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Ultrasound guided FNA and biopsy in suspected lung cancer in tertiary cancer center of Nepal

Sundar Suwal[1, 2], Dinesh Chataut[3*], Ajit Thapa[1]
[1] Department of Radiology, Tribhuvan University Teaching Hospital, Maharajgunj, Kathmandu, Nepal
[2] Department of Radiology, Bhaktapur Cancer Hospital, Bhaktapur, Kathmandu, Nepal
[3]Assistant Professor, Department of Radiology, Tribhuvan University Teaching Hospital, Maharajgunj, Kathmandu, Nepal

Abstract
Introduction: Ultrasonography (USG) has been underutilized for image guided biopsy or FNA of suspected lung cancer, despite its advantages over computed tomography (CT). USG can be effective for guiding FNA/ biopsy of peripheral lung / pleural/ mediastinal lesions and extra-thoracic metastatic lesions. This study was aimed to find diagnostic yield of USG guided biopsy or FNA in suspected lung cancer.
Methods: Retrospective cross-sectional study was done in lung cancer suspects sent to Radiology department of Bhaktapur Cancer Hospital for biopsy or FNA. USG guided biopsy or FNA obtained from either lung lesions or extrapulmonary lesions based on their size and feasibility. Semiautomatic biopsy instrument (18G x 16 cm) with Co-axial needle (17G) was used for biopsy and 22G spinal needle or hypodermic needle was used for FNA. Cytology/ histopathology report of these subjects were then retrieved. Data analysis was done with Microsoft Excel 2016.
Results: USG guided biopsy or FNA was done in 178 subjects, with 30 subjects lost to follow up. Diagnostic yield of USG guided biopsy and FNA was 94.7% and 79.4% respectively. Overall diagnostic yield was 91.2%. Malignancy was seen in 125 subjects, most common being adenocarcinoma, followed by squamous cell carcinoma and small cell carcinoma. Most of the malignancy was seen in older age group (61-80 years), squamous cell carcinoma being more common in elderly as compared to other malignancies.
Conclusion: The study showed high diagnostic yield of USG guided biopsy or FNA in suspected lung cancer with higher diagnostic yield of biopsy over FNA.

Keywords: diagnostic yield, histopathology, image guided biopsy, lung cancer

Introduction

Lung cancer is the leading cause of cancer related mortality worldwide and is seen as lung mass in chest radiographs or computed tomography (CT) [1]. Histopathological examination is gold standard for diagnosis of the lung masses. Either fine needle aspiration (FNA) or biopsy can be done for obtaining histopathological specimen. Percutaneous transthoracic FNA or biopsy is done with image guidance, commonly with CT or ultrasonography (USG). Although USG has been underutilized for lung cancer imaging, it can be effective for guiding FNA/ biopsy of peripheral lung lesions, pleural lesions, mediastinal lesions and extra-thoracic metastatic lesions [2, 3, 4]. Supraclavicular lymph nodes are often overlooked and frequently nonpalpable. USG may be helpful in detecting and guiding for biopsy/ FNA of these lymph nodes which may obviate more complication prone lung biopsy [5]. Practice of USG guided biopsy in diagnosis of lung cancer in Nepal is relatively new entity. Only few literatures of image guided biopsy in lung cancer in Nepal are available till date and most of them are based on CT guided biopsy. Thus, this study aims to find yield of USG guided FNA and biopsy in suspected lung cancer in a tertiary cancer center of Nepal.

Methods

Retrospective cross-sectional study was done in subjects with suspected lung cancer referred to department of radiology of Bhaktapur Cancer Hospital for Fine Needle Aspiration or biopsy during a period of 1st March 2019 to 29th February 2020. All the subjects were reviewed for suspicious lung lesions. They were accessed with USG (Esaote MyLab X6) for peripherally accessible mediastinal lymph nodes, supraclavicular lymph nodes, pleural lesions and chest wall lesions. Any of these lesions with size >10 mm underwent USG guided tru-cut biopsy and if size were <10 mm USG guided FNA were done. In case of absence of these extrapulmonary lesions, lung lesions were accessed with USG for feasibility of biopsy or FNA. Peripheral lesions >10 mm and with broad contact with pleura underwent USG guided biopsy. Smaller lesions underwent USG guided FNA. Semiautomatic tru-cut biopsy instrument (18G x 15 cm) with coaxial needle of 17G was used for the biopsy and 22G spinal needle or hypodermic needle were used for FNA. Cytology report or histopathology report of the subjects were retrieved.
Suspicious lung lesions not visible with USG and without any USG accessible extrapulmonary lesions were excluded from the study. Subjects lost to follow up for cytology/ histopathology findings were also excluded from the study.

