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CT guided biopsy of lung lesions

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Abstract

Introduction: Computed Tomography (CT) Biopsy is a corrigible coruscate procedure that corrected the discrepancy of the results between final biopsy and unguided Biopsy. CT guidance permits biopsy of nearly all lesions regardless of size and position. Recognition of the accuracy of biopsy and simple methods of treating pneumothorax has brought this method within the reach of most radiologist and pathologist. Infections and other neoplastic process may be proven by this method. In cases of malignancy of the lungs, cytopathological examination of material obtained by CT guided biopsy offers a quick and specific diagnosis which help clinicians implement appropriate anticancer measures like chemotherapy and radiotherapy. The present study is undertaken to determine the accuracy and efficacy of percutaneous biopsy in diagnosis of various lung lesions, and correlate the concordance with available results and available other methods. An interest to analyse the age, gender, topographic distribution and cytopathological diagnosis of thoracic mass lesions using CT guided biopsy is specially stepped in the current study.

Aim: To assess the role of Computed tomography (CT) guided biopsy in the diagnosis of thoracic mass lesion and to analyse and compare the results with other studies. To evaluate the diagnostic accuracy and complication of Computed tomography (CT) guided biopsy in thoracic masses. To know the pathological spectrum of thoracic mass lesions and to correlate CT findings with cytopathological report.

Methods: This Prospective study was done at Nizam's Institute of medical sciences, Hyderabad, surrounded by thickly populated districts which provide surplus material for doing research work and is also fully equipped with all the required modes and means for researches and health care. This study was conducted totally at indoor site including both OPD and IPD males and females from both urban and rural exclusively adults. Fifty one cases having Lung masses both malignant and benign were selected and subjected to CT guided biopsy. Statistical analysis was carried out by Using SPSS software version 12.

Results: Majority of the patients with lung masses in present study were males who constituted 66.6% and the females were 33.4%. Minimum age was of 22yrs and maximum age was of 92 yrs from the patients of this study. The mean age is 57 yrs. The chief etiological factor for the initiation of the pathogenesis of lung masses was found to be smoking. Out of the total cases included for the study 49% were malignant and 37% were benign lung masses. The complications observed were very few only in 8 cases (15.8%) in total of 51 cases selected for the study. The pneumothorax was noticed in 13.7% and haemoptysis in 1.9%.

Conclusion: This CT guided biopsy stands as fruitful topic for study will be to elucidate the diagnostic and prognostic procedures in chest. This procedure of diagnosis with prosaic complications like Pneumothorax or Haemothorax or Haemoptysis and with its mosaic results outstands and extends its scope of study.

Keywords: Computed tomography, biopsy, tumor, cytopathology

Introduction

Computed Tomography (CT) guided Biopsy is a corrigible coruscate procedure that corrected the discrepancy of the results between final biopsy and unguided biopsy. CT guidance permits biopsy of nearly all lesions regardless of size and position. Needle placement in small pulmonary lesions and deep mediastinal nodes can be determined with CT. Vascular and cardiac structures are well demonstrated and safely avoided [2]. CT is well established method of diagnosing both neoplastic and inflammatory conditions of lung [3]. Biopsy of the lung is generally indicated for the diagnosis of pulmonary lesions. There are many hazards associated with performing thoracotomy for lung lesions. Biopsy has become a diagnostic tool to assess the nature of radiographically demonstrable lung lesion. Fear of neoplastic tissue or cell implantation in the needle track may have initially inhibited its use

