

SPONTANEOUS PNEUMOTHORAX IN NEONATES: A COMPARISON BETWEEN EFFICACY OF NEEDLE ASPIRATION VERSUS TUBE THORACOSTOMY

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ABSTRACT

Background: Pneumothorax is an acute emergency and aspiration of the trapped air is almost always required and only in limited cases expectant management can be offered. Chest drains, needle aspiration and finally surgical intervention are needed depending upon the need of emergency. **Objective:** To compare the efficacy of intercostal chest tube and needle aspiration in cases with Pneumothorax in neonates. **Methodology:** It was a randomized control trial on 32 neonates presenting with non-tension pneumothorax diagnosed clinically and on chest X ray and were randomly selected in two equal groups, A and B. Group A was treated with intercostal chest tube (ICT) and Group B underwent needle aspiration. This study was carried out at Arar hospital, Northern provinces, Saudi Arabia. These cases were then followed via clinical improvement and X ray chest to look for complete resolution. Outcome was observed in the form of complete resolution and time taken to resolution. **Results:** In this study, there were total 32 cases, sixteen in each group. In group A out of 16 there were 9 (56.25%) males and 7 (43.75%) females, while in group B there were 10 (62.50%) males and 6 (37.50%) females. The mean age of group A and B were 7.27±3.05 days and 7.34±2.93 days respectively. There was no statistical significant difference in socio-demographic factors of both groups. The complete resolution of the symptoms and radiological clearance was seen in 15 (93.75%) out of 16 cases of group A as compared to 13 out of 16 (81.25%) in group B with p=0.09. There was significant difference in mean duration of resolution which was 7.56±1.48 days in group A in contrast to group B with 4.78±0.92 days with p value of 0.01. There was no statistically significant difference in both groups regarding socio-demographic factors, pre term or term labor or side effect profile. **Conclusion:** Pneumothorax are not uncommon in neonates. ICT is a better treatment option regarding complete resolution. However, time taken to resolution is significantly shorter with needle aspiration.

Keywords: Pneumothorax, Neonates, Needle aspiration, ICT.

INTRODUCTION

Pneumothorax is described as air leak which is accumulated between the visceral and parietal pleura leading to compression of the lung. Neonatal period is the most vulnerable period for this complication and etiology is poorly understood. Its incidence varies between 0.05 to 1% of all term pregnancies.^{1,2} The most proposed pathophysiology to be involved is the excessive pressure generated to open the lungs that is compressed during pregnancy. This pressure might approach 100 cm of water. This pressure normalizes after few breaths but the undergone damage needs some treatment. Other factors can also contribute to this including respiratory distress syndrome (RDS), Peri-natal asphyxia (PA), meconium aspiration syndrome (MAS), sepsis, transient tachypnea of newborn (TTN), sepsis, lung parenchymal infections or congenital heart diseases. All these disease are severe enough to require invasive ventilation which also has an added risk factor for pneumothorax.³⁻⁵

A wide range of symptoms is associated with presentation of the disease and a very low threshold is required to diagnose it early.^{6,7} X-ray chest is considered as the gold standard.

Tension pneumothorax is a pediatric emergency and needs immediate chest intubation. However, the cases with mild symptoms not compromising the respiratory efforts may be managed on individual basis and multiple options are available i.e. intercostal chest intubation, needle aspiration, pigtail catheter drainage etc.⁸

The objective of this study was to compare the efficacy of intercostal chest tube and needle aspiration in cases with pneumothorax among neonates.

METHODOLOGY

It was a randomized control trial in which total 32 neonates who were suffering from pneumothorax were enrolled. These cases were diagnosed on the basis of clinical signs and symptoms (shortness of breath, grunting and tachycardia) but not severe enough to lead to respiratory failure and confirmed by chest X-ray showing hyper lucent area with definite lung border and no signs of tension pneumothorax. The cases with respiratory failure, tension pneumothorax, hydro-pneumothorax, tachycardia more than 120 beats per minute and needing invasive ventilation to maintain oxygenation were excluded. Then these cases were

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divided into two groups A and B respectively. The cases were allocated by simple envelope method into these groups. Group A was treated with intercostal chest intubation (ICT) and Group B was treated with needle aspiration. This study was carried out at ArAr Hospital, North province of Saudi Arabia between the periods of 1st July 2014 to 30th June 2016. The cases were followed for improvements in symptoms and radiological improvement on chest X-ray. The cases with no signs and symptoms of pneumothorax and fully expanded lung over chest X-ray with no air leak were labeled as complete resolution and duration taken for complete resolution was also noted.