All the data were entered in Microsoft Excel 2016 and the data analysis was done in the same.

Results

A total of 178 subjects, 93 (52.2%) male and 85 (47.8%) female, with suspected lung cancer with mean age of 62.32 ± 12.66 years and age range of 23 -85 years underwent ultrasound guided biopsy or fine needle aspiration. Median age of the subjects was 64.5 years with interquartile range of 17 years. Tru-cut biopsy was done in 132 (74.2%) subjects and FNA was done in 46 (25.8%) subjects.(Table 1) Thirty (16.9%) subjects were lost to follow-up and cytology/ histopathology report could not be retrieved.

Table 1: Sites of USG guided biopsy/ FNA (n=178)

	Biopsy (%)	FNA (%)	Total (%)
Right lung	74(41.6)	18(10.1)	92(51.7)
Left lung	48(27)	12(6.7)	60(33.7)
Supraclavicular lymph node	7(3.9)	15(8.4)	22(12.3)
Chest wall lesion	2(1.1)	1(0.6)	3(1.7)
Mediastinal lymph node	1(0.6)	0(0)	1(0.6)
Total	132(74.2)	46(25.8)	178(100)

Cytology/ histopathology reports revealed malignant lesions in 100 tru-cut biopsies and 25 fine needle aspirations. Six biopsy specimens and seven FNA specimens were either inadequate or negative for malignancy. Four lung biopsies and one supraclavicular lymph node biopsy showed tuberculosis. Three lung specimens showed inflammatory pathology and two supraclavicular lymph nodes were reactive nodes only. Diagnostic yield of USG guided biopsy was 94.7% and that of USG guided FNA was 79.4%. Overall diagnostic yield of USG guided biopsy and FNA was 91.2%.

Among 125 subjects with malignancy, 65 (52%) were male and 60 (48%) were female. Right lung malignancy was seen in 81 (64.8%) subjects and left lung malignancy was seen in 44 (35.2%) subjects. Most common malignancy was adenocarcinoma, 48 (38.4%), followed by squamous cell carcinoma, 45 (36%) and small cell carcinoma, 12 (9.6%).Three samples from FNA showed either malignancy only or suspicious for malignancy. However 22 FNA samples showed subtypes of malignancy also. All of the malignant biopsy samples showed subtypes of malignancy, although three biopsy samples showed either carcinoma or non-small cell carcinoma only.(Table 2) Malignancy was seen in 93 (76.2%) biopsied lung lesions and 15 (50%) fine needle aspirated lesions. Among them, 43 (39.8%) lesions were adenocarcinoma and 41 (38%) lesions were squamous cell carcinoma.

Table 2: Cytology/ histopathological diagnosis after USG guided Biopsy/ FNA (n=148).

	Biopsy (%)	FNA (%)	Total (%)
Adenocarcinoma	41(27.7)	7(4.7)	48(32.4)
Squamous cell carcinoma	39(26.3)	6(4.1)	45(30.4)
Small cell carcinoma	9(6.1)	3(2)	12(8.1)
Adenosquamous carcinoma	4(2.7)	0(0)	4(2.7)
Carcinoid	2(1.3)	0(0)	2(1.3)
Sarcoma	1(0.7)	0(0)	1(0.7)
Carcinosarcoma	1(0.7)	0(0)	1(0.7)
Carcinoma	2(1.3)	5(3.4)	7(4.7)
Non-Small cell carcinoma	1(0.7)	1(0.7)	2(1.3)
Malignancy	0(0)	1(0.7)	1(0.7)
Suspicious for malignancy	0(0)	2(1.3)	2(1.3)
Negative/ Inadequate	6(4.1)	7(4.7)	13(8.8)
Benign	8(5.4)	2(1.3)	10(6.8)
Total	114(77)	34(23)	148(100)

Most of the malignant lesions were seen in 61-80 years of age group, 71 (56.8%). Squamous cell carcinoma was more common in older age group (61-80 years) as compared to adenocarcinoma, 31 (68.9%) and 21 (43.8%) respectively. However, adenocarcinoma was more common in younger age group (41-60 years) as compared to squamous cell carcinoma, 22 (45.8%) and 12 (26.7%) respectively. (Table 3) Mean age of the subjects with squamous cell carcinoma and adenocarcinoma were 65.9 years and 60 years respectively. Minimum age at which malignancy was detected was 30 years and maximum age was 85 years.