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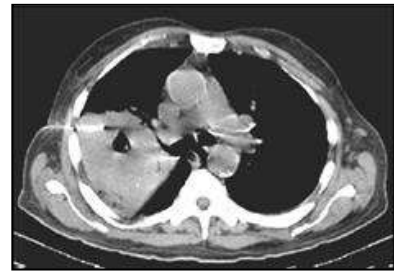
but proven groundless. Recognition of the accuracy of biopsy and simple methods of treating pneumothorax has brought this method within the reach of most radiologist and pathologist. Infections and other benign process may be proven by this method. All intrathoracic lesions including deep Hilar lesions are now routinely and safely sampled using CT guided biopsy. In cases of malignancy of the lungs, cytopathological examination of material obtained by CT guided biopsy offers a quick and specific diagnosis which help clinicians implement appropriate anticancer measures like chemotherapy and radiotherapy. The present study is undertaken to determine the accuracy and efficacy of biopsy in diagnosis of various lung lesions, and correlate the concordance with available results and available other methods. The current study is also focused to evaluate the accuracy and complications in CT guided biopsy in thoracic masses. It also includes the comparison of CT guided biopsy pathological reports of thoracic masses with those of histopathological biopsy results. An interest to analyse the age, gender, topographic distribution and cytopathological diagnosis of thoracic mass lesions using CT guided biopsy is specially stepped in the current study.

Aim: To assess the role of Computed tomography (CT) guided biopsy in the diagnosis of thoracic mass lesion and to analyse and compare the results with other studies. To evaluate the diagnostic accuracy and complication of Computed tomography (CT) guided biopsy in thoracic masses. To know the pathological spectrum of thoracic mass lesions and to correlate CT findings with cytopathological report.

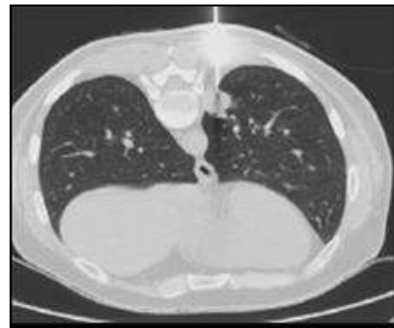
Methods: This Prospective study was done at Nizam's Institute of medical sciences, Hyderabad, after formulating a standard protocol proforma, obtaining approvals and informed consent for patients from March 2019 to April 2020. All adult cooperative patients without bleeding tendency or coagulopathy where the lung lesion is not approachable by ultrasound were included. Fifty one cases having Lung masses both malignant and benign were selected and subjected to CT guided biopsy. After Patient positioning and instructions, three millimeter slices with 1.5mm interval continuous sections of CT scans is obtained during breath hold to identify and target the lesion. As far as possible aerated lung was avoided to prevent pneumothorax. Course of needle was over ribs and not on ribs (causes periosteal irritation - vasovagal stimulation and also difficult to manipulate needle later) or under ribs (as neurovascular bundle travels just below it).

The distance from midline to entry site or the depth from skin and angle of insertion of needle is accessed on CT monitor. Stepwise advancement of the co axial needle was done within the plane of gantry to a position just outside the parietal pleura directed at the lesion and the slice is rescanned to assess the position of needle. After conformation of coaxial needle, biopsy needle is introduced to obtain the sample.

Post procedure check CT was done to rule out related complications. The scanner used in this study is Philips Brilliance 16. χ^2 (2×2 table) was used to test for statistically significant differences between dichotomous variables. χ^2 ($R \times 2$ table) was used to test for differences between categorical variables. Statistical analysis was carried out by Using SPSS soft ware version 12.



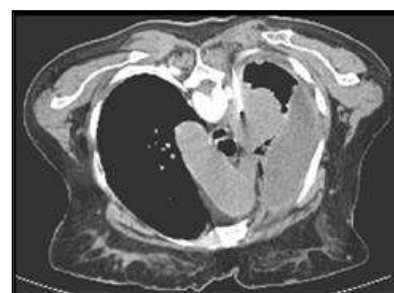
CT 1: Radiological finding: Malignant lesion. Cytopathology: Aspergilloma.



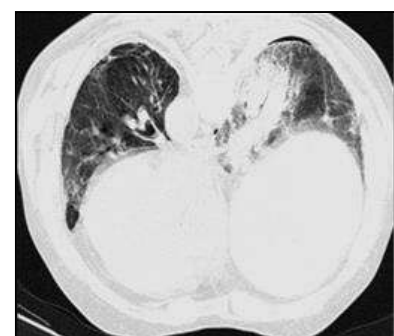
CT 2: Radiological finding: Malignant lesion. Cytopathology: Metastasis from renal cell carcinoma.



