Evaluation of fluoroscopy guided transbronchial lung biopsy in the diagnosis of peripheral lung shadows.

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Abstract:

The diagnosis of peripheral pulmonary lesions (PPLs) remains a clinical challenge for chest physicians. Flexible bronchoscopy with sampling procedures is recognized as the "gold standard" to obtain the correct diagnosis of PPLs.

Study objectives: the aim of this study is to evaluate the fluoroscopic guided transbronchial lung biopsy in the diagnosis of peripheral lung shadows.

Design: prospective study.

Interventions: Transbronchial lung biopsy via fiberoptic bronchoscope under fluoroscopic guidance was done for all patients and some of them underwent C-T guided biopsy.

Participants: Thirty patients with peripherally situated lung shadows were selected.

Measurements and results: The fluoroscopy guided transbronchial lung biopsy was diagnostic in 17 cases with percentage of 56.6%, and it was not diagnostic in 13 cases with percentage of 43.3%. these 13 paitents were subjected to C-T guided transthoracic needle biopsy. It was diagnostic in 8 cases with percentage of 61% and not diagnostic in 5 cases with percentage of 38.5%.

Conclusion: this study demonstrates the usefulness of both transbronchial lung biopsy together with percutaneous approaches in the diagnosis of peripheral pulmonary lesion.

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Introduction:

Bronchoscopy is the most commonly used minimally invasive diagnostic procedure in pulmonary medicine and is widely used for the diagnosis.

The diagnosis of peripheral pulmonary lesions (PPLs) remains a clinical challenge for chest physicians. Flexible bronchoscopy with sampling procedures is recognized as the "gold standard" to obtain the correct

diagnosis of PPLs. Conventional diagnostic procedures (CDPs) for PPLs include transbronchial biopsy (TBB), bronchial washing (BW), or bronchial brushing, but the diagnostic yields are variable and sometimes suboptimal (diagnostic rate approximately 18 to 62%).1 Diagnostic accuracy is influenced by lesion size; **Schreiber and McCrory** have reported in a systematic review that the diagnostic accuracy of lesions _ 20 mm in mean diameter was 33%. Other studies [3] have found the diagnostic accuracy of benign lesions to be 35 to 50%, which is lower than that of malignant lesions.

Methodology:

Thirty patients with peripherally situated lung shadows were selected. These patients were 19 males and 11 females aging between 25 years old and 70 years old with mean age of 47 years old.

Inclusion criteria were peripherally situated pulmonary lesion beyond bronchoscopic vision.

Exclusion criteria included: patients with advanced emphysema, severe persistent cough, recent or uncontrolled CAD, bleeding tendency, vascular pulmonary lesions or diffuse lesion not accessible for TBLBs. All patients were subjected to: good history taking and clinical Examination, plain chest X-ray P-A and lateral view, liver and kidney function, bleeding profile. Transbronchial lung biopsy via fiberoptic bronchoscope under fluoroscopic guidance and some of them underwent C-T guided biopsy.

Premedication consisted of an intramuscular injection of atropine sulfate (0.5mg). Topical anesthesia of the nose was with 5% lignocaine solution and that of the pharyngo-laryngeal zone was with 2% lignocaine. Transnasal approach was used. After choosing the segment from which the biopsy is to be taken, the bronchoscope is advanced until it wedges into a bronchus that is approximately the same diameter. Accordingly to **Paul 1994** sustained suction was applied only after obtaining the last piece of tissue that was intended to be taken in order to reduce the risk of bleeding. Six bites were taken in order to have an adequate sample. After the subsegmental bronchus has been wedged, the patients was then asked to breath slowly and quietly. The

small closed forceps was extended into the bronchus, when the resistance was met the forceps was withdrawn 1-2 cm opened and advanced again until resistance was refelt.

The patient's facial expression was watched before asking the assistant to close the forceps and avulse the tissue. If there is an expression or gesture that indicates the perception of an abnormal sensation from the chest, the forceps blades were not closed in that particular position. Then the forceps was pulled slowly and steadily rather than quickly in most cases. If there was too much resistance to avulsion of tissue, the bronchoscope was withdrawn to straighten its tip slightly.

