Transthoracic Aspiration Cytology for the Diagnosis of Thoracic Infection†

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Abstract

The article describes the use and results of transthoracic aspiration cytology for diagnosis of thoracic infection in a Thai referral chest center. We reviewed 60 cytologic samples, initially diagnosed as thoracic infection or inflammation among a total of 532 percutaneous transthoracic needle aspirations obtained from patients with clinical suspicion of malignancy in a period of 6 years. Follow-up clinical data were collected and correlated with cytologic diagnosis. We found specific microorganisms in 8 samples (13.33%). These included 4 cases of actinomycosis, 3 cases of cryptococcosis and a case of aspergillosis. Granulomatous inflammation was found in 12 samples (20.00%). Among these patients, 10 cases were verified as having tuberculosis. The remaining 40 samples (66.67%) revealed acute inflammatory exudate with no specific micro-organism. Follow-up clinical data confirmed or assumed infection in 27 cases. Therefore, in patients with thoracic infection who presented with clinical suspicion of malignancy, from our experience, aspiration cytology revealed adequate morphology for accurate diagnosis which resulted in prompt specific treatment and better prognosis.

Key word : Aspiration Cytology, Thoracic Infection, Transthoracic Aspiration

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Generally, the main purpose of aspiration cytology is to diagnose malignancy of the suspected lesion; however, from our practice, we found that the procedure was also useful for the diagnosis of infection. This article describes the use and results of aspiration cytology for the diagnosis of thoracic infection in a Thai referral chest center.

MATERIAL AND METHOD

All aspirated samples from patients with clinical suspicion of thoracic malignancy but cytological diagnosis of infection or inflammation at the Central Chest Hospital, Thailand from October 1992 to November 1998 were reviewed. We found 60 samples from 60 patients that constituted 11.28 per cent of a total of 532 samples from the thoracic region obtained at the same period. The age of the patients ranged from 23 to 84 years. The mean age ± S.D. was 54.82 ± 15.54. The male to female ratio was 44: 16. The procedure of obtaining the samples was done by percutaneous transthoracic needle aspiration under ultrasound or computed tomographic guidance (Fig. 1). It was performed in case routine investigations for malignancy such as bronchoscopy and bronchial biopsy revealed negative result. Aspiration was performed in lung, mediastinum and pleura or chest wall in 49, 5 and 6 cases respectively. The X-ray findings were mass, nodule and infiltration in 40, 12, and 8 cases respectively. Interpretation of the cytologic samples as thoracic infection or inflammation was done on the basis of the presence of these findings: specific microorganisms; epithelioid cell or granulomatous inflammation and acute inflammatory exudate. Follow-up clinical data was collected in each case and correlated with cytologic diagnosis.

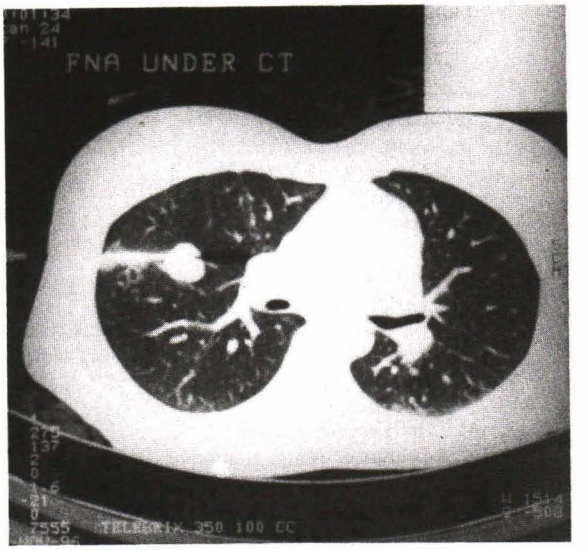

Fig. 1. CT-guided percutaneous transthoracic needle aspiration of the intrapulmonary nodule in one case.

Fig. 2. Direct smear of fine needle aspirate from one case reveals yeast-forms with thick mucinous capsule of *Cryptococcus neoformans*. (Papanicolaou stain x400)

RESULTS

Table 1 outlines the number and percentage of cases with cytologic diagnosis of thoracic infection or inflammation and follow-up clinical data. The aspirated samples from 8 cases (13.33%) revealed specific microorganisms which lead to definite diagnosis of thoracic infection. These included 4 cases of actinomycosis, 3 cases of cryptococcosis (Fig. 2) and a case of aspergillosis.

Epithelioid cells and chronic inflammatory cells with or without necrosis which lead to the diagnosis of granulomatous inflammation were found in samples from 12 cases (20.00%). Follow-up clinical data verified tuberculosis in 10 cases, pulmonary inflammatory pseudotumor in another 1 case and revealed no verification in the other case. The following results were shown among tuberculosis cases. Surgical resection revealed tuberculoma in 3 cases. Follow-up sputum examination revealed acid-fast-bacilli in 3 cases. Needle biopsy confirmed granuloma and the patient improved after treatment with antituberculosis drugs in 1 case. Three cases revealed no acid-fast-bacilli from sputum examination but improved after treatment with antituberculosis drugs.