CT 3: Radiological finding: Malignant lesion. Cytopathology: Small cell carcinoma.



CT 4: Radiological finding: Malignant lesion. Cytopathology: Squamous cell carcinoma.



CT 5: Left side lesion with needle in-situ with post procedural small pneumothorax

Results

In the present study cytological diagnosis was made in 44(86%) out of 51 cases and the remaining 7 cases were inconclusive and descriptive report was given to the patients. Out of these cases 25 cases (49%) were malignant and 19(37%) were benign. The most common primary lung tumor was Adenocarcinoma (n=12, 23.5%), followed by Squamous cell carcinoma (n=9, 17.6%), Small cell

carcinoma (n=01, 1.9%), Metastatic lesion (n=02, 3.9%). There were 19 benign lesions out of which Koch's (n=11, 21.5%), Chronic inflammation (n=05, 9.8%), Aspergilloma (n=02, 3.9%), Lung abscess (n=01, 1.9%). In the present study complications due to the procedure were seen in 8 cases, of which 7(13.7%) had Pneumothorax and 1(1.9%) Haemoptysis.

Table 1: Demographical details of the entire sample population.

| Variables | Numerical Data |
|------------------------------------|--------------------------|
| Age | 57 years (22 – 92 years) |
| Male: Female | 34:17 |
| Side involved (Right: Left) | 25:26 |
| Site involved | |
| Right upper lobe | 15 |
| Right middle lobe | 05 |
| Right lower lobe | 05 |
| Left upper lobe | 14 |
| Left middle lobe | 08 |
| Left lower lobe | 04 |
| Smoker: Non smoker | 31:20 |
| Cytopathology | |
| Adenocarcinoma | 12 |
| Squamous cell carcinoma | 09 |
| Koch's | 11 |
| Aspergilloma | 02 |
| Chronic inflammation | 05 |
| Lung Abscess | 01 |
| Small cell carcinoma | 01 |
| Mesothelioma | 01 |
| Metastasis | 02 |
| Non specific | 07 |

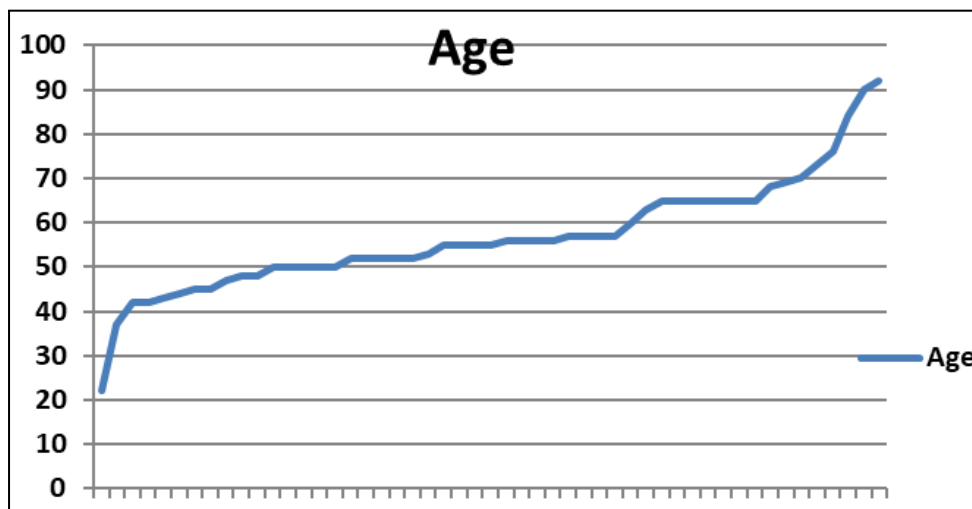


Fig 1: Graphical representation of age in our study group

The study includes 51pts with a mean age of 57 years (range 22-92). There were 34 males and 17 females in the study.

