

Transient tachypnoea of the newborn (TTN) requiring mechanical ventilation - case report & review of literature.

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Introduction

Transient tachypnea of the newborn (TTN) is usually a benign and self-limited disease of the newborns and the prognosis is generally excellent¹. It is believed to be resulting from incomplete resorption of fluid from the lungs of the newborn. Infants present with respiratory distress, requiring oxygen supplement for 2-3 days. However some infants with severe symptoms and hypoxaemia may need prolonged oxygen supplement and sometimes mechanical ventilation. Here we present a borderline preterm baby with TTN, who required mechanical ventilation.

Case summary

A male newborn baby weighing 2.62 kg was born to a 35 years old mother by caesarean section at 35+4 weeks gestation because of oligohydramnios at Apollo Hospitals, Dhaka. APGAR score was 5 at 1 min & 9 at 5 min. The baby developed tachypnoea soon after birth and was shifted to the Neonatal Intensive Care Unit (NICU). Baby was kept under warmer requiring hood oxygen 2 liters/min. Physical examination on admission revealed: heart rate 156 beats/min, well perfused, respiratory rate 75/min and breath sounds were normal. No chest retractions were noted. Blood pressure (BP) 64/44mmHg. Rest of the systemic examination was normal. The chest radiograph showed well expanded lungs, fluid in the horizontal fissure and increased pulmonary vascularity. On the basis of clinical examinations and chest x-ray the baby was diagnosed as Transient Tachypnoea of Newborn (TTN). At 24 hours of age, oxygen requirement increased to 4 l/min; Arterial blood gas at this time revealed: pH 7.3, PaCO₂ 19.6 mmHg and PaO₂ of 26.7 mmHg, HCO₃ 9.7, base excess of -14.2. Metabolic acidosis was corrected by Sodium bi carbonate. In the next 12 hours, the oxygen requirement gradually increased to 10 liters/min and respiratory rate increased to 116/min. Blood counts were normal and hematocrit was 62%; CRP <0.6mg/dl. Mean BP dropped to 32 mmHg and required dopamine to maintain BP. As even with 10L/min hood oxygen, saturation was not maintained, baby was intubated and ventilated at 41 hours. Initial ventilator settings were PIP 15, PEEP 5, respiratory rate 35/min, FiO₂ 90%. In the next 24 hours, FiO₂ requirement dropped to 40%. Echocardiography revealed a structurally normal heart and evidence of moderate pulmonary hypertension with tricuspid regurgitation. On day 3, serum electrolytes were Na- 143, K- 3.7, Cl- 109, HCO₃- 25, and urea 14mg/dl, creatinine 0.49 mg/dl. Baby was extubated after 72 hours and kept on hood oxygen for another day. On day 6, baby was on breast feed and discharged on day 9 of life.