The used forceps was different, according to the circumstances alligator one used in some cases, while other types like cubed with non serrated sharp edges and the universal biopsy and grasping forceps which has also serrated edges like the alligator one, were also used. If considerable bleeding occurred following the biopsy, the bronchoscope was hold on the wedged position long enough that the blood will clot (typically about 5 minutes, occasionally longer)

After completing the procedure, patients stayed under medical observation for one hour or more if necessary. Chest x-ray was not routinely done after the procedure for all patients but only for those who experienced marked dyspnea. No patients developed pneumothorax after bronchoscopy.

Fluoroscopy was helpful in positioning the forceps when biopsying peripheral lung shadows and in carrying out transbronchial lung biopsy. Fluoroscopic control is necessary to be certain that the forceps does not perforate the visceral pleura and that the jaws of the biopsy tool open properly. Fluoroscopy time was minimal and protective lead upon aprons was worn by all personals during the procedure.

Results:

Case number	Diagnosis	
١.	Diagnostic	Carcinoid tumour
٢.	Diagnostic	Adenocarcinoma
٣.	Diagnostic	Aspergillus
٤.	Diagnostic	Ectopic goiter
٥.	Non diagnostic	
٦.	Non diagnostic	
٧.	Non diagnostic	
٨.	Non diagnostic	
٩.	Non diagnostic	
١٠.	Diagnostic	Tuberculous granuloma
١١.	Diagnostic	Alveolar cell carcinoma
١٢.	Diagnostic	Squamous cell carcinoma
١٣.	Non diagnostic	
١٤.	Diagnostic	Squamous cell carcinoma
١٥.	Diagnostic	Pulmonaru tuberculosis
١٦.	Non diagnostic	
١٧.	Diagnostic	Pulmonary tuberculosis
١٨.	Diagnostic	Carcinoid tumour
١٩.	Diagnostic	Adenocarcinoma
٢٠.	Non diagnostic	
٢١.	Diagnostic	Alveolar cell carcinoma
٢٢.	Non diagnostic	
٢٣.	Diagnostic	Squamous cell carcinoma
٢٤.	Non diagnostic	
٢٥.	Non diagnostic	
٢٦.	Diagnostic	Squamous cell carcinoma
٢٧.	Diagnostic	Carcinoid tumour
٢٨.	Non diagnostic	
٢٩.	Diagnostic	Squamous cell carcinoma
٣٠.	Non diagnostic	

Table ١ results of C-arm guided transbronchial lung biopsy

Case number	Diagnosis	
٥	Non diagnostic	
٦	Non diagnostic	
٧	Non diagnostic	
٨	Diagnostic	Small cell carcinoma
٩	Non diagnostic	
١٣	Diagnostic	Adenocarcinoma
١٦	Diagnostic	
٢٠	Non diagnostic	Squamous cell carcinoma
٢٢	Diagnostic	Adenocarcinoma
٢٤	Diagnostic	Squamous cell carcinoma
٢٥	Diagnostic	Adenocarcinoma
٢٨	Diagnostic	Small cell carcinoma
٣٠	Diagnostic	Squamous cell carcinoma

Table ٢: results of C-T guided biopsy

Case number	Diagnosis	Procedure
٥	Pulmonary tuberculosis	Highly +ve tuberculin test
٦	Malignant tumour	Pleural effusion +ve for malignant cells
٧	Wegner's granuloma	Limited thoracotomy
٩	Infected hydatid cyst	Limited thoracotomy
١٠	Infiltrating poorly differentiated squamous cell carcinoma	Limited thoracotomy

Table ٣: results of cases not diagnosed neither by transbronchial nor CT guided biopsy.

