



Original Research Article

Radiological Evaluation of Neonatal Thoracic Lesions

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ABSTRACT

Introduction: Within 48-72 hours, most common disorder that occurs in neonate is respiratory distress. Post natal respiratory distress is the most important indication for chest x-ray. Clinically it is very difficult to distinguish between pulmonary and extra pulmonary causes.

Objectives: To show the radiographic appearances of various causes of neonatal respiratory distress, and varied appearances of each pathology.

Method: This is a prospective observational study that was conducted in rural tertiary care center. Anteroposterior chest radiograph in supine position of (118) neonates were taken, presented with a chief complaint of respiratory distress. Chest x ray was taken with the help of portable x ray machine in NICU department. Chest x rays were taken on first day of admission and then follow up chest x rays were taken.

Results: The commonest cause of respiratory distress in neonates which presented with respiratory distress was transient tachypnoea of new born, which is (32.20%), followed by hyaline membrane disease (20.33%), neonatal congenital pneumonia (16.94 %), meconium aspiration syndrome (11.86 %), cardiac causes (5.08 %), trachea-oesophageal fistula (4.23 %), congenital diaphragmatic hernia (2.54%), aspiration pneumonia (2.54%), idiopathic persistent pulmonary hypertension (1.69%), eventration of diaphragm (1.69 %) followed by pneumoperitoneum (0.84 %).

Conclusion: Any sign of respiratory distress is an indication for roentgenogram of the chest which should be taken as early as possible.

Key Words: Acute respiratory distress, Transient tachypnoea.

INTRODUCTION

The first breath and first cry have always been mystical signaling the beginning of a new life. A newborn is considered neonate till the age of 28 postnatal days.

Respiratory distress constitutes the commonest morbidity requiring admission of neonate in an intensive care unit. Improved diagnosis and treatment due to

technological advancements and increased pediatric and radiological specialization have led to an impressive fall in neonatal mortality.

The role of diagnostic imaging is to provide the clinician probable underlying etiology of the patients' symptomatology with the knowledge of the relative advantages and disadvantages of the various modalities for the wide range of disorders in

infants keeping the dosage of radiation minimum to the patient.

Respiratory distress is defined by presence of at least two of following three features:

1. Tachypnea (respiratory rate >60 per minute)
2. Retractions (intercostal, subcostal, sternal and suprasternal)
3. Noisy respiration (grunt, stridor or wheeze)

Chest radiography is very essential in neonates with acute respiratory distress to exclude the surgical and medical causes of respiratory distress. It is the most important indication for neonatal respiratory distress. Clinically it is very difficult to distinguish the difference between pulmonary and extra pulmonary causes of respiratory distress as a neonate can develop respiratory distress in utero, during delivery or in post natal period. [1]

Aims and objectives:

- 1) To present a brief overview of the various chest pathologies in neonate.
- 2) To consider radiological appearances of various chest pathologies
- 3) To discuss current approaches for radiologic analysis and diagnosis of these pathologies
- 4) To consider role of imaging for providing anatomical operative planes for surgeons.
- 5) To study the various Risk factors associated with development of severe respiratory distress in the new born
- 6) To assess the immediate clinical outcome of respiratory distress in newborn.

MATERIALS & METHODS

This is a prospective study of 118 newborns born with respiratory distress in Dhiraj general hospital, Pipriya, Waghodia dist, Vadodara during a period of 1 year.

Sources of Data: Newborns admitted to NICU department of Dhiraj general hospital, Vadodara due to respiratory distress. Chest X-ray AP view was done with portable X-ray machine Model GE Stalium.

Method of Collection of Data Inclusion Criteria:

1. All newborns admitted to NICU of Dhiraj general hospital, Vadodara within 72 hrs of birth due to respiratory distress.
2. All institutional delivered and delivered outside the institution are included within the 72 hours of birth.

Exclusion Criteria:

All Newborns admitted to NICU with onset of respiratory distress after 72 hrs.

Method of collection of data: This is prospective observational study of 118 neonates presented with respiratory distress. Neonates admitted in NICU department, within 72 hours of birth with respiratory distress were included in study.

Chest X-ray was done on 1st day of admission and then follow up X-rays were taken from 2nd day of admission till date of discharge as required. Findings of chest X-ray on 1st day of admission along with clinical history, birth history, maternal history, APGAR score at 1 minute, liquor, history of immediate cry and gestational age were noted. Then treatment history along with follow up chest X-ray findings was taken, on the basis of which, final diagnosis was concluded.

Compilation of all the observational data of Dhiraj General Hospital was done in the form of frequencies and percentage which has been depicted in the form of table.

