Chest Radiographic Finding in Neonatal Dyspnea

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Abstract

Background: Respiratory distress is one of the commonest disorders within the firs 48 - 72 hours of live and any sign of postnatal respiratory distress is an indication for roentgenogram of the chest.

Objectives: Is to show the range of chest radiographic findings in full term newborn babies suffering from respiratory distress, at or soon after birth.

Method: This is a prospective study that was conducted in the special care baby units in Baghdad teaching hospital and Children welfare teaching hospital during 2002. Anteroposterior chest radiograph in supine position of (129) full term newborn babies, presented with a chief complaint of respiratory distress were examined.

Results: The commonest cause of respiratory distress was transient tachypnea of newborn (41.8%), most of these showed hyperinflation (77%) and prominent pulmonary markings (68%) .Normal chest films seen in (16%). Pulmonary infection seen in (17.8%) of cases, with findings of bronchopneumonia (43%), and lobar consolidation affecting mostly the right upper lobe (34%). Other causes were respiratory distress syndrome (13.1%), meconium aspiration (13.1%), congenital heart disease (9.3%). Less frequent causes were pneumothorax, congenital lobar emphysema, congenital diaphragmatic hernia and pleural effusion.

Conclusion: Any sign of post– natal respiratory distress is an indication for roentgenogram of the chest which should be taken as early as possible. In addition, chest radiograph should be read by an expert radiologist.

Key words: chest radiography neonatal dyspnea

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Introduction

Respiratory distress is one of the commonest disorders encountered within the first (48 – 72) hours of life [(1)] . Disturbance of the respiration in the immediate postnatal period may have originated in utero, in the delivery room or in the nursery. A wide variety of pathological lesions may be responsible for one or more of the signs of respiratory distress or failure. Cyanosis is common and if respiratory embarrassment is severe, pallor may also be present. Its is occasionally very difficult to distinguish cardiovascular from respiratory disturbance on the basis of clinical signs alone. Any signs of postnatal respiratory distress are an indication for roentgenogram of the chest [(2).] It has a wide range of causes, some of which are life threatening. Chest radiograph is considered the most reliable diagnostic tool to study the respiratory distress in newborn [(3).]

Chest radiographic findings of some of the major causes of neonatal respiratory distress are [(4, 5)] :

Transient Tachypnea of Newborn

Chest radiographs will show prominent pulmonary interstitial marking, fluid in the interlobar fissure and interpleural space, and slight over inflation. In severe cases alveolar edema or a reticular granular appearance similar to that of respiratory distress syndrome of the newborn with the only difference being that pulmonary aeration is normal to slightly increased.

Respiratory Distress Syndrome

Chest radiograph will usually be abnormal at 6 hours. There is normal to decreased aeration, fine reticular shadowing throughout both lungs with accentuation of the air brochogram. As the condition progresses the reticuloglandular shadowing becomes more confluent and there is progressive loss of clarity of the diaphragm and cardiac contours.

Meconium Aspiration Syndrome:

Chest radiograph shows patchy areas of collapse and consolidation with areas of hyperinflation. Pneumothorax and pneumomediastinum are frequent complications.

Neonatal Pulmonary Infection:

The spectrum of chest radiographic finding includes streaky shadows resembling transient tachypnea of newborn, perihilar and patchy pulmonary opacities resembling aspiration and homogenous opacification resembling respiratory distress syndrome.

Congenital Diaphragmatic Hernia

Postnatal radiograph shows opaque hemithorax with deviation of the mediastinum away from the lesion. With time radiolucincies will be seen in the affected hemi thorax.

Congenital Lobar Emphysema

Immediately after birth the affected lobe may be opaque but will gradually become hyper-lucent due to reduced pulmonary vascularity. There will be gross over inflation with compression of the remaining lobes of the lungs and mediastinal shift.

Methods

This prospective study was conducted in the special care baby unit in Baghdad teaching hospital and Children welfare teaching hospital during 2002.

Anteroposterior chest radiograph in supine position of (129) (72 females, 57 males) full term neonates were examined (premature babies were excluded). These newborns were admitted with a chief complaint of respiratory distress. Additional radiograph were taken on request (lateral and erect). Chest X – rays were taken by a portable X – ray machine using (100 cm) focus field distance, (45 – 50 kVp) and (4 – 5 mAs).

Final diagnosis was based on clinical, radiological and laboratory findings.