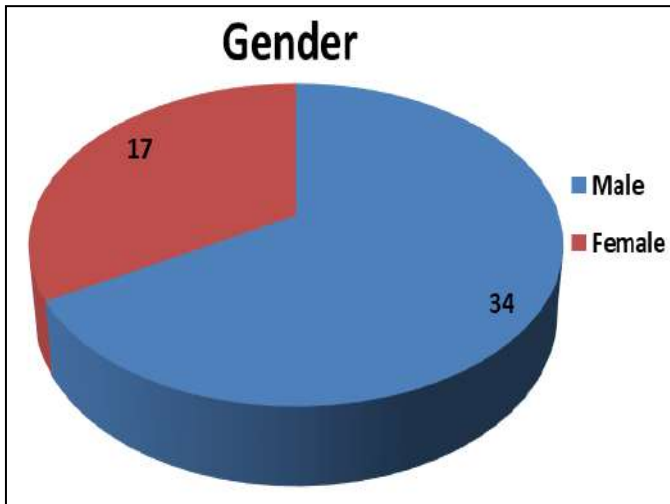


Fig 2: Pie representation of gender in our study group

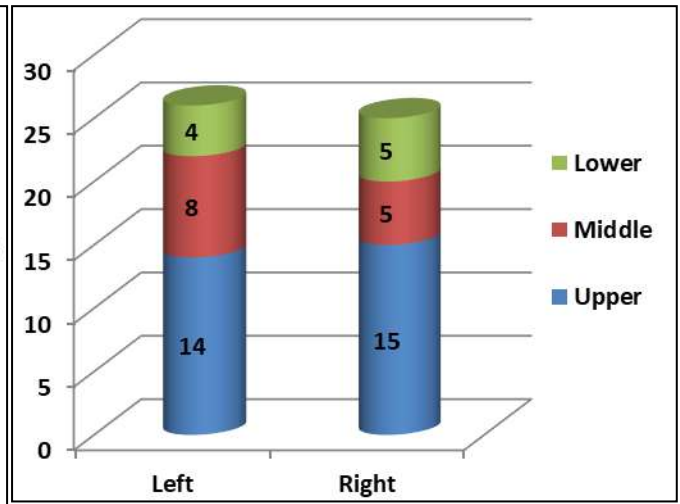


Fig 3: Bar representation of side and lobe involvement of lung.

In our study among the patients in majority of them right upper lobe is commonly involved in 15 patients right upper lobe is involved and in 14 left upper lobe is involved.

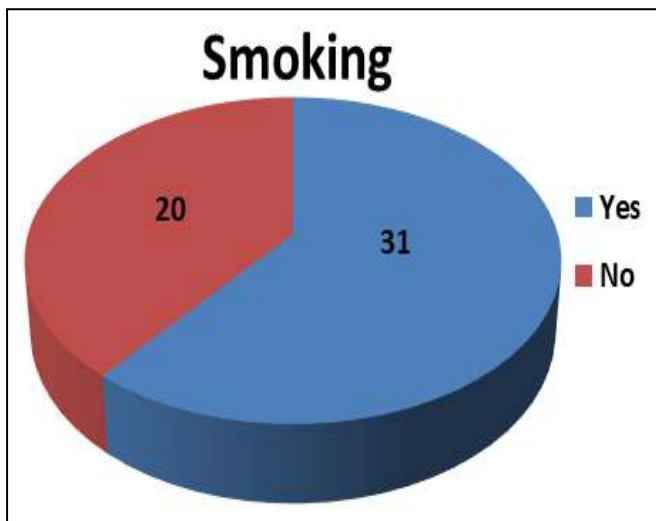


Fig 4: Pie representation of history of smoking.