RESULTS AND ANALYSIS

We also noted varied appearances of transient tachypnoea of newborn on chest x-ray, 21.05% presented with hyperinflation in both lung fields; 5.26% with linear streaky

opacities arising from perihilar region; 7.88% with prominence of interlobar fissure; 26.33% with hyperinflation with linear opacities with prominence of interlobar fissure; 2.63% with hyperinflation with

prominence of interlobar fissure; 21.05% with hyperinflation with linear streaky opacities; 2.63% with linear streaky opacities with prominence of interlobar fissure and 13.15% had normal chest x-ray.

ETIOLOGY OF NEONATAL RESPIRATORY DISTRESS

ETIOLOGY	FREQUENCY (n = 118)	PERCENTAGE
Transient tachypnoea of newborn	38	32.20%
Hyaline membrane disease	24	20.33%
Congenital pneumonia	20	16.94%
Meconium aspiration syndrome	14	11.86%
Aspiration pneumonia	3	2.54%
Cardiac causes	6	5.08%
Tracheoesophageal fistula	5	4.23%
Congenital diaphragmatic hernia	3	2.54%
Idiopathic persistent pulmonary hypertension	2	1.69%
Eversion of diaphragm	2	1.69%
Pneumoperitonium	1	0.84%
TOTAL	118	100%

DISCUSSION

In this study commonest cause of respiratory distress in neonates which presented with respiratory distress was transient tachypnoea of new born, which is (32.20%), followed by hyaline membrane disease (20.33%), neonatal congenital pneumonia (16.94 %), meconium aspiration syndrome (11.86 %), cardiac causes (5.08 %), tracheoesophageal fistula (4.23 %), congenital diaphragmatic hernia (2.54%), aspiration pneumonia (2.54%), idiopathic persistent pulmonary hypertension (1.69%), eventration of diaphragm (1.69 %) followed by pneumoperitoneum (0.84 %).

Raed H AL-Saad et al showed causes of neonatal respiratory distress in 129 full term neonates, transient tachypnea of newborn as most common cause followed by neonatal pneumonia, hyaline membrane disease, meconium aspiration syndrome. [1] Study included full term neonates as the study group, so neonatal pneumonia was more common than hyaline membrane disease. In this study full term as well as preterm neonates was both included. In this study hyaline membrane disease is more common than neonatal pneumonia.

Causes of respiratory distress in different studies are same, but their arrangement is different. It can be due to difference in sample size, neonate age included, their gestational age, age of newborn.

Chest radiographic finding in patients with transient tachypnea of newborn in this study showed that hyperinflation with linear streaky perihilar opacities with prominence of interlobar fissure was most common finding of transient tachypnea of newborn (26.32%), followed by only hyperinflation noted as sole finding on chest x ray (21.05%), hyperinflation with linear streaky opacities(21.05%), prominence of interlobar fissures (7.88%), linear streaky perihilar opacities (5.26%), hyperinflation with prominence of interlobar fissures (2.63%), linear opacities with prominence of interlobar fissures(2.63%). Normal chest x rays were noted in 13.15% cases of transient tachypnea of newborn.

Raed H AL-Saed et al found chest X-ray films were normal in 16%. [1] Agrawal et al found that many newborn with transient tachypnea had clear chest films. [2] Marini et al in 1997, found only

reticulonodular shadowing in chest radiograph of patients with transient tachypnea of newborn. [3] In present study 13.15% are normal. In this study most common presentation was combination of hyperinflation of lung fields with linear streaky perihilar opacities with prominence of interlobar fissures. No nodularity was noted in our study.

The commonest radiographic appearance of neonatal pneumonia in this study was soft tissue opacity with air bronchogram. Left lung was more commonly involved in our study. Left lower zone was most commonly involved (55%). Raed H AL-Saed et al found commonest radiographic appearances seen in cases of pneumonia were bronchopneumonia and right upper lobe consolidation. [1] Mathur et al in 2001, found that alveolar infiltrate was seen in (44.6%), lobar consolidation in (9.7%) and clear lungs in (14.5%), reaching a conclusion that clinical features and chest X- ray would miss the diagnosis of pneumonia in (15%) of neonates with dyspnea and had to be collaborated with sepsis screen and blood culture (1). [4] In this study the diagnosis of neonatal pneumonia depends on radiological and clinical findings. No case was found with normal chest x- ray in this study. On the other hand Aridi N M et al in 1992, observed chest radiographic abnormalities in (42.8%) of patients with neonatal septicemia even in the absence of respiratory distress. [5]

