Safety and Effectiveness of Fluoroscopy-Guided Percutaneous Transthoracic Pleural Biopsy in Patients with Exudative Pleural Effusion

In Chul Nam[1], Doo Ri Kim[1], Jeong Jae Kim[1], Im-kyung Hwang[1], Jeong Sub Lee[1]

[1]Department of Radiology, Jeju National University School of Medicine, Jeju National University Hospital, 15, Aran 13-gil, Jeju, 63241, Republic of Korea

- **Introduction:** Pleural biopsy can aid in identifying the cause of pleural effusion and help establish a treatment strategy. This study aimed to evaluate the diagnostic performance and other procedural characteristics of fluoroscopy-guided percutaneous transthoracic pleural biopsy (PTPB) in patients with exudative pleural effusion.

- **Methods:** Patients with exudative pleural effusion who underwent PTPB between May 1, 2014, and February 28, 2023, were included in this retrospective study. The technical success rate, the interval between percutaneous catheter drainage (PCD) and PTPB, the number of tissue samples, procedural time, and procedure-related complications were evaluated. The sensitivity, specificity, and accuracy were computed to evaluate the diagnostic performance of PTPB.

- **Results:** Seventy-one patients, comprising 50 men and 21 women (mean age, 69.5 ± 15.3 years), were included in this study. The final diagnoses were benign lesions in 48 patients (67.6%) and malignant lesions in 23 patients (32.4%). The technical success rate was 100%. The mean number of biopsies was 4.5 ± 1.3. The mean procedural time was 4.4 ± 2.1 min. The complication of minor bleeding was reported in one patient (1.4%). The sensitivity, specificity, and accuracy were 47.8%, 100%, and 83.1% in cytologic testing, and 65.2% 100%, and 88.7% in PTPB alone, respectively. On interpreting the cytology results along with PTPB, the sensitivity, specificity, and accuracy were 78.3%, 100%, and 93%, respectively.

- **Discussion**: This is the first study to assess the diagnostic performance and other procedural characteristics of fluoroscopy-guided pleural biopsy to the best or our knowledge. PTPB is a simple technique enough for interventional radiologists or trainees to perform and can be performed irrespective of the patient's breathing. This is evidenced by the fact that the procedure time was short, at an average of 4.4 ± 2.1 min. In terms of diagnostic performance, PTPB alone showed an acceptable performance, with the exception that the sensitivity is somewhat lower. This could be attributed to the fact that the biopsy was performed blindly. Nevertheless, the operators could obtain pleural effusion during the PTPB procedure, which facilitated the concurrent execution of PTPB and cytologic tests, which consequently improved the overall diagnostic performance, and increased the sensitivity, accuracy, NPV, and AUC to 78.3%, 93%, 90.6%, and 89.1%, respectively.

Conclusion: Fluoroscopy-guided percutaneous transthoracic pleural biopsy is an accurate and safe diagnostic technique for patients with exudative pleural effusion, with acceptable diagnostic performance, low complication rate, and reasonable procedure time.

Table. Diagnostic performance of PTPB, cytologic testing, and the combined interpretation of PTPB and cytologic testing.

	PTPB	Cytologic testing	PTPB + cytologic testing
Sensitivity (%)	65.2 [42.7 – 83.6]	47.8 [26.8 – 69.4]	78.3 [56.3 – 92.5]
Specificity (%)	100	100	100
Accuracy (%)	88.7 [81.4 – 96.1]	83.1 [74.4 – 91.8]	93 [87 – 98.9]
PPV (%)	100	100	100
NPV (%)	85.7 [77.4 – 91.3]	80 [73 – 85.5]	90.6 [81.6 – 95.4]
AUC (%)	82.6 [71.8 – 90.6]	73.9 [62.1 – 83.6]	89.1 [79.5 – 95.3]
*P**	< 0.05		

