

Original Research Article

Diagnostic yield of percutaneous computed tomography guided core needle biopsy of lung lesion and its complications in tertiary hospital

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ABSTRACT

Background: Early diagnosis of lung cancer can reduce its mortality and morbidity. Minimally invasive image guided percutaneous core needle biopsy can obtain tissue sample for diagnosis and staging of lung cancer, which is crucial for correct management of lung lesions. Common complications of lung biopsy include pneumothorax, parenchymal haemorrhage and haemoptysis. The study was aimed to determine diagnostic yield and complications of the percutaneous computed tomography (CT) guided core needle biopsy of lung lesion in tertiary hospital.

Methods: Hospital based prospective study was performed in 40 patients in Tribhuvan University Teaching Hospital. CT guided biopsy of lung lesions was performed with 18-gauge semi-automated biopsy instrument. The complications following the biopsy were recorded and correlated with different factors using chi-square test. Histopathology report were obtained to measure the diagnostic yield.

Results: Among 40 patients who underwent guided lung biopsy, histopathology showed definitive diagnosis in 37 patients; 31 malignant and 6 benign lesions. Parenchymal haemorrhage, pneumothorax and haemoptysis were seen in 13, 8 and 5 respectively; however, none required active intervention. Emphysema in traversing lung and numbers of pleural punctures used were predictive factors of complication (p value <0.05).

Conclusions: The study showed percutaneous image guided core needle biopsy has high diagnostic yield with fewer complication rates and is thus recommended for routine biopsies of lung lesions.

Keywords: Complication, Computed Tomography guided biopsy, Diagnostic yield, Lung lesion

INTRODUCTION

Computed Tomography (CT) offers the most accurate method of localizing the lung lesions regardless of its distance from skin and provides relevant information on needle trajectory within the lung as well.¹ Commonly described complication of lung biopsy is pulmonary haemorrhage leading to haemoptysis or hemothorax.² Risk of various complications is affected by different parameters such as biopsy needle size, lesion size, lesion depth from pleura, number of pleural punctures during biopsy, needle traversing through fissure and emphysema in the path of the biopsy.^{3,4}

Lung cancer is the most common cancer worldwide with incidence of 16.54% in Nepal.^{5,6} Early diagnosis of lung cancer is important as treatment in the early stage significantly reduces morbidity and mortality related to the lung cancer.⁷ As there is paucity of literatures on image guided lung biopsy in Nepal, this study was aimed to find out diagnostic yield and complications of CT guided percutaneous biopsy of suspicious lung lesion in tertiary hospital of Nepal.

METHODS

Prospective study was done in patients referred to department of radiology and imaging of Tribhuvan

University Teaching Hospital for biopsy of suspicious lung lesions during the period of August 2018 to September 2019. Ethical approval was obtained from institutional review board of Institute of Medicine and informed consent was taken from all the subjects.

Patients suspected for lung cancer sent for biopsy of lung lesions were included in the study. Patients with abnormal coagulation parameters, gross emphysema of lungs, lung lesion size less than 1 cm, and those not giving consent were excluded from the study.

Sample size was estimated with purposive sampling technique and forty subjects were selected for the study.

CT guided core needle biopsy of lung lesion was obtained using 18G semiautomatic biopsy instrument and 17 G coaxial needle (Figure 1). Demographic information of the subject, size and location of the lesion, distance of the lesion from skin and hilum, emphysema in traversing lung parenchyma, and complications following the biopsy were recorded in Microsoft excel sheets. Histopathology report of the biopsied specimens were traced and recorded in Microsoft excel sheets. Diagnostic yield of the CT guided core needle biopsy was measured as per the histopathology reports. Correlation of complications with different variables related to subject's demographic information, lung lesion and adjacent lung parenchyma was done using chi-square test.



Figure 1: Axial CT image during CT guided right lung mass biopsy with biopsy needle within the mass.

RESULTS

Among the total 40 patients who underwent CT guided lung biopsy, 24 (60%) were male and 16 (40%) were female. Age range was 31-86 years with median age of 62.5 year and interquartile range of 13.75.

Mean size of the lesion was 2.96 cm with range of 1.5-5.3 cm. Mean depth of the lesion from skin was 4.46 cm

with range of 2.8-7.6 cm. Mean distance of the lesion from hilum was 3.78 cm with range of 0.5-9.5 cm.