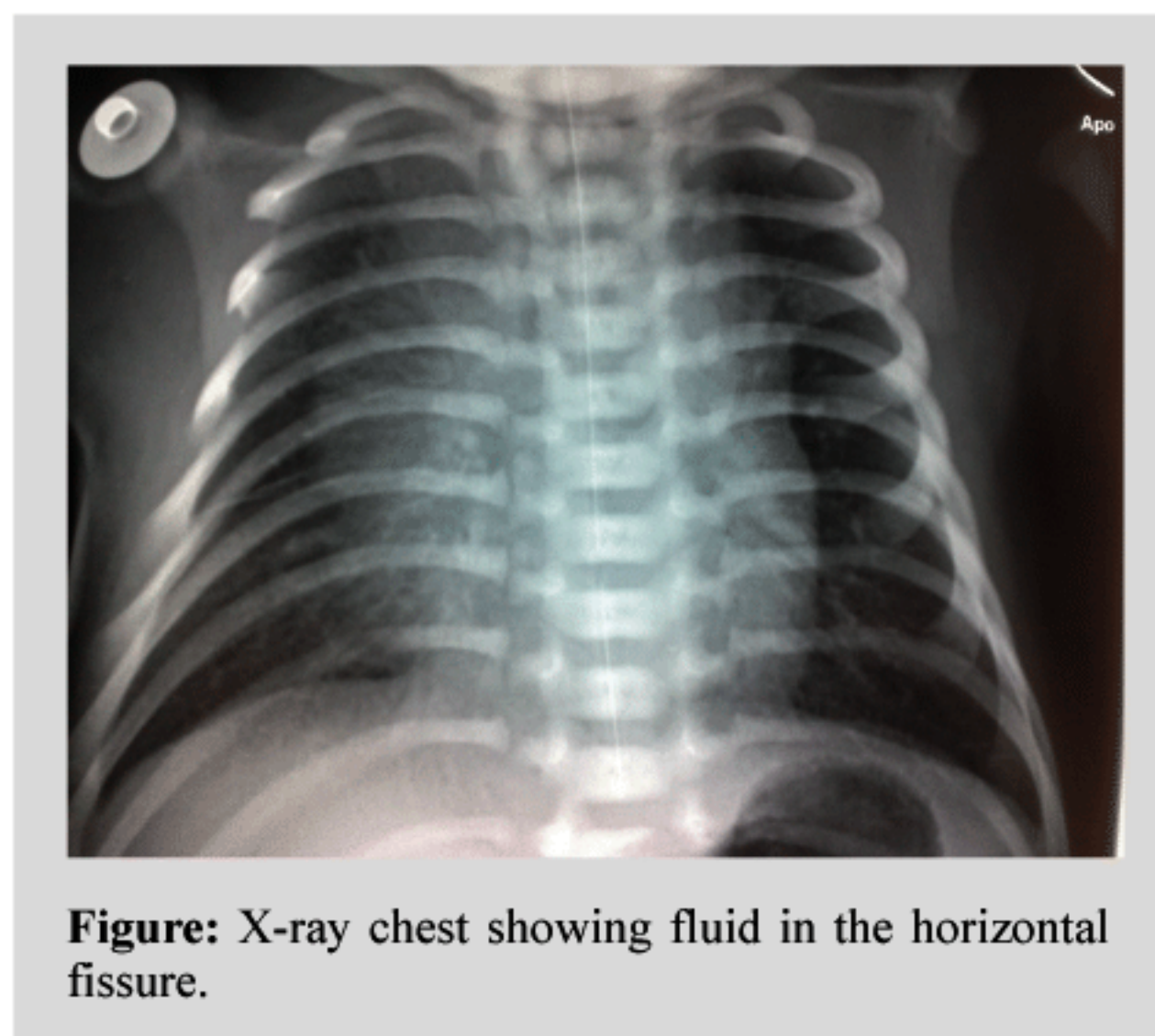


Figure: X-ray chest showing fluid in the horizontal fissure.

Discussion & review of literature

TTN was first described by Avery et al in 1966 and the cause is believed to be delayed resorption of lung fluid¹. It occurs in 3.6 to 5.7 per 1,000 term infants². Retention of fetal lung fluid may be more common in preterm infants (up to 10 per 1,000 births), but there usually are coexisting problems such as respiratory distress syndrome (RDS) that may mask its presentation³. TTN is one of the most common causes of neonatal respiratory distress⁴. Risk factors for TTN include birth by caesarean section with or without labor, male sex, family history of asthma (especially in mother)⁵, lower gestational age, macrosomia, and maternal diabetes. Tachypnoea and grunting can be common immediately after birth and is considered part of transition. Among a cohort of 466 newborns, 17.4% had grunting respirations at birth, but the grunting subsided in most by 2 hours of age (68% stopped within 30 minutes, 85% by 1 hour, and 93% by 2 hours)⁶. If grunting and other signs of distress persist, the baby may require further assessment and intervention.

The diagnosis of TTN is based on clinical and radiologic findings and is by exclusion of other known causes of respiratory distress such as hyaline membrane disease (HMD), pneumonia, aspiration, pneumothorax etc. TTN usually presents within a few hours of birth with tachypnoea, retractions, and grunting and occasionally with a requirement for supplemental oxygen. Respiratory rates are more than 60 breaths/min, often in the range of 80 to 100 breaths / min, and sometimes higher. Chest

