TRANSTORASİK İĞNE ASPİRASYON BİYOPSİSİ SONRASI GELİŞEN İATROJENİK PNÖMOTORAKS YÖNETİMİ

Management of Iatrogenic Pneumothorax, Following Transthoracic Needle Aspiration Biopsy

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ÖZET

Amaç: Pnömotoraks Trans Torasik İğne Aspirasyon Biopsisinin (TTIAB) en sık komplikasyonudur. Tedavisinde konservatif takip ve göğüs tüpü uygulamasının yeri tartışılmakta ve tercihler farklılık göstermektedir. Bu çalışmanın amacı TTIAB sonrası pnömotoraks tedavisini farklı yaklaşımlarla değerlendirmektir.

Hastalar ve Yöntem: Çalışmamız retrospektif kesitseldir. Ocak 2016 ve Aralık 2017 arası TTIAB sonrası gelişen pnömotoraks vakaları incelenmiştir. Pnömotoraks tedavisi için: yüksek akım (8-10 lt nazal oksijen) ile konservatif ve göğüs tüpü yerleştirmesini kullanarak oluşturduğumuz 3 tedavi protokolü pnömotoraks yüzdesine göre uygulayıp sonuçları değerlendirilmiştir.

Bulgular: Toplamda 187 hastaya akciğerdeki kitle lezyon tespiti ve malign hastalık öntanısıyla TTIAB işlemi uygulandı. Hastaların 24 ünde (%12,8) işlem sonrası pnömotoraks tespit edildi. Tanımladığımız protokoller kullanılarak toplamda 9 hastada (%37,5) göğüs tüpü yerleştirildi. On beş hasta (%62,5) konservatif (yüksek akım nazal oksijen ile) tedavi edildi. Ortalama hastane kalış süresi tüm çalışma grubu için 3,2 gün idi . Hastalarda mortalite yada morbidite izlenmedi

Sonuç: TTIAB sonrası iatrojenik pnömotoraks riski mevcuttur. Pnömotoraks yüzdesine göre oluşturduğumuz 3 protoke dayalı algoritmamız basit olarak uygulanabilir ve sonuçları başarılıdır. Bu hastaların yakın takibi ve gerektiğinde acil göğüs tüpü yerleştirilebilmesi için multidisipliner takım çalışmasına ihtiyaç vardır.

Anahtar Sözcükler: *Iatrojenik; Pnömotoraks; Trans torasik iğne aspirasyon biopsi; Girişimsel radyoloji*

ABSTRACT

Purpose: Pneumothorax is the most common complication following Trans Thoracic Needle Biopsy (TTNB). The treatment plan choice is either conservative treatment with high flow (8-10 lt) nasal oxygen and surgical treatment with chest tube is still varying. The aim of this study to evaluate the treatment plans for pneumothorax after TTNB and efficacy different treatment approaches

Patients and Methods: This is a retrospective cross-sectional study. Patients with pneumothorax following TTNB between January 2016 and December 2017 are evaluated. According to the size of the pneumothorax, we have created 3 treatment protocols consisting of follow up with high flow (8-10 lt) nasal oxygen and –or chest tube insertion . The results were analyzed

Results: There were 187 patients who had CT guided TTNB for diagnosis of a lung mass. Of those 24 patients (12,8%) had pneumothorax following the procedure. Overall 9 patients needed chest tube (37,5 %) The mean hospitalization for the whole group was 3,2 days There was no mortality or morbidity in the study group.

Conclusion: Pneumothorax following TTNB may be seen.Our algorithm of 3 protocols depending on the size of pneumothorax is simple to use and results successful.There is a need for a multidisciplinary teamwork, close follow up and preparation for urgent chest tube insertion.

