



Original Article

IMMEDIATE OUTCOME OF NEONATE WITH PNEUMOTHORAX

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Abstract:

Objectives : To determine the outcome of pneumothorax in term and post term neonates.

Study Design : Neonates presented with respiratory distress and diagnosed pneumothorax by X-ray at the time of admission or during the course of hospital stay were included in this study.

Results: Total 49 cases were included for the study, among them 29(59.18%) were male and 20(40.82%) female, 42(85%) babies cured and 7(15%) expired. Thirty-five (71.46%) delivered by LUCS, 14(28.57%) by NVD. Pneumothorax associated with maternal risk factors like UTI 10(21.2%), PROM 5(10.2%), GDM 2(4.2%) cases, PIH 1(2.0%), PET 1(2%), were observed. No maternal risk factor has been identified in 25(51%) cases and 4(8.1%) cases due to other reason. Nineteen neonates (38.77%) with meconium aspiration syndrome, 14(28.57%) required PPV, 10(20.40%) with pneumonia 2(4.08%) with congenital heart disease, 2(4.08%) with TTN, pneumothorax 2(4.02%). Total 40(81.63%) cases were in patient, only 3(7.5%) of them died, 9(18.36%) babies were out patient among them 4(8.16%) died, (P value \hat{A} 0.001). Significant death were seen among those who admitted after 24 hours of age, 3 out of 6 cases). Four (8.16) out of 36(73.4%) expired who admitted before 24 hours of age, (P value \hat{A} 0.001.) Pneumothorax were managed by nitrogen wash out 29(59.18%), 5(10.20%) needle aspiration with high flow oxygen, 5(10.20%) needed needle aspiration, chest tube with high flow oxygen. Ten (20.40%) babies needed needling, chest tube drainage with ventilator, among them 6(12.24%) expired and 4 survived. No death were observed among the neonates who were managed with high flow oxygen.

Conclusions: High index of suspicion, prompt diagnosis by cold light and urgent portable X-ray and immediate intervention is needed for life saving and better outcome.

Key words: Pneumothorax, neonates

Introduction:

Pneumothorax is one of the air leak syndrome and is more common in the newborn period than in any other childhood. It can be divided into spontaneous and secondary pneumothorax from underlying lung pathology or with assisted ventilation. Incidence of

spontaneous pneumothorax is highest during neonatal period¹. The causes and risk factors of symptomatic spontaneous pneumothorax in term newborns are not completely understood. Incidence observed 0.05–1% of all term newborns. This is most probably due to high transpulmonary pressure generated with the onset of breathing². The first inspiratory effort in the infant produces transpulmonary pressure higher than 100 cm of water column and open the lungs that were collapsed in utero. After the first few breath, this pressure normalized and lungs takeover the function. If this transpulmonary pressure remains higher for a long period of time, it leads to alveolar rupture and consecutive pneumothorax.

Other than spontaneous pneumothorax some associated risk factors has been identified like

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respiratory distress syndrome (RDS), meconium aspiration syndrome (MAS), perinatal asphyxia (PNA), transient tachypnoea of newborn (TTN), sepsis, congenital pneumonia, congenital heart disease (CHD), also associated respiratory support with ventilator, nasal continuous positive airway pressure (NCPAP) were seen.³ The early diagnosis and treatment of neonatal pneumothorax (NP) is crucial, as it may help to avoid complications like hypoxaemia, hypercarbia, or impaired venous return and can save life.^{4,5,6}

The aim of the study was to see the immediate outcome of the neonates with pneumothorax at NICU.

Material and Methods:

It was an observational study conducted at neonatal intensive care unit (NICU) in Ad-din Women's Medical College Hospital over a period of one year, from Jan. 2012 to Dec. 2012. Term and post term neonates (gestational age >37 weeks) presented with respiratory distress with positive X-ray finding of pneumothorax were included for the study. Neonatal demography like gestational age, sex, birth weight, mode of delivery, underlying medical conditions, age of appearance of pneumothorax, type of respiratory support and outcome. Babies with definite congenital malformations, any syndrome were excluded from the study. X-ray chest of both anterior-posterior and lateral view, blood gas analysis, complete blood count, CRP, blood culture, serum electrolyte, calcium were done after admission. Written consent was taken at the time of admission for doing the invasive procedure and before doing chest tube drainage. Neonates with mild to moderate pneumothorax, but haemo-dynamically stable were managed

conservatively with high flow oxygen with oxyhood. In case of sever pneumothorax as evidenced by shifting of mediastinum, cyanosis, bradycardia, hypotension were managed immediately by needle aspiration followed by chest tube drainage. Diagnosis of pneumothorax was always confirmed by chest X-ray.