		Positive diagnostic	Negative non diagnostic
Number	٣٠	١٧	١٣
Percentage	١٠٠%	٥٦.٦٦%	٤٣.٣٣%

Table ٤: number of cases submitted to C-arm guided transbronchial biopsy

		Positive diagnostic	Negative non diagnostic

Number	١٣	٨	٥
Percentage	١٠٠	٦١.٥٣%	٣٨.٤٦%

Table ٥: number of cases submitted to C-T guided biopsy

	Right	Left
Non diagnostic	No = ٦ $\overline{x}$ = 42.86	No = ٧ $\overline{x}$ = 43.7
Tumour	No = ٦ $\overline{x}$ = 42.86	No = ٦ $\overline{x}$ = 37.5
infection	No = ٢ $\overline{x}$ = 14.2	No = ٣ $\overline{x}$ = 18.75

X^2 = ٠.٤٣ Non significant

No significant statistical relation between the site and nature of the lesion and the positivity of TBLB

Statistical analysis:

Numerical data were summarized as means and standard deviations. Data were compared using different tests according to the type of the data to be compared. The statistical analysis was done using a Mackintosh Quadra-٧٠٠ computer and Stat-View statistical package. Statistical analysis was done according to Knapp and Miller (١٩٩٢). THE "F" test was used to compare the mean of different group; more than two groups to be compared quantitatively through an analysis of variance (ANOVA). The unpaired student "t" test is used for comparing means of the two groups. A "p" value of ٠.٠٥ was considered the limit below which the difference of the values would be statistically significant.

Discussion:

In this study ٣٠ patients with peripheral lung shadows of different appearances with different aetiology were included.

All patients were subjected to bronchoscopy with fluoroscopy guided transbronchial lung biopsy. In all patients the bronchoscopy did not reveals any endobronchial lesion. The fluoroscopy guided transbronchial lung biopsy was diagnostic in ١٧ cases with percentage of ٥٦.٦%, and it was not diagnostic in ١٣ cases with percentage of ٤٣.٣%. These ١٣ patients were subjected to C-T

guided transthoracic needle biopsy. It was diagnostic in ٨ cases with percentage of ٦١% and not diagnostic in ٥ cases with percentage of ٣٨.٥%.

Three cases of these ٥ cases underwent limited thoracotomy in order to obtain definite diagnosis. The remaining two cases one of them was diagnosed as pulmonary tuberculosis on basis of high positive tuberculin test, and the other one developed pleural effusion and its cytology was positive for malignant cells.

Chest X-ray was not done routinely after the procedure except only for those who experienced marked dyspnea after the procedure. No patients developed pneumothorax after bronchoscopy in this series. This is probably an underestimate as the incidence of pneumothorax in other series reaches up to ١٠% (٥). However in study comparing the yield of fluoroscopy versus non-fluoroscopic guided transbronchial lung biopsy in ٦٥٠ patients divided in two equal groups there is no clinical significant difference in the rate of pneumothorax discovered between the two groups. (٦)

Out of all ٣٠ patients, ٢٢ patients had malignant disease (٩ squamous cell carcinoma, ٥ adenocarcinoma, ٣ carcinoid tumour, ٢ alveolar cell carcinoma, ٢ small cell carcinoma and ١ malignant effusion). The resting ٨ patients had bengin lesion, (٤ tuberculous patients, ١ Wagner's granulomatosis, ١ asperigllosis, ١ hydatid cyst, ١ ectopic goiter).

Of the ١٧ patients who were diagnosed via transbronchial lung biopsy, ١٢ patients had malignant diseases (٥ squamous, ٣ carcinoid, ٢ adenocarcinoma and ٢ alveolar cell carcinoma). The resting ٥ patients had bengin lesions (٣ tuberculous patients, ١ aspergillosis and ١ ectopic goiter).

None of the ٨ patients diagnosed through C-T guided biopsy was benign. Within the ٣ patients who underwent thoracotomy, ٢ patients have benign diseases and only one had a malignant disease.

In the ٢٢ patients with malignant disease, fluoroscopic guided transbronchial biopsy had a diagnostic yield of ١٢/١٢, the site of the lesion either left or right, also whatever any lobar localization has

no significant effect on the yield of TBLB.