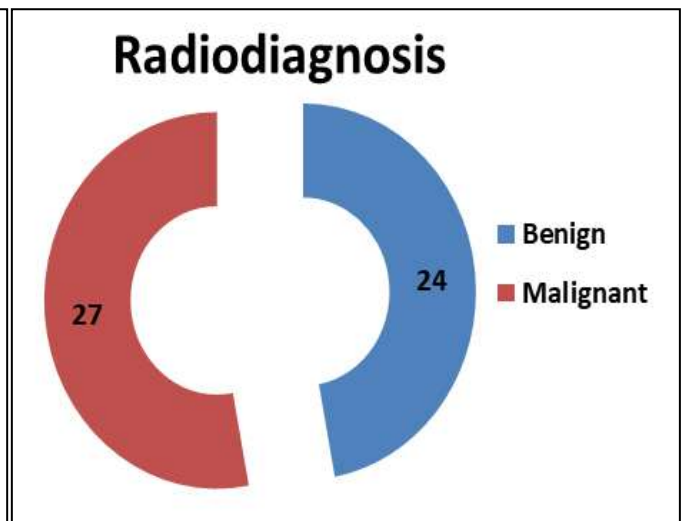


Fig 5: Representation of provision diagnosis on radiological findings.

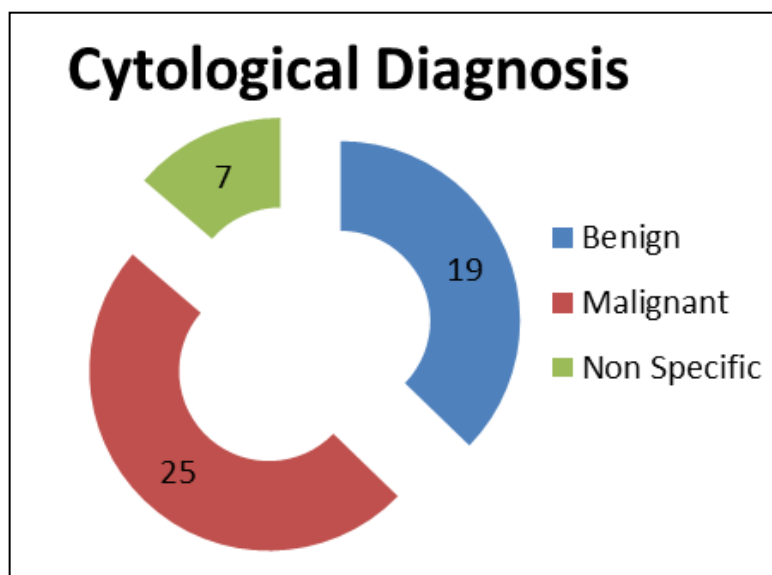


Fig 6: Representation of cytological diagnosis.