Table 1. Cytologic diagnosis of thoracic infection and follow-up clinical data.

Thoracic infection or inflammation		No		%
Specific microorganism		**8**		**13.33**
- Actinomycosis		4		
- Cryptococcosis		3		
- Aspergillosis		1		
Granulomatous inflammation		**12**		**20.00**
- Tuberculosis		10		16.66
• Resection of tuberculoma	3			
• Sputum AFB positive	3			
• Confirmed of granuloma and improved with antiTB	1			
• Sputum AFB negative but improved with antiTB	3			
- Inflammatory pseudotumor		1		1.67
- Not verified		1		1.67
Acute Inflammatory exudate		**40**		**66.67**
- Confirm or assume as infection or inflammation		27		45.00
• Aspiration culture positive for microorganism	8			
• Aspiration exam positive for AFB	1			
• Resection with result of infection or inflammation	4			
• Improve or cure with antibiotic	10			
• Improve or cure with antiTB	3			
• Infection + malignancy	1			
- Malignancy		7		11.67
- Not verified		6		10.00
Total		**60**		**100**

The cytologic samples from 40 cases (66.67%) revealed acute inflammatory exudate that consisted mostly of polymorphonuclear cells, necrotic cells, nuclear debris, fibrin and a few histiocytes. Follow-up clinical data confirmed or assumed infection or inflammation in 27 cases (45.00%), indicated malignancy without any other evidence of coincidental infection in 7 cases (11.67%) and revealed no verification in 6 cases (10.00%). The following results were shown among cases of infection. Cultures were positive for microorganisms in 8 samples. These included *Streptococcus* spp., *S. aureus, H. influenzae, P. aeruginosa, C. neoformans* from each one case, *M. tuberculosis* from 2 cases and *M. tuberculosis* with *A. fumigatus* from one case. Examination of the aspirated sample revealed acid-fast-bacilli in 1 case. Four patients underwent surgical resection and revealed infection or inflammation. These included aspergillosis, actinomycosis, inflamed bronchiectasis and pseudolymphoma. Improvement or cure after treatment with antibiotics and antituberculosis drugs was found in 10 and 3 patients respectively. One case had both aspergillus infection and malignancy of nonsmall cell lung cancer. The 7 patients with malignancy included 2 cases of squamous cell carcinoma, 2 cases of large cell carcinoma, a case of adenosquamous carcinoma, a case of undifferentiated carcinoma and a case of Hodgkin's disease.

DISCUSSION

Percutaneous transthoracic needle aspiration is a procedure to obtain a satisfactory sample of intrathoracic lesion for cytologic examination. Interpretation of the aspirated sample is based on the presence of cytomorphology recognized as a disease on the slides. The cytologic findings may represent the whole or part of disease from the patient. It is practical to use aspiration cytology in search of malignant disease; however, the procedure reveals adequate cytologic findings for diagnosis of infection in some cases as well. Recently, only a few papers in the literature described the cytologic features of these specific infectious diseases from the thoracic region: actinomycosis[1], cryptococcosis[2] and aspergillosis[3]. We found specific microorganisms in 13.33 per cent of cases from our series. Recognizing the features of microorganisms

in the cytologic sample definitely indicates thoracic infection. This will avoid further invasive diagnostic procedures and lead to appropriate treatment.

Granulomatous inflammation is defined in a cytologic sample by the presence of epithelioid cells and chronic inflammatory cells with or without necrosis. These findings are found in most cases of tuberculosis[4] and some other specific infections[5,6]. However, the presence of granuloma in cytologic samples does not rule out malignancy in the suspected cases because such features can also be found in samples from various types of malignant neoplasms[7]. Therefore, further investigations such as video-assisted thoracoscopic surgery or exploratory thoracotomy are needed in such cases. From our series, we found most of the cases had tuberculosis. In 4 uncertain cases that had following surgery, we found tuberculosis in 3 cases and inflammatory pseudotumor in 1 case. Reviewing histologic slides in the latter case, granulomas could be found in some regions of the tumor corresponding to the cytomorphology.

The cytologic findings of acute inflammatory exudate are not specific but suggestive of acute infection or inflammatory process[8]. From our series, about two thirds of the cases were confirmed or assumed to have infection. These included diseases caused by pyogenic bacteria, mycobacterium and fungi. Special stains for microorganisms in such samples would be helpful to find out the causative agents. While waiting for the culture report, treatment with antiinfective drugs showed some advantages. Even in cases with undetected causative agent, patients were cured or improved after the treatment. Acute inflammatory exudate was also found in aspirated samples from a malignant lesion. This could represent only a part of the patient's disease such as a neoplasm with coincidental infection. The tumors which produced obstructive pneumonitis or tumor necrosis with inflammatory response revealed the same findings. Therefore, further investigations or surgery were needed in such cases with uncertain clinical diagnosis.

