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Case report

## Case series of trans-thoracic nodule aspirate performed by interventional pulmonologists

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## ABSTRACT

Percutaneous interventional tissue sampling of pulmonary masses and lymphadenopathy is a means for diagnosis of thoracic malignancy. The user base that can perform this skill with ultrasound guidance is expanding. A retrospective cohort of fine needle aspiration and percutaneous core biopsies was identified to evaluate their safety and efficacy. 47 distinct procedures were performed by a university medical center's Interventional Pulmonary service between 2012 and 2018. 39 consecutive procedures were diagnostically successful by percutaneous means, with 34 of the successful diagnoses based on fine needle aspiration alone. In our cohort by percutaneous biopsy the most common diagnosis was Non-Small Cell Lung Cancer with 28 samples, followed by Small Cell Lung Cancer with 7 samples as well as additional solitary diagnoses of suspected infection, Hepatocellular Cancer, Hodgkin Lymphoma and Malignant Melanoma. 4 procedures had complications, two of which resolved post procedure with observation and two pneumothoraces which resolved with chest tube placement and hospital observation. A wide variety of diagnoses were obtained with percutaneous biopsies with 83% of percutaneous biopsies performed by Interventional Pulmonologists achieving diagnostic success.

## 1. Introduction

Ultrasound guided biopsies have been published in the radiology and pathology fields dating back to 1976 [1]. The more recent adoption of chest ultrasound in pulmonary and critical care medicine has increased the skill with which providers can perform dynamically led procedures. We planned to assess the safety and efficacy of interventional pulmonologists performing ultrasound guided lymph node and chest biopsies in a retrospective cohort.

## 2. Methods

At a quaternary care university medical center, a retrospective cohort of consecutive procedures performed by the Interventional Pulmonary service between 2012 and 2018 was reviewed. Cases were defined by Current Procedural Terminology (CPT) codes 10022 (FNA with imaging), 32405 (percutaneous core biopsy), 76942 (ultrasound guidance for biopsy). This study was approved by the UMASS Medical School Institutional Review board, #H00015504.

All patients who had pulmonary masses that were abutting the

pleura or who had enlarged head/neck lymph nodes who were seen by the Interventional Pulmonary service underwent biopsy by the Interventional Pulmonary service.

The consented sterile procedures were performed under local anesthetic using a SonoSite® (Bothell, WA) ultrasound with both linear and curvilinear probes. An eight-centimeter 22 gauge fine needle aspiration (FNA) or less commonly an eight-centimeter 18 gauge Temno core biopsy were used for sample collection. Passes were given to onsite pathology who determined adequacy of the sample and transferred biopsies to the department of pathology.

Post procedure, patients were evaluated by either three-point ultrasound to establish lung sliding or chest radiograph. Charts were manually reviewed by one reviewer and complications and diagnoses confirmed. Final diagnosis was established from all future biopsy or surgical resection if performed.

Data was analyzed in R and Fischer Exact Tests were used to compare groups.  $P < 0.05$  was considered significant.

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**Table 1**  
Demographics mean (IQR) or % (n).

Female	60% (28)
Age	68 (60,77)
BMI	26 (22,30)
Height (cm)	165 (157,171)
Weight (kg)	70.3 (57.9,81.5)
Tobacco Use	
Never	6% (3)
Active	17% (12)
Quit	51% (24)
No Data	17% (8)

**3. Results**

47 distinct procedures were identified. 36 (75%) of the patients were smokers [Table 1](#). 83% (39) of procedures were diagnostically successful, [Table 2](#). 72% (34) of procedures had a diagnosis via fine needle aspiration alone. 30% (14) of the procedures were ultrasound guided head/neck lymph node biopsies. Of the 8 non-diagnostic percutaneous biopsies, future pathological samples revealed 4 were non-small cell lung cancer, 1 was a T cell lymphoma and 2 resolved with antibiotics and time. 1 sample remained undiagnosed. [Table 2](#).

There was no statistical difference on size of biopsy and rate of diagnostic yield or procedure complications. [Table 3](#).

Of the 33 transthoracic biopsies, 12% (4) of procedures had complications and 12% (4) were nondiagnostic. Two pneumothoraces, which both resolved with chest tube placement for three days in the hospital. One episode of hemoptysis which resolved within several hours without intervention and observation alone. And one vasovagal episode which was fully resolved with post procedural monitoring.

There was a mean of 5 passes on all the biopsy sites. Mean size of transthoracic target was 5.6 cm in the smaller dimension. All of them were adjacent to the pleura by ultrasound. [Table 4](#).

**Table 2**  
Biopsy pathology vs. Final Pathology for all biopsy sites.

		Final Pathology									
		Hepatocellular CA	Hodgkin lymphoma	Malignant melanoma	Non-diagnostic	Non-Small Cell Lung Cancer (NSCLC)	NSCLC: Adenocarcinoma	NSCLC: Squamous	Small Cell Lung Cancer	t-cell lymphoma	Infection likely
Biopsy	Infection Likely	0	0	0	0	0	0	0	0	0	1
Pathology	Hepatocellular CA	1	0	0	0	0	0	0	0	0	0
	Hodgkin lymphoma	0	1	0	0	0	0	0	0	0	0
	Malignant melanoma	0	0	1	0	0	0	0	0	0	0
	Non-diagnostic	0	0	0	1	1	3	0	0	1	2
	Non-Small Cell Lung Cancer (NSCLC)	0	0	0	0	8	1	0	0	0	0
	NSCLC: Adenocarcinoma	0	0	0	0	0	11	0	0	0	0
	NSCLC: Squamous	0	0	0	0	0	0	8	0	0	0
	Small Cell Lung Cancer	0	0	0	0	0	0	0	7	0	0

**Table 3**  
Final Pathology by size of tumor (in cm) for chest biopsies.

	2 ≤ T < 4	4 ≤ T < 6	6 ≤ T < 8	8 ≤ T < 10	10 ≤ T
Infection Likely	1	0	0	0	0
Hepatocellular CA	0	1	0	0	0
Hodgkin lymphoma	0	0	1	0	0
Malignant melanoma	1	0	0	0	0
Non-diagnostic	2	1	3	0	0
NSCLC:	1	2	1	0	1
adenocarcinoma	2	1	1	1	2
NSCLC: squamous	0	5	2	0	1
Small cell	1	0	1	0	1

**Table 4**  
Biopsy site data. N or mean (IQR).

	Transthoracic biopsies	Lymph node biopsies
Number of procedures	33	14
Number of passes	5 (3-7)	5 (4-5)
Smaller Dimension (cm)	5.6 (4-7)	2 (2-2)
Larger Dimension (cm)	7.6 (5-11)	2 (2-2)

**4. Conclusions**

In this cohort, ultrasound guided transthoracic FNA and core biopsies were well tolerated with complications in line with recent reported literature and less than prior CT guided techniques [2]. Furthermore, FNA alone was often diagnostic. Interventional Pulmonologists appear to be able perform ultrasound guided biopsies both effectively and safely.

### Contributions

DBK Conceptualization, Writing – Review & Editing, Project administration, Formal Analysis, KH Writing – Review & Editing.

### Declaration of competing interest

None.

### References

- [1] [A.J. Chandrasekhar, C.J. Reynes, R.J. Churchill, Ultrasonically guided percutaneous biopsy of peripheral pulmonary masses, Chest 70 \(1976\) 627–630.](#)
- [2] [C.B. Laursen, et al., Ultrasound-guided lung biopsy in the hands of respiratory physicians, J. Bronchol. Interv. Pulmonol. 23 \(2016\) 220–228.](#)