Keywords: *Iatrogenic; Pneumothorax; Transthoracic needle aspiration biopsy; Interventional radiology*

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INTRODUCTION

The improvement in the diagnostic tools and their accessible clinical use had increased the rate of diagnosis for pulmonary lesion the recent years. The scans used by radiology and nuclear medicine give enormous data about a suspicious lesion. However, there is always a need for tissue proof about the exact diagnosis and for further treatment and follow up of the patient. Computed tomography (CT) guided Trans Thoracic Needle Biopsy (TTNB) is the accepted tool for the histopathologic diagnosis in pulmonary lesions (1,2). TTNB provides diagnostic tissue in more than 90% patients (3, 4). TTNB is an outpatient-based procedure and became very standardized for undiagnosed lung lesions(2).

Pneumothorax is the most common complication following TTAB (5,6).The risk varies between 5-61% (1,7,8,9) There had been several studies trying to figure out the potential risks for pneumothorax and need for chest tube placement (1,2,10, 11, 12). Association with TTNB and pneumothorax risk may be related to lesion size, subpleural location, lesion depth, emphysema, the angle of needle pleural puncture and post-biopsy position. (1,2,10)

The aim of this study to evaluate the rate of pneumothorax in consecutive patients underwent TTNB in a single center, evaluating the treatment protocols thus the efficacy of conservative treatment with high flow oxygen.

Study design

This is a retrospective cross-sectional study between January 2016 and December 2017. The data gathered retrospectively from a prospective medical data collection system. The study was performed in an academic teaching hospital. All TTNB were performed in the same interventional radiology unit and followed by thoracic surgery department in the same medical center. Some of the procedures (TTNB, chest tube insertion) were performed by residents under the guidance of academic staff (consultant thoracic surgeons and radiologists). All patients had CT and –or PET CT for the suspicious lesion in the lung. All the procedures were performed percutaneously under CT guidance (128 –row CT scanner Somatom Definition AS; Siemens Healthcare). All TTNB were performed with 9–15-cm and 20- and/or 22-gauge needles with the patient prone or supine position the shoulders were abducted to move the scapulae laterally, depending on the distance of the lesion to the chest wall and considering the number of pleural surfaces to be least crossed by the needle. A pillow support was placed under the patient's chest to open the intercostal spaces on prone position.The importance of breath-holding was explained to each patient and was performed few times before the procedure The patient interrupted breathing with the command after normal inspiration at functional residual capacity. CT scanned images were obtained from the lung apices to the diaphragm for the confirmation of the pre-diagnosed and reported pulmonary lesions at end inspiration in the lung window setting. According to the CT scan, the puncture point was determined after measuring the distance from the skin surface to the pleura, the length of the needle path and the smallest angle between the pleura and the needle. CT images were obtained to check the course of the biopsy needle and double checked for the correct configuration. The position of the needle tip was confirmed within the lesion and a specimen was obtained. Most of the interventions were performed with the support of a pathologist who is on-site to approve the material. If no pathologist was existing specimen acquisition was repeated until the thought was clear that the specimens were adequate. Immediately after the acquisition of the specimens, as the patient stayed in the same lying position chest CT images were obtained to evaluate pneumothorax. The patients are consulted with the thoracic surgeons from the authors (on-site or by using the intranet system to evaluate the CT scans taken after the procedure) The existence and size of the pneumothorax were determined on the basis of the criteria established by Rhea et al. (13).

According to the size of the pneumothorax by % we have created 3 protocols for the management of the patients (see table 2 -flow diagram)

Protocol 1 (P1): If the patient's pneumothorax size was more than 20% the patient had chest tube insertion (see the technique below) urgently and hospitalized.

Protocol 2 (P2) : If the patient's pneumothorax size was

5 to 20 %, the patient was hospitalized and followed by high flow 8-10 lot of nasal oxygen continuously also was lying in a supine position. After 24 hours a chest X-Ray was taken, if the pneumothorax size was stable or regressed the treatment of high nasal oxygen was continued. If a regression of pneumothorax size less than 5% was detected the patient was discharged for outpatient follow up.If there is progression and the pneumothorax size is more than 20% P1 works.

Protocol 3 (P3): If the patient's pneumothorax size was 5 % or less the patient was followed in the outpatient clinic for that day with high flow nasal oxygen. If the chest X-ray in the following hours showed progression in the pneumothorax size the patient either went into either P1 or P2 according to the last % amount. If the size is less or stable the patient was sent home and asked for an out-patient admission in the next 72 hours.