In our study hyaline membrane disease on chest x ray showed ground glass opacity (complete white out lungs) in 45.83% as the most common appearance on chest x ray, followed by haziness with air bronchogram (20.83%), fine reticulogranular appearance (20.83%) and only haziness (12.51%). Out of 24 neonates with hyaline membrane disease developed complications of pneumothorax (8.34%), pneumo mediastinum (4.17%), pulmonary

hemorrhage (4.17%) and persistent pulmonary hypertension (4.17%). Raed H AL-Saed et al found chest radiographs showed a reticuloglandular appearance as the commonest abnormality (52 %). [1] Ground glass appearance seen in (23%). Only one case had normal chest radiograph. Complication was seen in 2 patients who showed small pneumothorax. Marini et al, found that (10 of 62) patients with hyaline membrane disease had negative chest radiograph, 26 had fine granular opacities and had marked hypo expansion with reticulonodular opacities. [3] While finely granular evenly distributed structures combined with signs of hypoventilation are the chest x-ray finding in hyaline membrane disease seen by Ponhold in 1982. [6]

This study shows most common chest x ray appearance of meconium aspiration syndrome as multiple coarse soft tissue patchy opacities seen in both lung fields in 57.14%. Similar finding was seen in 3 previous studies Chen et al in 1990, Yeh et al in 1979 and Raed H AL-Saed et al. [1,7,8] In rest of cases with meconium aspiration syndrome chest x ray showed multiple patchy opacities with collapse of lung (meconium aspiration syndrome) in 28.57% and patchy opacities with air leak in 7.14% cases.

Present study had 3 cases of congenital diaphragmatic hernia, out of them 2 were on left side (66.67%) and 1 on right side (33.33%). later on these cases were operated. One neonate with congenital diaphragmatic hernia developed pulmonary hypoplasia. Congenital diaphragmatic hernia is left sided in 85% of cases Wilson and Eugene 1997. [9]

Respiratory distress due to cardiac conditions was in 6 neonates (5.08%). Out of 6 neonates 4 (66.67%) were diagnosed with cardiomegaly and in 2 (33.33%) chest x ray was normal. Oeppen et al 2002 showed, in asymptomatic newborns with

cardiac murmur, chest radiograph appeared not to influence patient management. ^[10]

5 (4.23%) neonates were diagnosed with trachea oesophageal fistula. 4(80%) were diagnosed with oesophageal atresia with trachea esophageal fistula between distal end of oesophagus and trachea (type C) and 1 (20%) with (type B) only oesophageal atresia with no stomach air shadow seen. Esophageal Atresia and Tracheoesophageal Fistula 10 Year Review by Chien-Yi Wu1 et al found type C of trachea esophageal fistula in 88% neonates. ^[11]

Eventration of diaphragm was found in 2 patients, 1 on left and 1 on right side. In extrapulmonary cause 1neonate developed respiratory distress due to pneumoperitoneum.

In this study, Persistent pulmonary hypertension is found in 6 neonates, in which chest x ray shows no features. These cases are diagnosed by echocardiography. 2 are due to idiopathic cause and 6 are due to secondary cause after respiratory disease.

Pneumothorax was seen in 4 neonates with other pulmonary diseases, 2 in hyaline membrane disease, 1 in meconium aspiration syndrome and 1 in neonatal pneumonia. No isolated pneumothorax was noted in present study.

CONCLUSION

Respiratory distress is one of the most common disorders that occur within the first (48-72) hours of life. Neonate can have respiratory disturbance in utero, in delivery room or in nursery. There are wide varieties of causes that can cause respiratory distress in neonate. There are pulmonary and extrapulmonary causes. Pulmonary causes include transient tachypnea of newborn, hyaline membrane disease, congenital neonatal pneumonia and meconium aspiration syndrome. Extrapulmonary causes include surgical causes like congenital

diaphragmatic hernia, tracheoesophageal fistula, eventration of diaphragm, cardiac causes and pneumo peritoneum can cause external pressure and cause respiratory distress. It is difficult to distinguish pulmonary and extrapulmonary causes of respiratory distress clinically. Any sign of post natal respiratory distress is an indication for roentgenogram of chest. Chest radiography is most important tool to study the respiratory distress in neonates. In our present study chest x ray was done in neonates, presented with respiratory distress. Transient tachypnoea of new born is most common cause of neonatal respiratory distress (32.20%), followed by hyaline membrane disease (20.33%), neonatal congenital pneumonia (16.94 %), meconium aspiration syndrome (11.86%), cardiac causes (5.08%), trachea-oesophageal fistula (4.23%), congenital diaphragmatic hernia (2.54%), aspiration pneumonia (2.54%), idiopathic persistent pulmonary hypertension (1.69%), eventration of diaphragm (1.69%) followed by pneumoperitoneum (0.84%). One should remember post natal respiratory distress is an indication for chest roentgenogram which should be taken as early as possible.

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