Table 3: Common types of malignancies in different age groups (n=125)

Age group	Adenocarcinoma	Squamous cell carcinoma	Small cell carcinoma	Total malignancy
31-40	3	1	0	5
41-50	11	4	2	17
51-60	11	8	3	29
61-70	13	13	6	36
71-80	8	18	1	35
81-90	2	1	0	3
Total	48	45	12	125

Discussion

Many imaging techniques are available for guided biopsy or FNA and selection of the most appropriate technique needs consideration of different parameters like size and site of lesion, relationship of the lesion with critical anatomical structures, and visibility of the lesion. USG guidance is preferred these days due to its advantage of real-time monitoring and no risk of radiation exposure. However, it is limited to superficial lesions, especially in lung biopsies [4, 6]

.CT guidance in lung biopsy has few advantages over USG guidance as it provides better spatial resolution compared to USG, and tissue sample can be obtained even if a small pneumothorax develops during the procedure [4].

Diagnostic yield of USG guided biopsy in lung lesions ranges from 64% to 97% [4]. Diagnostic yield of USG guided lung biopsy was 91.8% in study done by Khosla *et al* [4], which is less than the diagnostic yield of USG guided biopsy in present study (94.7%). However, we included biopsy/ FNA of extrapulmonary lesions as well in 17 subjects. Diagnostic yield of USG guided transthoracic biopsy was also lower in study done by Diacon *et*

al [3] (81%) as compared to the present study. Diacon *et al* found higher diagnostic yield in FNA (91%) as compared to the biopsy (81%), which is contrast to the findings of present study. We found higher diagnostic yield with biopsy (94.7%) than FNA (79.4%). Diacon *et al* obtained three aspirations from slightly different areas of the target lesion, whereas we obtained single aspiration from the target lesion. This might be the reason of higher diagnostic yield of FNA in the study done by Diacon *et al*. These days, revealing genetic mutations in lung cancer is important to plan the targeted therapies [6]. Schneider *et al* [7] found sufficient samples for molecular testing were significantly higher in core biopsy as compared to the fine needle aspiration biopsy (67% and 46% respectively, p= 0.007). Diagnostic yield for malignancy in the present study was 84.5%, which is similar to the study done by Diacon *et al* [3] (86%) and slightly higher as compared to the study done by Khosla *et al* [4] (79.7%). Historically, squamous cell carcinoma was the most common type of lung cancer with predominant central lesions. The trend have changed and adenocarcinoma is the most common type of lung cancer nowadays [8]. We also found adenocarcinoma as the most common lung cancer (38.4%) followed by squamous cell carcinoma (36%). Adenocarcinoma was the most common lung cancer in studies done by Diacon *et al* [3], Modi *et al* [9], and Lee *et al* [2]. However, Srivastava and Bajaj [10] found squamous cell carcinoma as the most common cancer in their study. One of the reason of this disparity could be small sample size in their study. Peripheral squamous cell carcinomas are in rising trends at present [11]. These peripheral squamous cell carcinomas can be detected with USG and can guide for biopsy/ FNA. Among 108 lung lesions sampled under USG guidance, 41 (38%) lesions were squamous cell carcinoma in our study. Squamous cell carcinoma were seen in more elderly subjects than adenocarcinoma in present study with mean age of 65.9 years and 60 years respectively. Similar findings was demonstrated by Kawase *et al* [12]. There are several limitations in our study. Large volume of subjects (16.9%) were lost to follow up, which may affect our results, including diagnostic yield. The study is retrospective, thus prone to selection bias. Sample size for biopsy and FNA was not homogeneous, which may be the reason of lower diagnostic yield of FNA as compared to other studies. Also the study is single-center study, thus, the results cannot be generalized.

Conclusion

The study showed high diagnostic yield of ultrasound guided biopsy and FNA in suspected lung cancer. Diagnostic yield for malignancy was higher with biopsy as compared to FNA, and biopsy can be superior for molecular testing as well.

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