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radiographs show mild cardiomegaly, increased vascular markings, fluid in the horizontal fissure and over-inflation of the lungs⁷. In most cases, the clinical condition is benign with infants requiring <40% oxygen for 2-3 days^{1,7}. However some infants with TTN have been reported with severe symptoms and profound hypoxaemia resulting in the need for mechanical ventilation⁸. Halliday HL et al⁹ suggested two distinct types of TTN, a mild or classical type resulting from mild left ventricular failure and a severe type associated with generalized myocardial failure, pulmonary hypertension and right to left shunting. They studied 6 infants of TTN with much more severe clinical course. These infants had clinical and radiographic signs of TTN and they required much more oxygen (>60%), and 3 of them required mechanical ventilation. The duration of treatment with oxygen was much greater (98 hours). Kasap B et al¹⁰ in a recent retrospective review of 95 newborns who had TTN, compared clinical and laboratory findings between two subsets: babies in whom tachypnea lasted fewer than 72 hours and those in whom it lasted more than 72 hours. The authors suggested that a peak respiratory rate of more than 90 breaths/min at 36 hours of age was highly predictive of prolonged tachypnoea. Prolonged TTN was associated with lower white blood cell count and hematocrit values, longer hospitalization, and antibiotic treatment in this study.

In our case, respiratory rate was 116/min at 36 hours of age and tachypnoea persisted for prolonged time requiring oxygen supplementation for 5 days and mechanical ventilation because of hypoxemia. The Echocardiography of our case also showed moderate pulmonary hypertension. The white cell count was normal and although blood culture had no microbial growth, baby was empirically covered with antibiotics. Our baby required 9 days of hospital stay for complete recovery.

Wiswell TE¹¹ evaluated effect of furosemide on 50 infants having TTN in a controlled, prospective, randomized trial. The furosemide group was given 2 mg/kg orally at the time of diagnosis, the control babies received a placebo. No significant difference in the duration of tachypnoea or in the length of hospitalization was observed with furosemide therapy.

TTN is a retrospective diagnosis, excluding other known causes of respiratory distress. Echocardiography may be used to evaluate infants with respiratory disorders and to exclude congenital heart disease¹². Infants with severe TTN should be cared for in neonatal intensive care units where close monitoring and mechanical ventilation are available.

References:

1. Avery ME, Gatewood OB, Brumley G. Transient tachypnoea of newborn. Possible delayed resorption of fluid at birth. *Am J Dis Child.* 1966;111:380-5.
2. Field DJ, Milner AD, Hopkin IE. Changing patterns in neonatal respiratory diseases. *Pediatr Pulmonol.* 1987;3: 231-235 .
3. Dani C, Reali MF, Bertini G. Risk factors for the development of respiratory distress syndrome and transient tachypnoea in newborn infants. *Eur Resp J.* 1999;14:155-159.
4. Hjalmarson O. Epidemiology and classification of acute neonatal respiratory disorders - a prospective study. *Acta Paediatr Scand.* 1981;70:773-783.
5. Greenough A. Transient tachypnoea of newborn. In: Chernick V, Boat TF, Wilmott RW, Bush A, editors. *Kendig's disorders of the respiratory tract in children.* Philadelphia: Saunders Elsevier; 2006. p. 325-326.
6. Yost GC, Young PC, Buchi KF. Significance of grunting respirations in infants admitted to a well-baby nursery. *Arch Pediatr Adol Med.* 2001;155:372-375.
7. Wesenberg RL, Graven SN, McCabe EB. Radiological findings in wet-lung disease. *Radiology.* 1971;98:69-74.
8. Tudehope DI, Smyth MH. Is 'transient tachypnoea of newborn' always a benign disease? Report of 6 babies requiring mechanical ventilation. *Aust Paediatr J.* 1979;15:160-5.
9. Halliday HL, McClure BG, McC RM. Transient tachypnoea of newborn: two distinct clinical entities? *Arch of Disease in childhood.* 1981;56:322-25.
10. Kasap B, Duman N, Ozer E. Transient tachypnea of the newborn: predictive factor for prolonged tachypnea. *Pediatr Int.* 2008;50:81-84.
11. Wiswell TE, Rawlings JS, Smith FR. Effect of furosemide on the clinical course of transient tachypnoea of the newborn. *Pediatrics.* 1985;75:908-910.
12. Halliday HL. Measurement of ventricular systolic time intervals in the normal and ill newborn by M -mode echocardiography. In: Rolfe P, editor. *Fetal and neonatal physiological measurements.* London: Pitman Medical and Biological Engineering Society 1980. p. 70-89.