Chest tube protocol was as follows: A 24F chest tube was inserted under local anesthesia from the anterior axillary line from 4th or 5th intercostal space. An underwater sealing system (conventional, non-digital) was connected. If there were a defect in the expansion of the lung a negative suction system was added to the underwater drainage system. No additional antibiotic was given, analgesia consisting of paracetamol and NSAID were applied. The chest tube is pulled off after a 24 hours time for without air leakage . After pulling out the chest tube, a control X-ray has been taken and if no sign pneumothorax is seen the patient was discharged. A follow up of 10th day was planned to take out the closure stitch. A prolonged air leakage is defined as air leakage continuing after the 7th day of chest tube insertion

Flow Diagram for Treatment Protocols

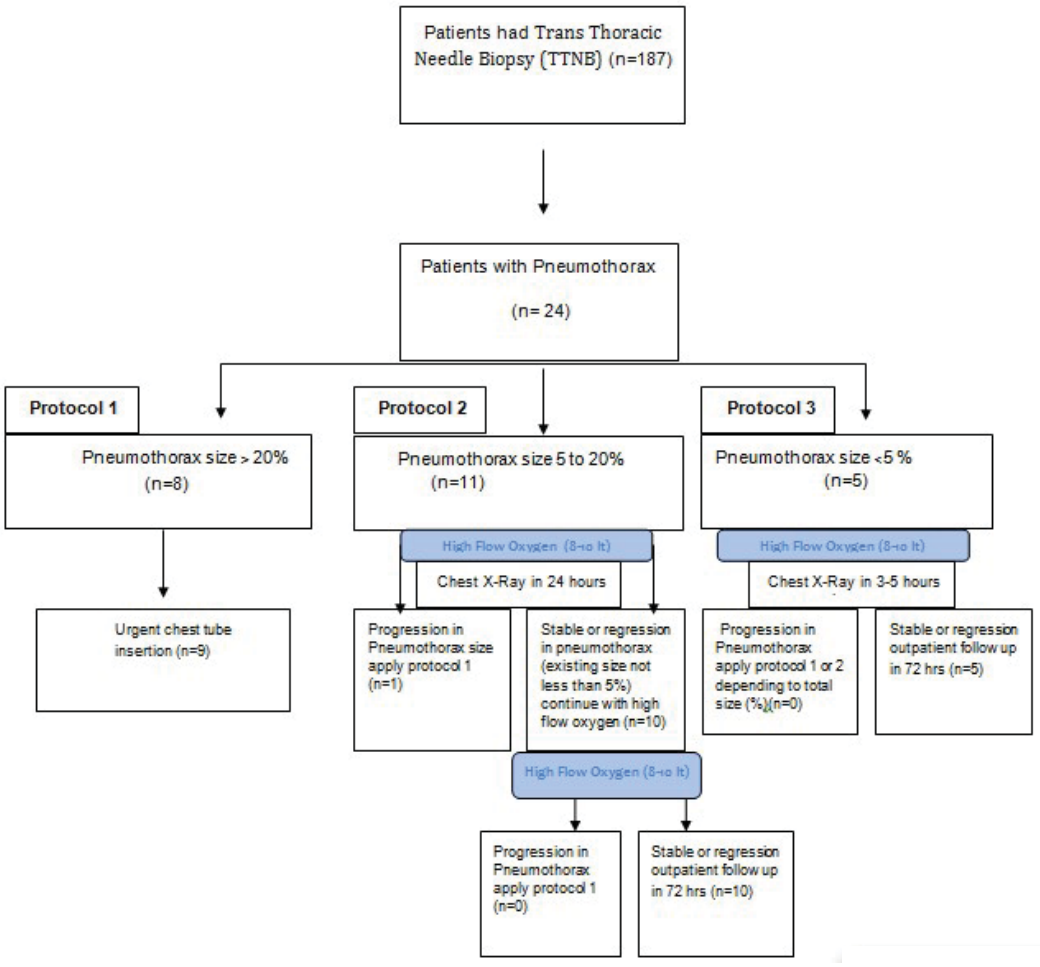

Table 1: Patient Demographics

Age-year (mean, range)	62,4(39-86)
Gender	
Male	16 (66,6%)
Female	8 (33,3%)
Pneumothorax Site	
Left	7 (29,1%)
Right	17 (70,8%)
Active smoker	
Yes	13 (54,2%)
No(ex smoker-never smoked)	11 (45,8%)
Radiological parenchyma status	
Eymphysema	12 (50%)
Normal	12 (50%)
Symptoms after TTNB related with pneumothorax	
Pain	19 (79,1%)
Dyspnea	4 (16,6%)

RESULTS

There were 187 patients who had CT guided TTNB. Of those 24 patients (12,8%) had pneumothorax following the procedure . Sixteen of them were male (66,6%) and 8 were female (33,3%). The average age was 62,4(39-86) years and 13 patients (54,1%) were active smoker with a mean of 47,8 packages/year. COPD (Chronic Obstructive Pulmonary Disease) was diagnosed in 9 patients (37,5%) and had a treatment plan. Radiological evaluation has revealed that 12 (50%) patients had lung radiology emphysema in the lung. After the TTNB the mean size (%)of pneumothorax for 24 patients was 10,9 %. Pneumothorax was 17 (70,8%) right, 7 (29,1%) left sided. Nineteen patients (79,1%) had the symptom of back pain but this could not be cleared whether the pain was related to the puncture of the procedure or from pneumothorax itself.

Patients with protocol 1 and 2 had pneumothorax size mean %13,9 (8-60%). One patient underwent very urgent chest tube insertion in the CT room due to desaturation and severe dyspnea. Of the patients 8 (33,3%) had protocol 1, 11 patient (45,8%) had protocol 2 and 5 patient (20,8%) had protocol 3.

