the nodules such as spiculated margin, distortion of adjacent vessels, mixed ground-glass and

solid density, pseudocavity, air-bronchogram sign, diffuse and amorphous calcification, and enhancement more than 20 HU were reported to be found in malignancy more than benign lesions[2,8,9]. From the present study, these features were also found commonly in tuberculous lesion. Kim H, et al studied HRCT features of pulmonary nodules in tuberculous endemic area[10]. They found that spiculated margin, contrast enhancement more than 20 HU, pleural tag and mediastinal lymph node enlargement were more frequently seen in malignancy. In contrast to other previous studies, satellite lesions and cavitations were found more in benign lesion in their study. Kim YI, et al studied CT findings in whom pulmonary Tbc and bronchogenic carcinoma coexisted in the same lobe and found that most cancers concurrent with Tbc were large, lobulated masses with mediastinal lymphadenopathy similar to those of lung cancer without Tbc[11]. Takashima S, et al studied indeterminate solitary pulmonary nodules using first follow up HRCT and found that polygonal shape and concave margin were found greater in benign than malignant lesions[12]. Though the specificity is high for polygonal shape (100%), the sensitivity is quite low (23%).

The present pilot study found that CT findings of malignancy were not rare in tuberculous mass. From the present study the authors cannot conclude which finding could be potential predictive factor for pulmonary Tbc. Benign pattern of calcification is not a common finding in the presented cases. The major limitations of the present study are that the authors did not study only solitary pulmonary nodules or in screening cases and that only proven cases of Tbc were studied, so the authors did not have malignant cases for comparison. Furthermore, though the patients were followed up, the authors did not have follow up CT for criteria of growth pattern. Finally, retrospective study design caused many bias in the study. Because of these limitations, the authors could not evaluate the value of other ancillary findings on CT which may add confidence to the diagnosis for the lesions. However, the present study gave initial information for further study with appropriate study design to evaluate the value of HRCT in differentiating malignancy from benign lesions especially tuberculosis in endemic areas.

In conclusion, malignant findings on HRCT can be found commonly in pulmonary tuberculosis. It is important for secondary and tertiary hospitals with limited health care budget. Re-evaluation of value of CT in patients clinically controversy for malignancy and high prevalence of tuberculosis is needed in endemic areas.

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ภาพเอกซเรย์คอมพิวเตอร์ความละเอียดสูงในวัณโรคปอดที่คล้ายกับมะเร็ง

อรสา ชวาลภาฤทธิ์, อภิญญา เจริญศักดิ์, นิธิพัฒน์ เจียรกุล

เพื่อศึกษาลักษณะที่อาจช่วยในการวินิจฉัยก้อนในเนื้อปอดที่เกิดจากวัณโรคปอดด้วยการตรวจเอกซเรย์ คอมพิวเตอร์ความละเอียดสูง (HRCT) โดยการศึกษาย้อนหลังภาพ HRCT ของผู้ป่วยที่ได้รับการวินิจฉัยสุดท้ายว่า เป็นวัณโรคปอด จำนวน10 ราย เป็นชาย 6 ราย หญิง 4 ราย อายุเฉลี่ย 53.5 ปี จากจำนวนก้อนในเนื้อปอดที่พบ 13 ก้อน พบว่าขนาดเฉลี่ย 2.3 ซม. และ 53.8% ที่มีขนาดใหญ่กว่า 2 ซม. ตำแหน่งของก้อนอยู่ปอดกลีบขวาบน (30.8%) กลีบขวากลาง (7.7%) กลีบขวาล่าง (38.5%) และกลีบซ้ายบน (23.1%) พบหินปูนในก้อน 2 ก้อน ลักษณะขอบก้อน เป็นหนาม (76.9%) โค้งเว้า (23.1%) และเรียบ (7.7%) พบลักษณะกระจกฝ้า (23.1%) ลักษณะขอบที่เว้าเข้า (61.5%) และหลายเหลี่ยม (53.8%) ลักษณะลมค้างในหลอดลม (38.5%) และ ช่องว่างภายในก้อน (15.4%) เยื่อหุ้มปอดดึงรั้ง (30.8%) หลอดเลือดเสียรูป (23.1%) รอยโรคใกล้เคียง (38.5%) และรอยโรคใต้ชั้นเยื่อหุ้มปอด (46.2%) มี 2 ก้อนใน 7 รายที่มีภาพหลังฉีดสารปรับความชัดที่มีความทึบรังสีเพิ่มขึ้น ต่อมน้ำเหลืองโต 8 รายในจำนวน 10 ราย (80%) มี 2 รายที่ขนาดต่อมน้ำเหลืองใหญ่กว่า 2 ซม. ลักษณะอื่น ๆ ที่พบร่วมคือ เยื่อหุ้มปอดหนาหรือมีสารน้ำในช่องเยื่อหุ้มปอด (60%) ปอดแฟบ (20%) ถุงลมโป่งพอง (40%) และเนื้อปอดถูกแทรกซึม (50%) จากการศึกษานี้สรุปได้ว่า ลักษณะของ ก้อนที่เกิดจากวัณโรคปอดจากการตรวจ HRCT จะคล้ายลักษณะที่พบในมะเร็งปอด