

Intrapleural Tension Syndrome in the Neonate

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Summary

The causes of raised intrapleural tension in the neonate are discussed and reference is made to 10 children treated for this condition in 1984-1985. There were 10,000 live births at St. Luke's Hospital during this time with an early neonatal death rate of 8.9 per 1,000. There were 7 babies who succumbed to raised intrapleural tension.

Introduction

Respiratory distress in the new born is a common clinical emergency and accounts for an appreciable morbidity and mortality. Most of these neonates will be found to be suffering from hyaline membrane disease, congenital heart disease or respiratory depression from drugs given to the mother. A few will have an anatomical anomaly in the respiratory tract such as posterior choanal atresia, micrognothia and tracheo-oesophageal fistula. There is also a group of disorders that causes a change in intrapleural tension with mediastinal shift and requires urgent surgical correction.

The mediastinum in the neonate is more mobile than in the adult. It is readily displaced by an expanding intrapleural lesion resulting in bilateral lung compression and impairment of venous return to the heart. An immediate assessment of the baby's condition is obtained by Apgar's score. Most infants should score over 6 by one minute, and 8 by three minutes of life. Bradycardia (less than 100) indicates severe hypoxia.

Table 1: Causes of increased intrapleural tension in the newborn

1. Diaphragmatic Hernia
2. Spontaneous Pneumothorax
3. Obstructive Lobar Emphysema
4. Pleural Effusions and Chylothorax
5. Adenomatoid Hamartoma of the lung
6. Cysts of Mediastinum.

Diagnosis

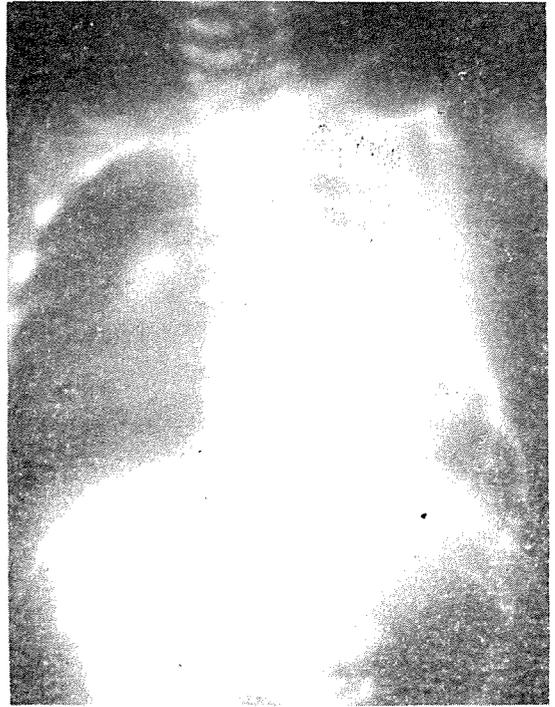
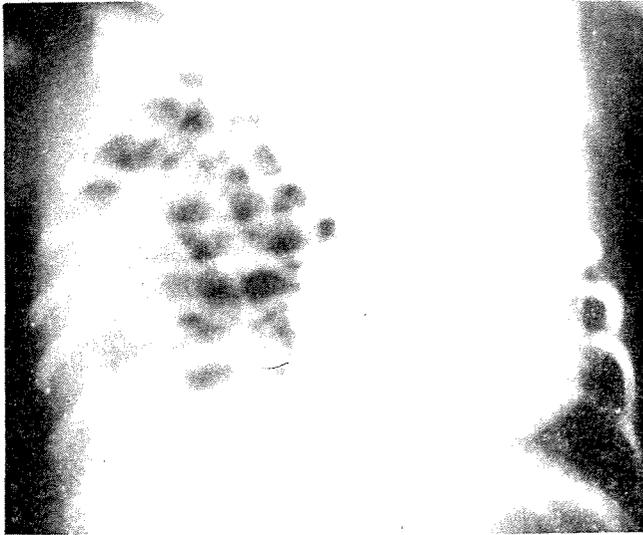
Neonates with respiratory distress are assessed by the paediatrician and immediately transferred to the Special Care Baby Unit in the mother and child complex at St. Luke's Hospital. There is therefore no delay in instituting emergency treatment including intubation and IPPR. The paediatric x-ray machine in the unit has proved extremely helpful to diagnose intrapleural tension. It is a policy of the unit to include the baby's abdomen as well as the chest in the x-ray films as this will give a clue to the presence of gut displacement or other anomalies. Ten babies were found to have respiratory distress due to increased intrapleural tension over the past two years.