Results:

The commonest cause of respiratory distress was transient tachypnea of newborn (41.8%). Other causes include neonatal pulmonary infection (17.8%), respiratory distress syndrome and meconium aspiration syndrome (13.1%) for each. Congenital heart diseases constitute(9.3%).**Table I.**

In patients with transient tachypnea of newborn, the observed radiographic abnormalities were hyperinflation and prominent pulmonary interstitial markings (77% and 68% respectively). Nine chest radiographs were normal (16.6%). Eight radiographs showed only hyperinflation and only prominent markings in additional three (14.8 % and 5.5% respectively). In four patients (7.4%), prominent transverse fissure was seen, all in combination with other findings **(Table-2)**.

In the 23 patients with pulmonary infections, the commonest radiographic findings were bronchopneumonia and right upper lobe consolidation (43% and 34% respectively). The other five patients showed consolidation in the right lower lobe in three 3 patients (13%) and left upper lobe consolidation in two of them (8.6%) **(Table-3)**.

Respiratory distress syndrome was the final diagnosis in (17) patients (13%). Reticuloglandular shadowing were the only findings in nine patients (53%), in another three this was associated with areas of consolidation (17.6%). Four patients (23.5%) had ground glass appearance with air brochogram. In two patients (11.8 %) an associated pneumothorax was seen, and only one patient (5.9%) had a normal chest radiograph.

In another 17 patients (13.1%) meconium aspiration was the final diagnosis. The main radiographic findings were bilateral patchy consolidation with reticular shadowing in 14 patients (82.3%). Two radiographs showed prominent pulmonary markings (11.7%) and one chest X – ray film was normal (5.8%). Only one patient showed pneumothorax (5.8%).

Twelve patients (9.3%) had congenital heart disease. Definite cardiomegaly was seen in two patients (16.6 %), one of them had right sided pleural effusion. Two patients (16.6 %) had radiographic findings similar to transient tachypnea of newborn. The remaining five patients had normal chest radiographs (41.6 %).

Pneumothorax was the only abnormality in two patients (1.5 %). Two patients (1.5%) showed congenital lobar emphysema, both affecting left upper lobe. Congenital diaphragmatic hernia was seen in one patient (0.7%) and pleural effusion was the sole abnormality in another patient (0.7%).

Table (1)

Causes of Respiratory Distress in Studied Patient

Diagnosis	*No.*	*%*
Transient tachypnea of newborn	54	41.8
Neonatal pulmonary infection	23	17.8
Respiratory distress syndrome	17	13.1
Meconium aspiration	17	13.1
Congenital heart disease	12	9.3
Pneumothorax	2	1.5
Congenital lobar emphysema	2	1.5
Congenital diaphragmatic hernia	1	0.7
Pleural effusion	1	0.7
Total	129	100%

(Table-2)
Radiographic Findings In Transient Tachypnea of Newborn No. o Patients (54)

Radiographic finding	Only Finding no.	%	In Combination no.	%
Hyperinflation	8	40	42	50.6	77
Prominent pulmonary markings	3	15	37	44.5	68
Prominent interlobar fissure	-		4	4.8	7
Normal	9	45	-		16
Total	20				100 %

(Table -3)
Radiographic Findings in Pulmonary Infection No. of Patients (23)

Radiographic finding	No.	%
Bronchopneumonia	10	43.5
Right upper lobe consolidation	8	34.7
Right lower lobe consolidation	3	13
Left upper lobe consolidation	2	8.6
Total	23	

Discussion

In the present study the commonest cause of respiratory distress in full term newly born babies were transient tachypnea of newborn which constituted (41.8%), followed by neonatal pulmonary infection (17.8%), respiratory distress syndrome and neonatal pulmonary infection (13.1 % for each). In a prospective study of 2824 consecutive deliveries to determine the frequency of respiratory disorders of all types, respiratory distress syndrome was the commonest cause followed by transient tachypnea of newborn, meconium aspiration and pneumonia [6] . In one study in India the leading cause of neonatal respiratory distress was transient tachypnea followed by infections, meconium aspiration and hyaline membrane disease [7] . On the other hand Mathur *et al*. [1], found that pneumonia was the commonest cause of respiratory distress in neonates. Although the commonest causes of respiratory distress in the different studies are similar, yet their arrangement is different and this may reflect the difference in the size of the sample, the age of the newborn included and the ethnic group. The relatively high incidence of respiratory distress syndrome in the present study which deals with full term newborn may be due to the incorrect estimation of the gestational age or more probably because the center of the study is a referral one for babies of high risk pregnancies.