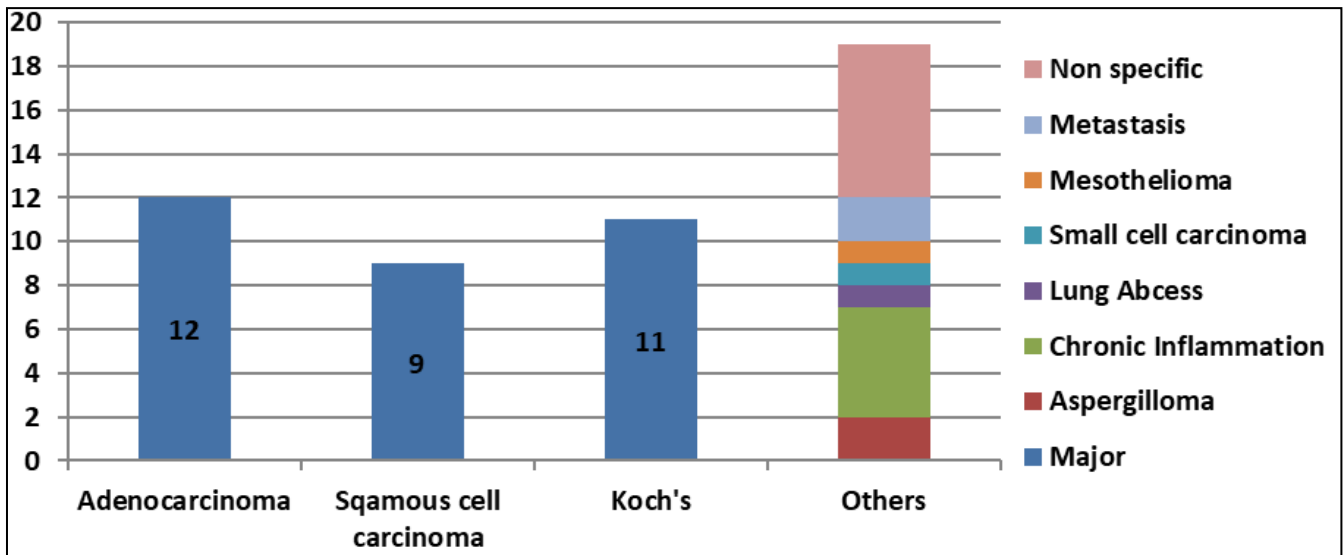


Fig 7: Bar representation of spectrum of lung lesion in our study.

Spectrum of lung lesions included in the study majority was lung malignancies, Adenocarcinoma (12), Squamous cell carcinoma (09), Metastasis (02), remaining are benign lesions Koch's (11).

Table 2: Complications

| Complications | Number of cases |
|---------------|-----------------|
| Pneumothorax | 7 (13.7%) |
| Haemoptysis | 1 (1.9%) |
| Haemothorax | Nil |
| Others | Nil |

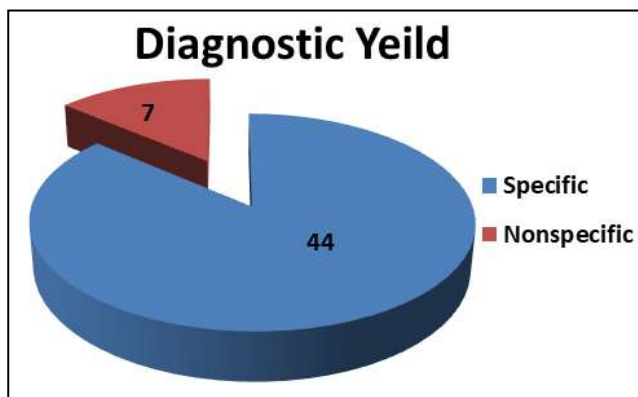


Fig 8: Pie representation of diagnostic yield of our study.

In the present study the diagnostic yield is 86% (44 cases) and the material obtained was inadequate for proper diagnosis in 07 cases.

Discussion

In present study all the 51 patients were adults. The peak incidence (22-92 yr) was the same as documented in one recent study. The mean age of 57 years is similar to the study conducted by Tsukada *et al.* [2] whose observation was also 57 years. However Schreiber *et al.* [4] showed a slightly higher mean age of 61.3 yrs in the case of CT guided biopsy of small (less than one cm) pulmonary lesions. Male patients 34 in number (66.6%) showed significant preponderance in our study compared to females 17 in number (33.4%). In the recent study by Heerink *et al.* [10] the percentage of male patients was a little higher than our study.

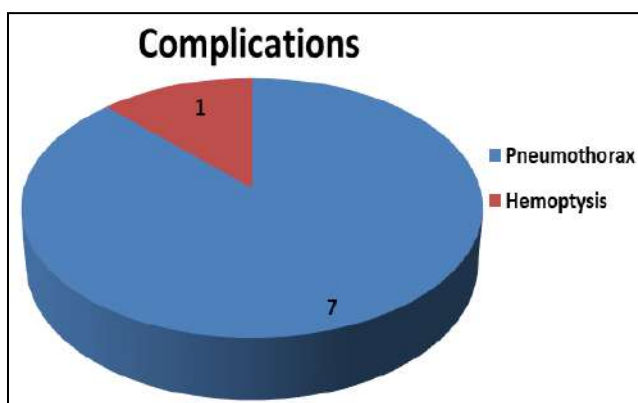


Fig 9: Pie representation of complications in our study.