Total 26 complications were seen in 17 patients, with parenchymal haemorrhage being the most common complication seen in 13 patients. Only one patient had all three complications and all of the patients with haemoptysis also had parenchymal haemorrhage. No active interventions were required for management of the complications. Most of the complications (13) were seen in old adults (>59 years) and no complications were seen in young adults (<40 years). However, no significant correlation was found between complications and age of the patients (p=0.89). Most number of complications were in male (10), but proportion wise more complications were seen in females (43.75%) than male (41.67%). The difference in complications based on gender was not clinically significant (p=0.90).

Table 1: Frequency of different variables related to lesion, traversing lung and complications (n=40).

| Variables | Frequency | Percentage (%) | |
|------------------------------|-----------|----------------|------|
| Size (cm) | <2 | 8 | 20 |
| | 2-4 | 24 | 60 |
| | >4 | 8 | 20 |
| Location in lung | LUL | 10 | 25 |
| | LLL | 7 | 17.5 |
| | RUL | 14 | 35 |
| | RML | 3 | 7.5 |
| | RLL | 6 | 15 |
| Depth from skin (cm) | <2 | 0 | 0 |
| | 2-4 | 13 | 32.5 |
| | >4 | 27 | 67.5 |
| Distance from hilum (cm) | <2 | 2 | 5 |
| | 2-4 | 25 | 62.5 |
| | >4 | 13 | 32.5 |
| Emphysema in traversing lung | Absent | 31 | 77.5 |
| | Present | 9 | 22.5 |
| Number of puncture attempts | 1 | 39 | 97.5 |
| | 2 | 1 | 2.5 |
| Pneumothorax | 8 | 20 | |
| Parenchymal haemorrhage | 13 | 32.5 | |
| Haemoptysis | 5 | 12.5 | |

Location wise, most of the complications were seen in right lung lesions (76.5%) and the difference in complications between the lesions in right and left lung was statistically significant (p=0.037). Complications were more with lesions in upper lobes than in lower lobes, but the difference was not significant. No significant correlation of the complications seen with the lesion size as well. Most complications were seen in lesion size of 2-4 cm (8). Five patients with lesion size <2 cm showed complications, among them four patients had

parenchymal haemorrhage and three patients had pneumothorax. Two of them also had haemoptysis. Most of the complications were seen when the lesion was >4 cm deep from skin (19) and when the lesion was 2-4 cm away from hilum (15). Among 13 patients with parenchymal haemorrhages, eight lesions were >4 cm deep from skin and seven were <4 cm away from hilum. Most of the pneumothorax were seen when the lesion was <4 cm away from hilum (6). Five among nine patients with emphysema in traversing lung parenchyma showed pneumothorax and only one patient showed parenchymal haemorrhage. Thus, presence of emphysema in traversing lung parenchyma was significantly associated with pneumothorax after lung biopsy (p=0.002). One patient with lesion size <2 cm and depth from skin >4 cm needed double pleural puncture, and pneumothorax was seen in her after the procedure (Table 1).

Histopathological diagnosis was obtained in 37 patients with diagnostic yield of the CT guided tru-cut biopsy of lung lesion of 92.5%. Two samples showed necrosis only and one sample showed fibrosis only. Most of the lesions were malignant (31) and among the malignant lesions, most were adenocarcinoma (17), followed by squamous cell carcinoma (8) (Table 2). Location wise, most of the adenocarcinoma and squamous cell carcinomas were >2 cm away from hilum. Only two lesions were within 2 cm from hilum and both were small cell carcinomas.

Table 2: Histopathology of the lesions (n=40).

| Variables | Frequency | Percentage (%) |
|--------------------------------|-----------|----------------|
| Benign | 6 | 15 |
| Malignant | | |
| Adenocarcinoma | 17 | 42.5 |
| Squamous cell carcinoma | 8 | 20 |
| Small cell carcinoma | 4 | 10 |
| Adenosquamous carcinoma | 1 | 2.5 |
| Metastasis | 1 | 2.5 |
| Inadequate | 3 | 7.5 |

DISCUSSION

Diagnostic yield of CT guided lung biopsy was 92.5% in our study with most of the lesions being lung cancer. Seventeen among 40 patients (42.5%) showed complications following the lung biopsy, with parenchymal haemorrhage being the most common complication. No significant correlation of complications was found with different factors with exception of emphysema in traversing lung. Significant higher complications were also seen in lesions in right lung. Even though we had higher complication rate, none of the patients needed active intervention, thus suggesting prevalence of only mild complications in our study.

Diagnostic yield of CT guided lung biopsy is high as supported by the studies done by Thapa et al (92.3%), and Jumpei et al (92.9%).^{8,9} Yuan et al even had higher diagnostic yield than our study (94.8%).¹⁰ The samples not yielding diagnosis in our study were either necrosis or fibrosis. Presence of predominant necrotic component in some of the lesions could be the cause of lower diagnostic yield in our study.