The data was entered and analyzed on SPSS version 19. Frequency and percentages were calculated for gender, term and pre-term birth and complete resolution and mean and standard deviation were calculated for age, duration of symptoms and time taken to resolution. Both the groups were compared in terms of their mean age, weight and duration of symptoms via independent sample t test and chi square test was applied for their gender to look for any difference between the two groups. Post stratification, chi square test was applied to compare the two groups to look for complete resolution and independent t test was used to compare the mean time taken to resolution between two groups, taking p value of ≤ 0.05 as significant.

RESULTS

In this study there were total 32 cases, sixteen each in both the groups. In group A out of 16 there were 9 (56.25%) males and 7 (43.75%) females while in group B there were 10 (62.50%) males and 6 (37.50%) females with $p=0.36$. (Table I)

Table I: Comparison between study variables of two groups.

Variable	Group A	Group B	P value
Age(days)	7.27 \pm 3.05	7.34 \pm 2.93	0.62
Weight(kg)	2.9 \pm 0.51	2.7 \pm 0.12	0.07
Duration symptoms (days)	1.12 \pm 0.43	1.29 \pm 0.54	0.30

The mean age, weight and duration of symptoms in group A and B did not show any statistically significant difference. (Table I)

The complete resolution of the symptoms and radiological clearance was seen in 15 (93.75%) out of 16 cases of group A managed by ICT and 13 (81.25%) out of 16 cases in group B with $p=0.09$. (Table II)

Table II: Complete resolution in both groups.

Complete resolution	Treatment group		P=0.09
	Group A	Group B	
Yes	15 (93.75%)	13 (86.67%)	
No	01 (6.25%)	03 (13.33%)	
Total	16(100%)	16 (100%)	

The mean duration of resolution was 7.56 \pm 1.48 and 4.78 \pm 0.92days in group A and B respectively with significant p value of 0.01. (Table III) There were no significant side effects noted in both the groups except for fever. Two cases in group A and one in group A had fever. One case of groups A developed air fluid level and was the only case which needed surgical intervention.

Table III: Duration of complete resolution

Group	Time for complete resolution (days)		P. Value
	Mean	Range	
Group A	7.56 \pm 1.48	6-10	0.01
Group B	4.78 \pm 0.92	3-6	

DISCUSSION

In this study treatment success was better seen in cases with chest tube insertion where resolution was seen in 15 (93.75%) out of 16 of cases as compared to needle aspiration where it was observed in 13 (81.25%) out of 16 cases. This was also observed by many other studies where better resolution was observed by ICT.⁹⁻¹¹ This can be explained by many ways. First of all ICT allows continuous drainage of the air as compared to needle aspiration which is a short time drainage procedure. In cases where there is persistent air leak, this non-stop drainage leads to better resolution. Secondly, the wider bore of the tube leads to better and early drainage as compared to thin bored tube which is also inserted for shorter duration. Although the drainage was better with the ICT but this difference was not statistically significant. This reveals that these cases may had an insulting event of the rent created at the bronchopleural level which is sealed off immediately

without further air leak and hence limited amount of air was accumulated which was successfully aspirated by both the procedures.

However, there was significant improvement in cases with needle aspiration as compared to tube drainage in terms of mean duration of time taken for complete resolution. Similar findings were seen in studies from the past that also found earlier resolution in cases with needle aspiration.¹²⁻¹⁵ Why the resolution was earlier with needle aspiration as compared to ICT? This might be due to active suctioning of the air contrary to chest tube where the drainage is being done by passive way. Other factors can also contribute pose a delay in expansion with ICT comprising tube blockage, air suction via wound site, improper joint fixation or poor care with underwater seal; hence further air trapping in pleural cavity could have led to delay in complete resolution. Moreover short duration of procedure with needle aspiration as compared to a surgical procedure leaving chest tube in situ might be another risk of secondary infection which can prolong the need to retain ICT.^{16,17} There were no significant difference in terms of complications as well except for one case managed by ICT which turned into hydro-pneumothorax. Other studies also did not show any difference in terms of complication rates among this entities.¹⁸⁻¹⁹ There were few limitations of this study. This study was a small sampled size study. Secondly, it did not include the risk factors causing the pneumothorax that what group had serious underlying disease.

CONCLUSION

Intercostal tube insertion is the better treatment regarding complete resolution. However, the time taken to complete resolution was significantly shorter with needle aspiration similarly side effect profile was low with needle aspiration.

Conflict of interest

The authors have declared no conflict of interest.

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