The chief etiological factor for the initiation of the pathogenesis of lung masses was found to be smoking. Out of total cases selected for the present study 31 cases (60%) were smokers and remaining 40% were non-smokers. In this study lung tumors were located more in the right side than in the left and upper zone is the most common site same as in the Tai *et al.* [12] lesions were quite large and of variable sizes in the study. Among the 44 (86%) cytologically diagnosed cases 25 (49%) were malignant and 19 (37.2%) were benign. Most of the Squamous cell carcinoma 9 (17.6%) diagnosed were located centrally out of which 5 (9.8%), showed necrotic lesions and in large lesions peripheral parts of the lungs were also involved. In Adenocarcinomas 12 (23.5%), 9 were peripheral and 3 were central in location. Two Metastatic lung lesions were diagnosed in known cases of renal cell carcinomas. Hilar and mediastinal lymphadenopathy were seen 3 (5.8%) cases and calcifications were seen in 5(9.8%) cases which turned out to be benign lesions.

The efficacy of CT guided biopsy of lung lesions was evaluated. In the present study the cytological and bacteriological examination of the material from lung biopsy yielded clinically useful information in 86%. Where as in studies done by Choi *et al.* 94% in 2012 [5], Moreland 85.3% in 2016 [13], Neyaz in 2015 [14] it was 87%, O'Neil *et al.* in 2012 [15] it was 94%, Kinoshita *et al.* [18] in 2006 it was 94% and Yildirim in 2009 [22]. it was 76%. The value of our study although close to the work done by Kim in 2015, Patel in 2014 and Heerink in 2017.

Table 3: Show the list of reference and year

| References | Year | No. of cases | Diagnostic yield |
|---------------|------|--------------|------------------|
| Laurent | 2000 | 130 | 87% |
| Tanisaro | 2003 | 50 | 76% |
| Priola | 2007 | 149 | 84% |
| Billich | 2008 | 251 | 94% |
| Patel | 2014 | 224 | 94% |
| Kim | 2015 | 34 | 85.3% |
| Heerink | 2017 | 1745 | 94% |
| Present study | 2020 | 51 | 86% |

Incidence of complication due to the procedure of CT guided biopsy of lung lesions. The literature states the most common complication to be pneumothorax. In our study the incidence of pneumothorax is 13.4% (7 cases) none of which required placement of chest drainage tubes. The incidence of pneumothorax in studies performed by Tsukada [2] in 2000 is 23-43%, Geraghty *et al.* [1] in 2003 in 22-9%, Schreiber *et al.* [4] in 2003 is 32%, Priola [3] in 2007 is 27%, Choi in 2012 [5] is 24%, Kuban, *et al.* [6] in 2015 is 26.9%, The incidence of haemoptysis is 1% in our study which also correlates with Kim, Heerink, Tanisaro, Patel, Geraghty *et al.* studies where the incidence was <5%.

Table 4: The cases report pneumothorax and haemoptysis

| References | Year | No. of cases | Pneumothorax | Haemoptysis |
|---------------|------|--------------|--------------|-------------|
| Tsukada | 2000 | 106 | 24% | <5% |
| Geraghty | 2003 | 94 | 27% | <5% |
| Schreiber | 2003 | 156 | 32% | <5% |
| Priola | 2007 | 134 | 26.9% | <5% |
| Choi | 2012 | 208 | 22.9% | <5% |
| Kuban | 2015 | 34 | 11.8% | <5% |
| Present study | 2020 | 51 | 13.7% | <5% |

Conclusion

Smoker's belt of population mostly somersault with lung masses and get subjected to diagnostic procedures, where in the ailment directly or indirectly is moiety in adults which is a real reposal for our perusal. This CT guided biopsy stands as fruitful topic for study will be to elucidate the diagnostic and prognostic procedures in chest. This procedure of diagnosis with prosaic complications like Pneumothorax or Haemothorax or Haemoptysis and with its mosaic results outstands and extends its scope of study. CT guide biopsy is recommended procedure which yield credent ravishing equipoise results and advised as the cravat and routine indoor and outdoor procedure of diagnosis in lung masses having nil or minimal complications of Pneumothorax or Haemothorax or Haemoptysis. So this procedure may be advised and adopted as a common procedure of diagnosis for lung masses. The CT guide biopsy is a paragon that is advised as an opt, approachable, accommodative and peaceableness device which provides adequate pellucid

material for promised biopsy and hence may be recommended for present and future investigative and inventive procedures for peripheral lung lesions in particular.

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