SUMMARY

Transthoracic aspiration cytology is particularly used in search of thoracic malignancy in our hospital. However, in patients with thoracic infection who present with clinical suspicion of malignancy, this procedure reveals adequate morphology to differentiate one disease from the other. Definite cytologic diagnosis of thoracic infection can be made by demonstration of specific microorganisms. However, recognition of various cytologic patterns of inflammation leads to accurate diagnosis in cases that reveal no microorganism. Finally, combination of cytomorphology and microbiological studies will increase accuracy for diagnosis.

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REFERENCES

1. Das DK. Actinomycosis in fine needle aspiration cytology. Cytopathology 1994; 5: 243-50.
2. Hsu CY. Cytologic diagnosis of pulmonary cryptococcosis in immunocompetent hosts. Acta Cytol 1993; 37: 667-72.
3. Tikkakoski T, Lohela P, Paivansalo M, et al. Pleuro-pulmonary aspergillosis. US and US-guided biopsy as an aid to diagnosis. Acta Radiol 1995; 36: 122-6.
4. Das DK, Pant CS, Pant JN, et al. Transthoracic (percutaneous) fine needle aspiration cytology diagnosis of pulmonary tuberculosis. Tubercle Lung Dis 1995; 76: 84-9.
5. Silverman JF, Marrow HG. Fine needle aspiration cytology of granulomatous diseases of the lung, including nontuberculous mycobacterium infection. Acta Cytol 1985; 29: 535-41.
6. Silverman JF, Johnsrude IS. Fine needle aspiration cytology of granulomatous cryptococcosis of the lung. Acta Cytol 1985; 29: 157-61.
7. Khurana KK, Stanley MW, Powers CN, et al. Aspiration cytology of malignant neoplasms associated with granulomas and granuloma-like features. Cancer (Cancer Cytopathology) 1998; 84: 84-91.
8. Orell SR, Walters MNI, Sterrett GF, et al. Manual and atlas of fine needle aspiration cytology, 2nd edition, Edinburgh: Churchill Livingstone 1992: 178.

การตรวจเซลล์จากการเจาะดูดผ่านผนังทรวงอกเพื่อวินิจฉัยภาวะติดเชื้อของทรวงอก†

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คณะผู้วิจัยได้ทำการศึกษาตัวอย่างทางเซลล์วิทยาจำนวน 60 ตัวอย่าง ที่แสดงลักษณะการติดเชื้อ หรือการอักเสบของทรวงอก จากตัวอย่างทั้งหมด 532 ตัวอย่างซึ่งเก็บจากผู้ป่วยที่มีลักษณะทางคลินิกเข้าได้กับเนื้องอกของทรวงอก โดยวิธีใช้เข็มขนาดเล็กเจาะผ่านผนังทรวงอก ในช่วงระยะเวลา 6 ปี และติดตามข้อมูลทางคลินิกของผู้ป่วยแต่ละราย เพื่อนำมาเปรียบเทียบกับการวินิจฉัยทางเซลล์วิทยา จากการตรวจตัวอย่างทางเซลล์วิทยาทั้งหมดพบ specific micro-organism จำนวน 8 ตัวอย่าง (13.33%) คือ actinomycosis จากผู้ป่วย 4 ราย cryptococcosis จากผู้ป่วย 3 ราย และ aspergillosis จากผู้ป่วย 1 ราย ตรวจพบลักษณะ granulomatous inflammation 12 ตัวอย่าง (20.00%) พบว่าเป็นตัวอย่างที่เก็บจากผู้ป่วยที่เป็นวัณโรคของทรวงอกจำนวน 10 ราย ส่วนอีก 40 ตัวอย่าง (66.67%) พบลักษณะทางเซลล์วิทยาเป็นแบบ acute inflammatory exudate จากการติดตามข้อมูลทางคลินิก พบว่าผู้ป่วยในกลุ่มนี้มีการติดเชื้อหรือการอักเสบของทรวงอก จำนวน 27 ราย การตรวจด้วยวิธีเซลล์วิทยาของการเจาะดูด ในผู้ป่วยที่มีลักษณะทางคลินิกเข้าได้กับเนื้องอกของทรวงอก ช่วยให้เราทราบว่า รอยโรคในผู้ป่วยบางราย มีสาเหตุจากการติดเชื้อ ซึ่งเป็นกลุ่มโรคที่ใช้วิธีการรักษาที่แตกต่าง และมีการพยากรณ์โรคที่ดีกว่าเนื้องอกของทรวงอก

คำสำคัญ : เซลล์วิทยาจากการเจาะดูด, การติดเชื้อของทรวงอก

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