Complications rate in our study was slightly lower than the study done by Wang et al (50.4%). They also showed higher parenchymal haemorrhage among all the complications as in our study.¹¹ Similar finding was also seen in the study done by Thapa et al.⁸ However, Jumpei and Yuan et al found pneumothorax as the most common complication.^{9,10} Wang et al also found significant correlation of parenchymal haemorrhage with diameter of lesion and length of needle within the lung parenchyma, which was not seen in our study.¹¹ The reason could be smaller sample size in our study. Significant correlation of presence of emphysema with pneumothorax was also seen in the study of Jumpei et al. The reason for this could be easy air leak from the damaged lung parenchyma (emphysema) than the normal lung parenchyma. Jumpei et al also found significant correlation of pneumothorax with length of needle within lung parenchyma, which was not seen in our study.⁹

Limitations of our study include smaller sample size. Another limitation is inhomogeneous sample in our study as most of the lesions were highly suspected of lung cancer clinically as well as radiologically. Also, most of the lesions were larger in size. Pathologists were not blinded in our study, thus there was possibility of observer bias for diagnostic yield.

Due to smaller sample size, the results of this study cannot be generalized for Nepalese population. With the surging expertise of interventional radiology in Nepal, more increased diagnostic yield and much reduced significant complications are expected in Nepal as well. Thus, further study with larger and homogeneous sample is recommended for generalizing diagnostic yield and complications of CT guided lung biopsy in Nepalese population.

CONCLUSION

CT guided lung biopsy has high diagnostic yield and is relatively safe with low significant complication rate in our study. Parenchymal haemorrhage is the most common complication. Study in larger and more homogeneous sample is recommended to identify factors associated with complications.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee of Institute of Medicine, Maharajgunj, Kathmandu, Nepal.

REFERENCES

1. Zhang H, Guang Y, He W, Cheng L, Yu T, Tang Y et al. Ultrasound-guided percutaneous needle biopsy skill for peripheral lung lesions and complications prevention. *J Thorac Dis.* 2020;12(7):3697-705.
2. Yang W, Sun W, Li Q, Yao Y, Lv T, Zeng J et al. Diagnostic Accuracy of CT-Guided Transthoracic Needle Biopsy for Solitary Pulmonary Nodules. *PLoS One.* 2015;10(6):e0131373.
3. Aktaş AR, Gözlek E, Yılmaz Ö, Kayan M, Ünlü N, Demirtaş H et al. CT-guided transthoracic biopsy: histopathologic results and complication rates. *Diagn Interv Radiol.* 2015;21(1):67-70.
4. Khan MF, Straub R, Moghaddam SR, Maataoui A, Gurung J, Wagner TOF et al. Variables affecting the risk of pneumothorax and intrapulmonary hemorrhage in CT-guided transthoracic biopsy. *Eur Radiol.* 2008;18(7):1356-63.
5. Spira A, Halmos B, Powell CA. Update in Lung Cancer 2015. *Am J Respir Crit Care Med.* 2016;194(6):661-71.
6. Piya MK, Acharya SC. Oncology in Nepal. *South Asian J cancer.* 2012;1(1):5-8.
7. Blandin Knight S, Crosbie PA, Balata H, Chudziak J, Hussell T, Dive C. Progress and prospects of early detection in lung cancer. *Open Biol.* 2017;7(9):170070.
8. Thapa A, Subedi K, Suwal S, Chataut D. CT guided lung biopsy: Diagnostic yield and complications, using 18G coaxial semi-automatic core needle. *Nepal J Med Sci.* 2019;4(1):20-5.
9. Takeshita J, Masago K, Kato R, Hata A, Kaji R, Fujita S et al. CT-Guided Fine-Needle Aspiration and Core Needle Biopsies of Pulmonary Lesions: A Single-Center Experience With 750 Biopsies in Japan. *Am J Roentgenol.* 2014;204(1):29-34.
10. Yuan D, Lü Y, Yao Y, Liu H, Qian W, Xiao X et al. Diagnostic efficiency and complication rate of CT-guided lung biopsy: a single center experience of the procedures conducted over a 10-year period. *Chin Med J (Engl).* 2011;124(20):3231-77.
11. Wang Y, Li W, He X, Li G, Xu L. Computed tomography-guided core needle biopsy of lung lesions: Diagnostic yield and correlation between factors and complications. *Oncol Lett.* 2014;7(1):288-94.

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