Table 2: Technique of Apgar Scoring

SIGN	0	1	2
Heart Rate	Absent	Slow (below 100)	Over 100
Respiratory Effort	Absent	Slow; Irregular	Good, Crying
Muscle Tone	Limp	Some flexion of Extremities	Active Motion
Reflex Irritability	No response	Grimace	Cough, Sneeze
Colour	Blue; Pale	Body Pink Extremities Blue	Completely Pink

DIAPHRAGMATIC HERNIA is the commonest cause of the tension syndrome. The defect is usually in the dome of the diaphragm posteriorly and 80% are left sided. The baby presents with cyanosis and dyspnoea. There is apparent dextrocardia, bowel sounds may be heard in the chest and radiography confirms the presence of bowel shadows in the chest. Neonates with diaphragmatic hernia can deteriorate quickly; a bout of crying distends the bowel and causes acute anoxia. Urgent intubation is necessary and the defect is then repaired through an abdominal approach. The lung on the same side as the hernia is usually collapsed and often hypoplastic. Attempts to inflate it may result in damage to the other lung as the pressure needed to achieve this is high.

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Pneumothorax and severe respiratory acidosis are common after surgery and contribute to the high mortality of this condition. The 3 neonates with a left diaphragmatic hernia all had severe pulmonary hypoplasia and died of respiratory failure although repair in all cases was relatively easy. The child with the defect in the right diaphragm was found to have most of the liver and colon in the right hemithorax. It proved technically impossible to reduce these organs into the abdominal cavity, and repair the defect through a transverse abdominal approach. Repair through a right thoracotomy using Marlex mesh would have been more appropriate in this case. The neonate with eventration of the diaphragm survived and was subsequently found to be suffering from the Dandy-Walker Syndrome.



PNEUMOTHORAX may result from high pressure insufflation during neonatal resuscitation. It may also arise as a later complication of the other primary causes of tension syndrome. The diagnosis is readily made on chest radiography and prompt intercostal drainage to an underwater seal resulted in quick relief of respiratory distress in both the neonates treated for this condition. One of them also had cerebral birth trauma and died three days later.

OBSTRUCTIVE LOBAR EMPHYSEMA is caused by a defect in the proximal bronchial cartilages causing a valvular obstruction allowing air to be sucked into the alveoli during inspiration but not out during expiration. The condition presents later than the other causes of respiratory distress and may be mistaken for a lung cyst on chest radiography. Thoracotomy and resection of the effected lobes cured the only child seen with this condition in the unit.

PLEURAL EFFUSION AND CHYLOTHORAX. Haemothorax develops soon after delivery as a result of birth trauma. Empyema may complicate staphylococcal or streptococcal pneumonia which produces a characteristic radiographic picture of multiple cysts interspersed throughout the area of pulmonary consolidation. These cysts result from trapping of air in the interstitial tissues of the lung and may form a giant pneumatocele or rupture to cause a tension pyopneumothorax. The neonate with congenital streptococcal empyema in this series was born to a diabetic mother and showed respiratory distress soon after birth. Intercostal drainage to an underwater seal resulted in immediate reinflation of the lung but the child suc-

cumbed to acute meningitis and septicaemia on the 7th day despite treatment with ampicillin and gentamicin.'

Chylothorax may result from chest trauma during delivery or represent a congenital malformation of the mediastinal lymphatics. The fluid is initially clear but assumes an opaque appearance with fat droplets in it once the baby is milk fed.

ADENOMATOID HAMARTOMA of the lung arises from the epithelial elements of the developing lung and may grow into a large, whitish, lobulated mass which presents with the features of raised intrapleural tension soon after birth. There have been no reports of children born with adenomatoid hamartoma of the lung at St. Luke's Hospital.

MEDIASTINAL CYSTS are also a potent source of respiratory distress. They include teratoma and duplication cysts of bronchial or oesophageal origin. We have not seen neonates with increased intrapleural tension due to mediastinal cysts although we have experience of the condition presenting in later childhood with dyspnoea and recurrent chest infections.

Table 3 Neonates treated for increased Intrapleural tension at SLH 1984/85

Sex and Age at Diagnosis	Diagnosis	Operative Findings	Outcome
1. Female - 2 hours	(L) Diaphragmatic Hernia	Large Posterior Defect	Died 6hrs post-op
2. Male - 14 hours	(L) Diaphragmatic Hernia	(L) Pulmonary Hypoplasia	Died 10hrs post-op
3. Female - 24 hours	(L) Diaphragmatic Hernia	Volvulus Neonatorum	Died few hours post-op
4. Male - 36 hours	Eventration (L) Diaphragm	Complete Pleuroperitoneal layers with Muscle Deficiency	Alive - Dandy - Walker Syndrome
5. Male - 8 hours	(R) Diaphragmatic Hernia	Liver Displaced in (R) Thorax Malrotation of Bowel	Died 2 hrs post-op
6. Male - 12 hours	(L) Diaphragmatic Hernia and (R) Pneumothorax		Died at Birth
7. Male - 5 days	(L) Pneumothorax	(Intercostal drain with underwater seal)	Alive and well
8. Female - 2 hours	(R) Pneumothorax and (L) Basal Pneumothorax	(Intercostal drain with underwater seal)	Died after 3½ days
9. Female - 3 months	(R) Neonatal Lobar Emphysema	Grossly Emphematous upper and Middle Lobes	Alive and well
10. Female - 2 hours	Streptococcal Empyema	Purulent Aspirate	Died of Septicaemia after 7 days