In the follow up for protocol 2 patients, only 1 patient (0,04%) had progression in the pneumothorax size and needed a chest tube insertion. That made the need for chest tube for 9 patients overall (37,5 %). The other 10 patients in protocol 2 (41,6% of all pneumothorax patients) had a regression in the by high flow oxygen treatment and were discharged (see the flowchart). The mean hospitalization for the whole group was 3,2 days (2-9 days). Protocol 1 patients stayed for 3,2 days (3-9). Protocol 2 patients 2,2 days(2-3).There were no patients with for prolonged air leak and need for further surgical treatment. There were no mortality (0%) or morbidity (0%) .

DISCUSSION

TTNB can be used for any mass lesion when it can be reached by the biopsy needle (14).The most important contraindications are poor respiratory functions, abnormal coagulation indices. Also, lung with underlying bullous lesions is a relative contraindication (2,15). The most common complication of TTNB is pneumothorax (1,2,15). The risk factors for pneumothorax have been defined as the presence of COPD, small lesion size, long needle path, the absence of ipsilateral surgery and repeating pleural puncture (15). There is additional defined risk for pneumothorax as increase patient age, increase depth, increased time of needle across pleura and transversal of a fissure(16,17,18). Regarding the community's smoking and air pollution status the national based literature has been reviewed. The rate of pneumothorax varies for TTNB from 13,8 %(12) to 16% (11) in Turkish community. Our rate is similar to the previous national publications. Our rate of chest tube insertion is higher. This might the result for referred patients from other centers who might think to be risky due to lung parenchyma or absence of thoracic surgery service.

CONCLUSION

Regarding its efficacy in giving the diagnosis any patient with the suspicion of lung malignancy should go under TTNB despite existing risks. The key thing is to manage the clinical situation according to the presence, amount and progression of pneumothorax. Our results revealed that measuring the size of the pneumothorax by % and using the conservative

management protocols as high nasal oxygen flow is a safe effective way.

If the patient has less pneumothorax size than 20 %, it's more likely to progress just after the TTNB. Conservative follow up with high flow oxygen Is essential for the patient safety and there is a need for a multidisciplinary teamwork, close follow up and we must be prepared for urgent chest tube insertion.

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