Chest radiographic finding in patients with transient tachypnea of newborn in this study showed that hyperinflation and prominent pulmonary markings were the most common and seen in most patients (77% and 68% respectively). These were associated with prominent interlobar fissure in four patients only. Chest X–ray films were normal in 16%. Agrawal *et al*. [6], found that many newborn with transient tachypnea had clear chest films and that the concept of transient tachypnea of newborn should be expanded to include cases with normal chest films. Marini *et al*. [3] in 1997, found only reticulonodular shadowing in chest radiograph of patients with transient tachypnea of newborn. No nodularity was seen in the present study and no explanation could be found.

The commonest radiographic appearances seen in cases of pulmonary infection in the present study were bronchopneumonia and right upper lobe consolidation. 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]. In the present study the diagnosis of pulmonary infection depends on radiological and clinical findings and none of patients diagnosed as such had normal chest films. On the other hand Faridi *et al*. [8] in 1992, observed chest radiographic abnormalities in (42.8%) of patients with neonatal septicemia

even in the absence of respiratory distress. Haney *et al*. [9] in 1984, found a pattern of radiographic abnormalities consistent with transient tachypnea of newborn in (17%) of cases and a second pattern resembling hyaline membrane disease found in 13%.

Respiratory distress syndrome was seen in (13.1%) of cases. Chest radiographs showed a reticuloglandular appearance as the commonest abnormality and it was the only one seen in 9 patients (52 %). 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*. [3], found that (10 of 62) patients with hyaline membrane disease had negative chest radiograph, 26 had fine granular opacities and [16] had marked hypo expansion with reticulonodular opacities. While finely granular evenly distributed structures combined with signs of hypoventilation are the chest x – ray finding in hyaline membrane disease seen by Ponhold [10] in 1982. The difference in chest radiographic findings could be due to that patients selected in the present study were full term while respiratory distress syndrome is commoner in the premature. Also and probably an important factor is the absence of regular follow up radiographs so that sequential changes and complications were less frequently detected.

The most common chest radiographic finding in cases of meconium aspiration syndrome was patchy consolidation with reticular shadowing. A similar finding was seen in 2 previous studies Chen et al. [11] in 1990, and Yeh *et al*. [12] in 1979, although in both, other findings such as hyperinflation, pleural effusion and air leak, were also common .The high number of consolidation seen in this study may be explained by the possible occurrence of infection .

Cardiac problems in 12 patients were suspected by auscultation and diagnosed by echocardiographic studies. Only two of them showed definite cardiomegaly. Patent ductus arteriosus seen in three patients. Slovis and Shankaran [13] in 1980, found (3 of 19) patients with respiratory distress syndrome had patent ductus arteriosus and that the radiographic criterion of patent ductus arteriosus was the appearance in sequential anteroposterior chest films of pulmonary plethora. In asymptomatic newborns with cardiac murmur, chest radiograph appeared not to influence patient management Oeppen *et al.* [14] 2002.

Pneumothorax was seen in two patients without any evidence of other pulmonary lesions, in one there is history of difficult labor with excessive tracheal suction. Two patients with respiratory distress syndrome and one with meconium aspiration syndrome had a radiographic evidence of pneumothorax. In three patients pneumothorax was diagnosed by junior radiologist, careful examination of the chest x - ray films revealed a skin crease markings rather than pneumothorax, a common problem in neonates.

Congenital lobar emphysema was seen in 2 patients, both affecting left upper lobe, the appearance was characteristic. In 2 studies all cases can be seen on chest radiographs Mhiri *et al*. [15] in 2003 and Ozcelik et al. [16] in 2003.

Congenital diaphragmatic hernia was seen in one patient, [16] hours old, who was in severe respiratory distress and operation performed in the second day . It was left sided (Bochdaleck type) .Congenital diaphragmatic hernia of foramen of Bochdaleck is left sided in 85% of cases Wilson and Eugene [17] 1997. . In this case the diagnosis depends on the clinical and plain chest film, no contrast study of the gastrointestinal tract performed. Nusmeier *et al*. [18] in 2000, discuss a case of a 2-day old girl who underwent laparotomy due to misinterpretation of the radiological investigation that suggest congenital diaphragmatic hernia which was not the case and the final diagnosis was very rare congenital pulmonary vascular anomaly.

Conclusion

Chest radiography is essential in neonates with acute respiratory distress to exclude structural abnormalities such as congenital diaphragmatic hernia or congenital lobar emphysema. One should remember that any sign of post–natal respiratory distress is an indication for roentgenogram of the chest which should be taken as early as possible. Finally chest radiograph should be read by an expert radiologist.

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