Lung biopsies are important for the diagnosis regarding lung lesions. The options for obtaining tissue samples are CT guided percutaneous needle biopsies and open biopsies. The CT guided percutaneous needle biopsy is the preferred route because of less complications and shorter, if any, hospital stay. However, CT guided percutaneous needle biopsies do have their own complications, specifically pneumothoraces. Prior research has stated a pneumothorax for CT guided percutaneous needle biopsies ranging from 20-40% with single slice CT. This research will discuss the complications for percutaneous CT needle biopsies with a 64 slice MDCT. The retrospective study involved 123 biopsies performed over a 44 month period at Oakwood Southshore Medical Center. The pneumothorax rate was improved with MDCT, with only a 9% pneumothorax rate. Overall the sensitivity was 95% and the specificity was 98%. The data supports that MDCT provides better results and a reduced complication rate compared to single slice CT.

Materials and Methods
This retrospective study evaluated 123 lung biopsies performed at Oakwood Southshore Medical Center over a span of 44 months from January 2009 to October 2012. The biopsies were performed on a GE LightSpeed VCT 64 slice MDCT. The patient demographics were varied and were not included in this study in account for the acquired data. The biopsies were performed by various radiologists who practice within the Oakwood healthcare system. The equipment used for the biopsies was a 19 gauge coaxial needle with a 20 gauge biopsy gun. There were 34 samples obtained per biopsy case. The patients positioned themselves on a CT table, and the thoracic wall included a CT slice thickness of 1.25 mm and usually the patient was examined 5 slices above and below the lesion during the procedure. Procedural scanning covered a larger area of the lung surface to have more options available for an approach into the lesion.

Each of the 123 cases were examined to see where the biopsy was aimed and see the distance from the pleural surface to the lesion. In addition, follow-up radiological studies were examined to determine if the patient had a pneumothorax or other significant complications, such as infection, or bleeding. The pathological report was researched for each case to see the diagnosis of the patient, to determine whether there was satisfactory tissue and if there were additional pathological findings from other procedures, such as a partial lung resection. The additional pathological findings were also examined to determine if there was a missed diagnosis by the CT guided biopsy.

The data collected involved obtaining the size of the lesion biopsied, the level of the lesion, the distance of the lesion from the lung pleur, and if there was a pneumothorax or not. If the patient had a pneumothorax, it was further researched to see if there was a chest tube or Thoracent placed and also to see how long of a hospital stay did the patient have because of the pneumothorax.

Results
The biopsied lesions varied greatly in size from 0.6 cm to 10.2 cm with an average of 3.6 cm and a median of 3.1 cm. The distance from the pleural surface varied from lesions abutting the pleura to 9.8 cm with an average of 1.5 cm and a median of 1.5 cm. The biopsies of the lesions varied throughout all parts of the lung. There was no biopsy performed which involved the needle going across a major fissure.

There were 3 cases (3%) in which a lesion abutted a lung pleura. There were 10 cases (8%) in which the lung lesion abutted a lung pleura.

There were 11 cases (9%) of a pneumothorax. 8 of 11 had lesions in the right lung (73%) and furthermore, 6 of the cases were with lesions in the right upper lobe (55%). There was adequate tissue for pathological diagnosis in all 11 of the cases. The size of the lesions with pneumothoraces varied 0.6 cm to 6.8 cm with an average of 2.4 cm and a median of 3.0 cm. There is the pleura varied from 0.6 to 3.7 cm with an average of 1.8 cm and a median of 2.5 cm. The patient’s hospital stay varied from one day to 9 days with an average stay of 2.45 days. There was no intervention in 7 of the 7 cases (50%). In 4 cases, the pleural cavity was a Thoracent placed in 1 case (17%) and a chest tube in 1 case (3%). Overall a further intervention was performed in 4 out of the 123 CT guided lung biopsies (3%).

There were 2 cases (2%) in which there was necrotic tissue which gave no pathological information for the diagnosis of the lesion. The number was used to calculate the sensitivity rate of 98%.

There were 8 cases (5%) in which the diagnosis was found on follow-up. The average size of the missed lesion was 2.2 cm with a medium of 0.1 cm. The average distance of the lesion from the pleura was 2.2 cm with a median of 2 cm. One of the missed diagnoses was found on a MDCT guided Transthoracic needle biopsy. The other was found on a large 19 gauge needle biopsy. There was a difference in the size in cases where a CT detected a lesion which was not classified as a diagnosis after a biopsy. One of the missed diagnoses was found to have a conclusive diagnosis via bronchoscopy. One of the missed diagnoses was found to have a conclusive diagnosis via a bronchoscopy. Overall, the sensitivity rate of CT guided percutaneous needle biopsies was (98%).

Conclusion
There is a decreased incidence of pneumothorax with MDCT in comparison to prior research data on single slice CT scanner. The rate is about half of what was previously reported. This is vital, because this proves that MDCT is a safer method regarding CT guided percutaneous needle lung biopsies. There is increased sensitivity as well at 95% which was previously reported at 89%. However, this could be technical because of a small sample size of missed diagnoses (6), but the overall resolution of MDCT may help with accurate navigation of the needle to the target lung tissue. The specificity is decreased by 1%, however this is likely technical in nature, considering there were 6 cases with lack of adequate tissue for a pathological diagnosis. It is of note, that besides pneumothoraces, no other complications such as bleeding, hematomas, hemothorax/pneumothorax, or infections were found.