Data were collected in a pre-form questionnaire and tabulated by frequency distribution tables and analyzed using proportions and SPSS version 17.

Results:

Over a period of one year total 9473 neonates were delivered at the department of obstetrics and gynecology, among them 643 neonates were admitted in the neonatal intensive care unit (NICU) for various indication and 40 of them developed pneumothorax during admission or during the course of hospital stay. Nine neonates were admitted from other hospital presented with respiratory distress with pneumothorax. Incidence of pneumothorax was 0.42% in this study. Out of 49 neonates 29(59.18%) male and 20(40.82%) female, male-female ratio was 1.4:1. Mean GA 39.03 wks. (37 to 43 weeks). Mean birth weight 2.7 kg. (1.5 to 4.7kg).

Table I Shows significant mortality observed in out born babies 4(8.16%) out of 9 (18.36%). On the other hand 3(6.12%) expired out of 40(81.63%) inborn patients. Babies who were admitted after 24 hours of age, 3 (6.12%) expired out of 9(18.36%). Babies admitted before 24 hours 4 (9.30%) expired out of 40 (81.63%) (P value<0.001). Incidence of pneumothorax is high in LUCS 35(71.42%), in NVD 14(28.57%) (P value<0.001).

Table-I
Neonatal demographic profile with pneumothorax (n=49)

| | Total | Neonates survived | Neonates Expired | P value |
|------------------------------|-------------|-------------------|------------------|---------|
| In born | 40(81.63%) | 37(74.13%) | 3(7.5%) | |
| Out born | 9(18.36%) | 5(10.2%) | 4(8.16%) | <0.001) |
| Admitted After 24hrs of Age | 9(18.36%) | 6(12.24%) | 3 (6.1%) | |
| Admitted before 24hrs of Age | 40 (81.63%) | 36(73.4%) | 4 (8.16%) | <0.001) |
| LUCS | 35(71.4%) | 31(63.2%) | 4 (8.16%) | |
| NVD | 14(28.57%) | 11(22.4%) | 3 (6.1%) | <0.001) |

Table-II
Admission diagnosis of neonates with pneumothorax

| | |
|--------------------------------------|------------|
| Meconium Aspiration syndrome (MAS) | 19(38.77%) |
| Perinatal asphexia(PNA) | 14(28.57%) |
| Pneumonia | 10(20.40%) |
| Transient tachypnoia of newborn(TTN) | 2(4.08%) |
| Congenital heart disease(CHD) | 2(4.08%) |
| Pneumothorax only(PN) | 2(4.08) |
| Total | 49(100%) |

Meconium Aspiration syndrome (MAS) was the most common (38.77%) disease associated with pneumothorax. Perinatal asphexia(PNA) was 2nd most common (28.57%).

Table-III
Maternal risk factors

| | |
|--------------------------------------|-----------|
| Gestational diabetics mellitus (GDM) | 2(4.2%) |
| Pregnancy induced hypertension (PIH) | 1(2%) |
| Pre- eclamptic toximia (PET) | 1(2%) |
| Prolong rupture of membrane (PROM) | 5(10.2%) |
| Urinary tract infection UTI | 10(20.4%) |
| Other Causes | 4(8.1%) |
| No maternal risk factors | 25(51%) |
| Total | 49(100%) |

Among the maternal risk factors UTI was the most common 10(20.4%) and 25(51%) mother did not show any risk factor.

Table IV
Observed survival and mortality with the site of involvement

| Site | Total | Survived | Expired | P value |
|-------------|------------|------------|-----------|----------|
| Unilateral | 43(87.75%) | 41(83.67%) | 2(4.08%) | |
| Bilateral | 6(12.24%) | 1(2%) | 5(10.2%) | < 0.001. |
| Total | 49(100%) | 42(85.71%) | 7(14.28%) | |
| Right sided | 30(61.22%) | 29(%) | 1(2%) | |
| Left sided | 13(26.53%) | 12(24.48%) | 1(2%) | < 0.001. |

Mortality among the bilateral cases were significant. P value < 0.001. Right sided pneumothorax is high. P Value < 0.001

