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ORIGINAL ARTICLE

Role of computed tomographic scanning prior to thoracoscopic surgery for primary spontaneous pneumothorax

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Background/Purpose: The role computed tomography (CT) performed prior to thoracoscopic surgery for primary spontaneous pneumothorax (PSP) remains unclear.
Methods: We retrospectively reviewed medical records of all patients who underwent thoracoscopic surgery for PSP during 2008–2012. Patients were stratified into two groups: CT group (patients who received preoperative CT scanning) and control group (patients who did not receive preoperative scanning). Short-term postoperative results and long-term pneumothorax recurrence rates were compared.
Results: A total of 298 patients were studied. Preoperative CT scanning was performed in 140 of them. The duration of operation, incidence of bullae formation, number of excised specimens, rate of complications, and postoperative hospital stay were similar between the two groups. After a mean follow-up of 20 months, the recurrence rates were 8.6% (12/140) in the CT group and 5.7% (9/158) in the control group ($p = 0.371$). In the CT group, five patients had unexpected pulmonary findings and three of them (60%) developed pneumothorax recurrence, the rate of which was significantly higher than that in patients without unexpected pulmonary findings (9/135, 6.7%, $p = 0.004$). Unexpected pulmonary lesions were more commonly noted in females (4/19, 21.1%) than in males (1/121, 0.8%; $p < 0.001$).
Conclusion: Preoperative CT scanning was not associated with better results after thoracoscopic surgery for PSP and is, therefore, not justified as a routine examination prior to the

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operation. In female patients, however, preoperative CT scanning might be needed because these patients tended to have a higher incidence of unexpected pulmonary lesions, which were associated with a higher rate of recurrence.

Introduction

Primary spontaneous pneumothorax (PSP) most commonly occurs in young, tall, lean males.[1–7] Video-assisted thoracoscopic surgery (VATS) that combines bullectomy with some kind of pleurodesis, either abrasion or pleurectomy, is the preferred intervention for treating complicated or recurrent PSP.[8–13] The mainstay of preoperative diagnostic imaging is erect chest X-ray.[1] X-ray findings characteristic of PSP include displacement of the pleural line and presence of air-fluid level in the costophrenic angle. Apical blebs are occasionally noted as well.[1]

Computed tomography (CT) is now widely used to establish a diagnosis and for treatment decision-making in patients with lung diseases.[14,15] CT scanning is very useful in detecting small pneumothorax, estimating the size, and identifying blebs/bullae and additional pathology of pneumothorax[1,16–34]; however, only a few studies have evaluated the relationship between preoperative CT scanning and the results of thoracoscopic surgery for PSP.[25–27] Some retrospective studies have shown that CT scanning may detect contralateral bleb or bullae and may have operation in once; this may reduce the recurrence rate of contralateral pneumothorax.[30,31]

In this study, the role of CT scanning performed prior to thoracoscopic surgery for PSP was evaluated. We hypothesized that preoperative CT scanning might detect more unexpected findings, which would improve the postoperative results and decrease the rate of pneumothorax recurrence after surgery.

Methods

Study design and patients

The aim of this retrospective study was to evaluate the association between preoperative CT scanning and postoperative outcomes, including short-term results and long-term pneumothorax recurrence after thoracoscopic surgery for PSP. Participants comprised patients with spontaneous pneumothorax who underwent VATS at the National Taiwan University Hospital, Taipei, Taiwan from January 2008 to December 2011. Exclusion criteria included age greater than 40 years, evidence of preexisting pulmonary diseases, presence of parenchymal lesions on chest radiography requiring CT scanning, presence of pneumothorax requiring bilateral VATS, and history of ipsilateral thoracic surgery.

This study was reviewed and approved by the Research Ethics Committee of the National Taiwan University Hospital (approval number 201202011RIC).

Preoperative studies and CT scanning

All patients underwent blood tests and investigated with an erect chest X-ray prior to thoracoscopic surgery. Unenhanced spiral CT of the chest was performed in some patients, depending on the treatment policy of the attending physician or surgeon. Although some physicians or surgeons requested preoperative CT routinely to detect contralateral bleb, bullae, or unexpected findings, others did not, to avoid unnecessary radiation exposure. All CT studies (LightSpeed VCT; GE Healthcare, Milwaukee, WI, USA) were performed with standard parameters (120 kVp, adjustable mA according to body size, 1.3 pitch, and 0.7-second rotation time) without contrast enhancement. CT scans were reconstructed at section widths of 5 mm in the axial plane and 3 mm in the coronal plane. The images were reviewed by a thoracic surgeon and a radiologist (J.S.C. and Y.C.C., respectively) who were blinded to the clinical data. The typical findings of PSP on CT scans were the presence of localized emphysema-like changes in the upper lung zones, or blebs or bullae in the upper lung zones or lateral subpleural areas, without parenchymal changes in other parts of the lungs.[1,28] Unexpected pulmonary lesions were defined as the presence of diffuse lung parenchymal lesions such as infiltrations, blebs, or thin-walled cysts.

VATS procedures

Either conventional or needlescopic VATS was performed with the patient under general anesthesia and one-lung ventilation. The anesthesia, preparation, and operative procedures used for needlescopic VATS were almost identical to those used for conventional VATS. Our previous studies have shown that the short-term results and pneumothorax recurrence rates are similar for both techniques, even though needlescopic VATS provides better cosmetic results and induces less residual chest pain.[10–13]

During thoracoscopy, pleural adhesions were freed using electrocautery. When blebs were identified, they were excised with an endoscopic stapler. Blind apical stapling was performed at the most suspicious area if no bleb could be identified. Mechanical pleurodesis was performed using pleural abrasion or apical pleurectomy, depending on the treatment policies or clinical trial protocols during different time periods.[11] After postoperative lung reinflation, a normal saline solution was instilled to check for air leaks. A chest tube was placed in the apex through one of the insertion wounds.

The patients were extubated in the operating room and observed for 1–2 hours in the recovery room. Chest radiography was performed either immediately after surgery or the next morning. The chest tube was connected to a low-