There is a small sample size to likely search for trends within the patient population with pneumothoraces, but there were some values which stood out. First, the overall majority of the lesions with a pneumothorax were in the right lung (8 of 11), with most of them (6 of 11) in the right upper lobe. There is no clear reason for this, as the lung tissue in the right upper lobe is the more stable for the patient, even though the lung volume is larger on the right because there is not heart taking up space, but again this is theoretical.

The retropective study can be improved by including a larger sample size than 123 cases, and also research into patient demographics such as age, sex, co-involvements and smoking status. In addition, patient positioning for the procedure was not taken in account, and this can also influence results as CT with fluoroscopy is another possible method of doing CT guided biopsies, and this may further improve on the rates in comparison with MDCT. These results can also and should be compared with other methods for lung biopsies such as bronchoscopy or video-assisted thoroscopic surgery. The advent of MDCT provides better resolution which may further improve on the rates in comparison with MDCT. These results can also and should be compared with other methods for lung biopsies such as bronchoscopy or video-assisted thoroscopic surgery.

Overall, the retrospective study demonstrate data to prove that MDCT provides an advantage over a conventional single slice CT for CT guided percutaneous needle lung biopsies. In addition there is a slight improvement of the sensitivity and a relatively stable specificity. The only major complication CT guided percutaneous needle lung biopsies are pneumothoraces. There is a risk of requiring a chest tube or Thoracent. The risks are relatively minimal for a definitive answer for the patient’s lung lesion, even though there is a small risk of complications due to the needle triggering a pneumothorax, which leads reasonable improvement in safety for a patient requiring a CT guided percutaneous needle lung biopsy.

References
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Abstract
Lung biopsies with MDCT and its complications

This retrospective study evaluated 123 lung biopsies performed at Oakwood Southshore Medical Center over a span of 44 months from January 2009 to October 2012. The biopsies were performed on a GE LightSpeed VCT 64 slice MDCT. The patient demographics were varied and were not taken into account for the acquired data. The biopsies were performed by various radiologists who practice within the Oakwood healthcare system. The equipment used for the biopsies was a 19 gauge coaxial needle with a 20 gauge biopsy gun. There were 34 samples obtained per biopsy case. The patients positioned themselves on a CT table, and the thoracic wall included a CT slice thickness of 1.25 mm and usually the patient was examined 5 slices above and below the lesion during the procedure. Procedural scanning covered a larger area of the lung surface to have more options available for an approach into the lung lesion. Each of the 123 cases were examined to see where the biopsy was aimed and see the distance from the pleural surface to the lesion. In addition, follow-up radiological studies were examined to determine if the patient had a pneumothorax or other significant complications, such as infection, or bleeding. The pathological report was researched for each case to see the diagnosis of the patient, to determine whether there was satisfactory tissue and if there were additional pathological findings from other procedures, such as a partial lung resection. The additional pathological findings were also examined to determine if there was a missed diagnosis by the CT guided biopsy.

The data collected involved obtaining the size of the lesion biopsied, the level of the lesion, the distance of the lesion from the lung pleura, and if there was a pneumothorax or not. If the patient had a pneumothorax, it was further researched to see if there was a chest tube or Thoracent placed and also to see how long of a hospital stay did the patient have because of the pneumothorax.

This study was to evaluate whether MDCT has an improvement for the complication rate for CT guided percutaneous needle biopsy lung lesions. Prior research demonstrated varying rates of pneumothoraces from 20-40%, and the articles themselves reported other research demonstrating rates from 8-64%. Most of the prior research was done on single slice CT’s, which there is a difference in image quality and resolution, in comparison to MDCT. This study was performed on 123 cases that were performed on a 64 slice MDCT.

Prior research has stated a sensitivity of 89% and a specificity of 99%. The sensitivity will be discussed regarding the specific diagnosis of the patient, and whether the bioposied tissue found the diagnosis or was the final diagnosis found on follow-up. The specificity was calculated from whether the tissue obtained via the needle biopsy revealed an adequate tissue sample for a pathological diagnosis.

Finally, the specific pneumothorax cases will be examined to see if there are any trends, which would lead a specific case for an increased risk for a pneumothorax. This retrospective study will examine the complications of doing a CT guided percutaneous biopsy with a 64 slice MDCT with a 19 gauge coaxial needle with a 20 gauge biopsy gun.

Introduction

The CT guided percutaneous needle biopsy is the preferred route because of less complications and shorter, if any, hospital stay. However, CT guided percutaneous needle biopsies do have their own complications, specifically pneumothoraces. Prior research has stated a pneumothorax for CT guided percutaneous needle biopsies ranging from 20-40% with single slice CT. This research will discuss the complications for percutaneous CT needle biopsies with a 64 slice MDCT. The retrospective study involved 123 biopsies performed over a 44 month period at Oakwood Southshore Medical Center. The pneumothorax rate was improved with MDCT, with only a 9% pneumothorax rate. Overall the sensitivity was 95% and the specificity was 98%. The data supports that MDCT provides better results and a reduced complication rate compared to single slice CT.