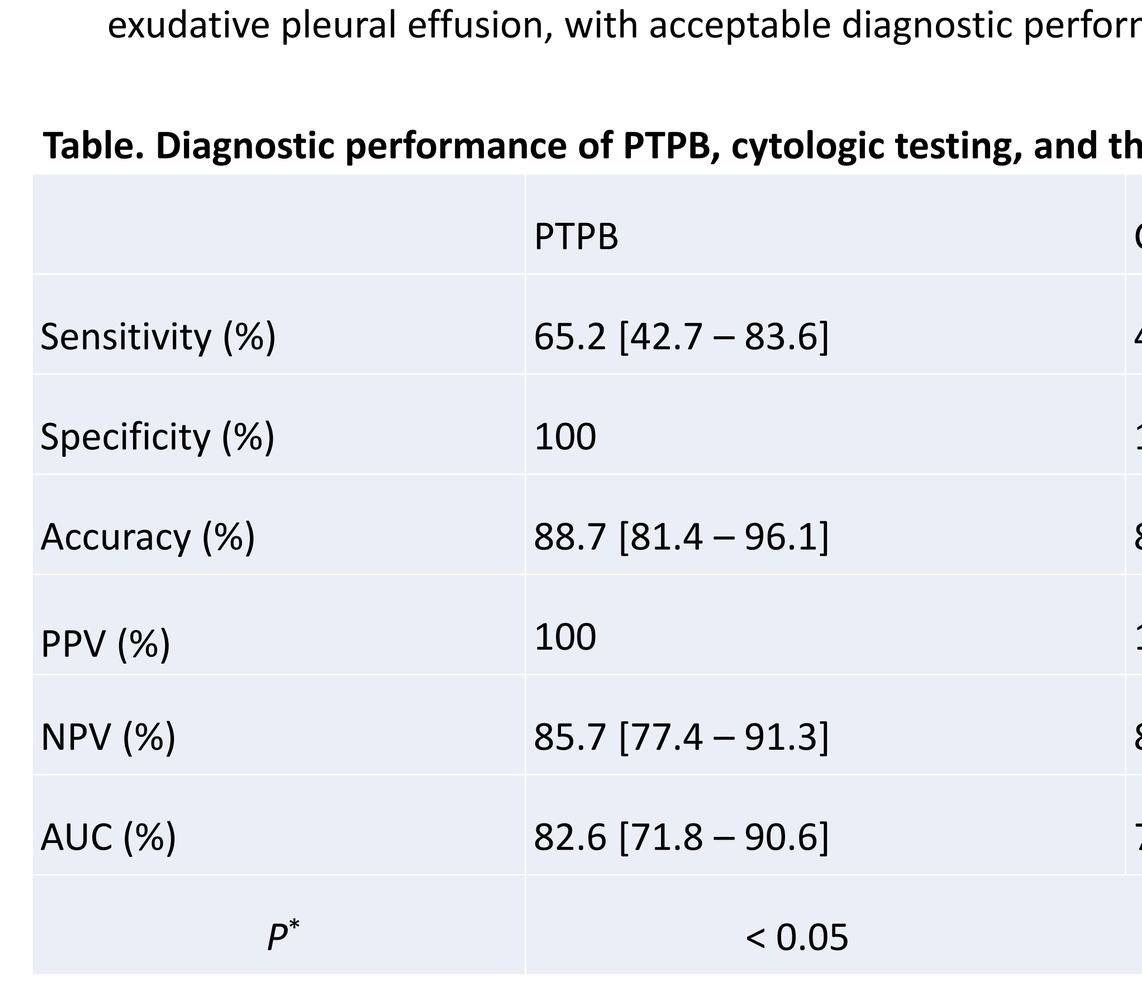

Figure. Images of an 81-year-old man on medication for diabetes mellitus and hypertension who presented to the outpatient department with dyspnea.

A. Axial image of contrast-enhanced computed-tomography showing diffuse thickening and enhancement of the left pleura (white arrow) with moderate left pleural effusion.
B. Axial image of ^{18}F-fluorodeoxyglucose positron emission tomography showing a mild, diffuse increase in the pleural uptake.
C. Fluoroscopy-guided percutaneous transthoracic pleural biopsy of the left upper thorax.
D. Photomicrographs (Hematoxylin and Eosin staining, x200) showing atypical glandular proliferations on a bloody background, suggestive of adenocarcinoma.