Concerning this work, fiberoptic bronchoscopy was the first diagnostic step in the routine work of a peripheral pulmonary lesion. In these ٣٠ patients, the overall diagnostic yield of bronchoscopic biopsy was ٥٧%. In a similar study carried by **Reichenberger and his colleagues (١٩٩٩),** the overall bronchoscopic yield was only ٥١%. The two figures were too close and comparable; despite they used TBLB together with the fluoroscopic guided transbronchial needle aspiration biopsy (TBNA). The applied transbronchial needle aspiration biopsy was only successful in ٢٠% of cases. **Wang and his colleagues in** ١٩٨٤, considered the combination of TBNA with TBLB to be beneficial and safe technique in the diagnosis of peripheral pulmonary lesion. In one study of ٣٧ patients with peripheral lung lesion the diagnosis yield of bronchoscopy increased from ٤٦% to ٧٠% when TBNA was added to TBLB **(٩). Chechani, ١٩٩٦,** reported a comparable diagnostic yield of the TBLB (٥٧%) in a peripheral lung shadow in absence of endobronchial abnormality. While many similar series were restricted to malignant lesion, only **Wang and Britt,** ١٩٩١ had positive yield for TBLB of ٤٥%, **(١٢)** had negative yield of ٤٨%. This study analyzed the value of fluoroscopic guided TBLB in ٣٠ patients with malignant and non malignant pulmonary lesions. This may explain the difference of the yield between theses series in this study, the reason for the difference of the result of the transbronchial approach can be linked to several factors such as the size of the lesion (**13**), as in **Noriyuki et al**., if the size of the peripheral lung lesion more than 15 mm in the mean diameter it was a significant factor predicting diagnostic yield and the relationship between the peripheral lesion and the adjacent airways **(١٥).**

Only a few studies compared the data obtained by transbronchial and percutaneous approaches on same group of patients **(١٦,١٧).** Most of these studies were performed by separate teams who carried out the diagnostic procedure at different times and different contexts. In fact, in most institutes, radiologist prefers to perform the percutaneous approach, while pulmonologists tend to use bronchoscopy to obtain the diagnosis of peripheral lesion. In fact, there are no standarzied strategies, defined rules or specific criteria that can establish what techquies should be used **(٥).**

In this study ١٣ patients were subjected to CT guided percutaneous transthoracic needle aspiration biopsy. The procedure was diagnostic in ٨ patients. None of these patients had benign diseases i.e. the ٨ patients all were malignant diseases. The remaining ٥ patients were diagnosed by open thoracotomy ٣ patients, ٢ patients by clinical follow up (Shanker and associates, ١٩٩٨) compared the CT guided transthoracic fine needle aspiration versus the transbronchial fluoroscopy guided biopsy in ٣٠ patients with pulmonary nodules.CT guided percutaneous needle biopsy was diagnostic in ٧٨% while bronchoscopic biopsy was positive in ٦٩%. A similar study **(١٩)** was performed in which, CT guided biopsy was performed in ٢٥ patients with pulmonary nodule, ١٦ patients underwent bronchoscopy. CT guided biopsy was positive in ٢٠/٢٥ patients while bronchoscopy gave positive results in only ٣/١٦. The better diagnostic yield of CT guided biopsy over bronchoscopic approach could be related to the size and the site of the lesion in these included patients in this study.

Gaeta et al., ١٩٩٢ suggested that a criteria for using a transbronchial approach rather a CT guided one could be a positive bronchus sign (i.e. a bronchus leading to or contained within the peripheral pulmonary lesions).

Conclusion:

This study demonstrates the usefulness of both transbronchial lung biopsy together with percutaneous approaches in the diagnosis of peripheral pulmonary lesion.

Fluoroscopic guided transbronchial approach should be performed before the percutaneous approach as it has a comparable sensitivity in diagnosis to CT, also the need to explore the respiratory passages for complete staging of the disease if malignancy is found, and the lower complication rate of transbronchial approach encountered in this study.

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