Table-V
Type of interventions done for pneumothorax

| Type of management | No. (%) | No. (%) of expired |
|--|------------|--------------------|
| Oxyhood with high flow O ₂ | 29(59.18%) | 0 (%) |
| Oxyhood+needle aspiration | 5(10.20%) | 0(%) |
| Oxyhood + needle aspiration + chest tube | 5(10.20%) | 1(2.0%) |
| Needling + chest tube+ ventilator | 10(20.40%) | 6(12.24%) |
| Total | 49(100%) | |

Twenty-nine (59.18%) neonates were managed with high flow oxygen through oxyhood. Five (10.20%) needed needle aspiration with high flow oxygen through oxyhood, 5(10.20%) needed needle aspiration, chest tube with high flow oxygen. Ten (20.40%) babies needed needling, chest tube drainage with ventilator, out of them 6(12.24%) expired and 4 survived. (among them 2 were on conventional ventilation and 2 were on high frequency ventilator care). No death were observed among the neonates who were managed with high flow oxygen.

Discussion:

Neonatal pneumothorax is a life threatening condition that is associated with high mortality and morbidity^{4,6}. Pneumothorax occurs for more frequently during the neonatal period than at any other time of life and is most often seen in first 3 days of life.^{7, 8}

Incidence of pneumothorax is much higher during 1st 24 to 28 hours of life. In one study shows 24(80%) out of 30 neonates presented with pneumothorax <48hours postdelivery.⁹ Our study most of the neonatal pneumothorax were presented in first 24 hours of life, 43 (87.75%) presented before 24 hours and 6(12.24%) after 24 hours of age. Mortality was higher in those patients who presented PN after 24 hours of life, 3(50%) out of 6 babies, due to prolong hemodynamic instability. This study shows 19(38.77%) neonates had meconium aspiration syndrome. However the high incidence for pneumothorax was also observed in patients with meconium aspiration (MAS) 23.81%, in another study¹⁰.

One study shows right sided pneumothorax is higher than that of the left side.¹⁰ In different study two thirds of the pneumothorax involves right lung and

between 15% and 25% of pneumothorax cases were bilateral.^{11,12} In our study 30(61.22%) neonates had right sided pneumothorax, 6(12.24%) had bilateral pneumothorax and the mortality was high, 5(10.2%) out of 6(12.24%) expired. Caesarian section was reported to be the more common mode of delivery in affected neonates.^{13,14} In this study number of caesarian section was 35(71.42%) and normal delivery 14(28.57%). Different studies shows that neonatal pneumothorax occurs more often in males than in females.^{11,15} Our study also shows neonatal pneumothorax more common in male, this was considered as a risk factor for the development of pneumothorax in another study.¹⁶

For more rapid resolution of pneumothorax in the mild to moderate symptomatic neonates, 100% oxygen for 8 to 12 hours, a procedure is known as nitrogen wash out therapy. Less nitrogen will enter into the lungs and at the same time absorption of nitrogen from the extrapleural space will increase and then exhaled. Total gas tension will decrease, which also facilitate to absorb nitrogen by the blood¹⁷.

In this study we used high flow oxygen as our cases were full term and in whom retinopathy of prematurity was not a problem. Twenty-nine (59.10%) neonates were managed with supplemental high flow oxygen with head box as they did not suffer from systemic hypotension and vitally stable except fast breathing without chest in drawing.

Five (10.20%) needed needle aspiration with high flow oxygen through Oxyhood. Another 5(10.20%) neonates needed needle aspiration, chest tube with high flow oxygen. 10(20.40%) babies needed needling, chest tube drainage with ventilator care, out of them 6(12.24%) expired and 4(8.16%) survived, 2 were on conventional ventilation and 2 were on high frequency ventilator. No death were observed among the 29(59.1%) neonates who were managed with high flow oxygen only and 5(10.20%) neonates managed high flow oxygen and needle aspiration. 15(30.6%) baby needed chest tube, among them 7(14.2%) expired. Mortality with chest tube along with respiratory support 46.6% in this study. In a study mortality reached 62.7%¹⁸⁽¹⁷⁾ in neonates with pneumothorax managed with respiratory support which higher than our study.

Conclusion:

Pneumothorax should be suspected in a newborn baby if there is no improvement in presence of

respiratory distress and also with sudden deterioration of a neonate on mechanical ventilation. Strong index of suspicion prompt diagnosis by urgent portable X-ray and immediate intervention is needed for life saving and better outcome.

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