of the mother influences the HC of the child at birth. The trend of increasing HC with increasing height and weight of mothers indicates that the maternal nutritional status is important for brain growth of the neonate.

Acknowledgement

The authors thank the Director and Superintendent of the Hospital for Women and Children, Madras, for permission to conduct the study. The Project was supported by the Indian Council of Medical Research, New Delhi.

REFERENCES

1. Cooke RW, Lucas A, Yudhirt PL, Pryse-Davies J. Head circumference as an evidence of brain weight in the fetus and newborn. Early Hum Dev 1977, 1: 145-149.
2. Sankaran K, Walton L, Tymchak Z, *et al.* Cranial volume and occipito-frontal circumference in neonates. Pediatr Res 1983, 17: 949-951.
3. Evans HE, Glass L. Prematurity, postmaturity and intra-uterine growth retardation. *In:* Perinatal Medicine. Eds Evans HE, Glass L. Harper and Row (Publishers), 1976, pp 64-78.
4. Bhatia BD, Tyagi NC, Sur AM. Nutritional indicators during pregnancy. Indian Pediatr 1988, 25: 952-958.
5. Bhat GJ, Mukelabai K, Shastri GN, Tavina C. Anthropometric parameters of Zambian infants at birth. J Trop Pediatr 1989, 35: 100-104.
6. Serenius F, Edressee AW, Swailem AR. Size at birth of infants in a Saudi Maternity hospital. Acta Pediatr Scand (Suppl) 1988, 346: 44-56.
7. Bhatia BD, Tyagi NK. Birth weight: relationship with other fetal anthropometric parameters. Indian Pediatr 1984, 21: 833-838.
8. Parekh VC, Pherwani A, Udani PM, Mukherjee S. Brain weight and head circumference in fetus, infant and children of different nutritional and socio-economic groups. Indian Pediatr 1970, 7: 347-358.

Fracture and Aspiration of Tracheostomy Tube: A Rare Complication

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Tracheostomy has found wide clinical application during the last 4-5 decades. Prolonged tracheostomy requires specific care to avoid complications. Late complications like tracheal stenosis, tracheomalacia, erosion of innominate artery, *etc.* have been well described. However, fracture and aspi-

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Received for publication: September 21, 1992; Accepted: January 5, 1993

ration through tracheostomy tube has been rarely reported(1-4). Here, we report such a complication in a tracheostomized child.

Case Report

A 9-year-old male child had undergone tracheostomy 13 days after birth for respiratory distress due to multiple papilloma and since then he had been breathing through a Fuller's tracheostomy tube.

At the age of 7½ yrs the child had a bout of violent cough and chest pain during which he coughed out a broken piece of tracheostomy tube. The child was hospitalized and the tracheostomy tube which had fractured at the distal end of one of the prongs of outer tube was removed, and a new Fuller's tube was inserted.

Nearly eighteen months later, the child again had a similar bout of cough and chest pain. On removal, mother discovered that one prong of Fuller's tube was missing. The child was hospitalized. On examination, air entry was decreased in right lower zone. An *X*-ray of the chest showed a metallic foreign body in the right, lower lobe bronchus. On bronchoscopy the broken flange could be seen obstructing the lumen of the right lower lobe bronchus but it could not be dislodged. Therefore, thoractomy was done to remove the flange.

Discussion

Fracture and aspiration of tracheostomy tube has been reported in the past(1-4). The first case of fracture and inhalation of a portion of tracheostomy tube was described by Bassoe and Boe(1) in 1960.

There are various factors which seem to predispose to this accident. Tracheostomy

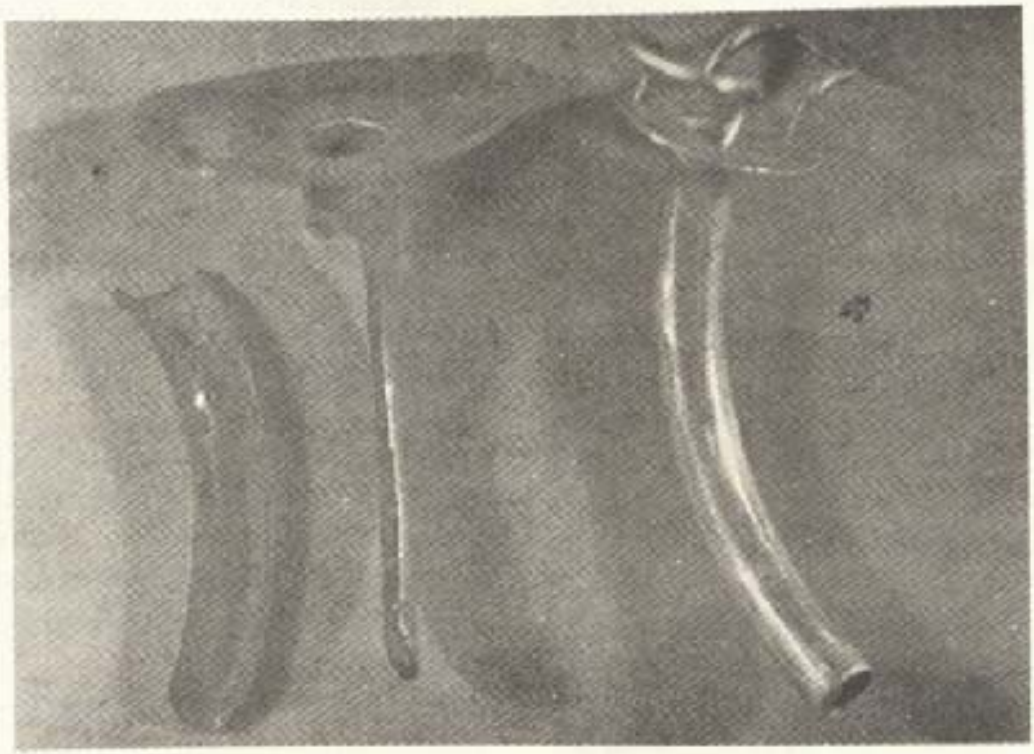

Fig. Photograph showing site of fracture of Fuller's tracheostomy tube.

tubes are made of different materials like silver and zinc alloy, PVC, copper and zinc alloy, German silver, stainless steel, *etc.* German silver is prone to "Corrosion Fatigue" which leads to cracking in the metal(1). Materials like zinc and silver alloy(5) and PVC(6) are prone to repeated boiling. In our case the Fuller's tube was made of Copper and Zinc alloy. It has been found that prolonged contact of copper with moisture from bronchial secretions and atmosphere leads to greenish brown deposits due to formation of basic carbonates known as verdigris(2).

In the majority of fractures reported the site of fracture is the junction of neck plate and the outer tube as in our case(2-6). This could be attributed to the fact that the endotracheal part of the tube and the neck plate are fused by a chemical reaction. Perhaps this makes it a weak spot prone to fracture(4). Moreover, tracheobronchial secretions tend to accumulate at the junction of neck plate and tube. This causes erosion of this junction, and hence fractures the tube(2).

Although fracture has been reported after as short period of 3 days(7) most of the fractures have occurred after prolonged use, perhaps due to aging and deterioration(8).

Various measures to prevent this rare complication are: (*i*) Endotracheal part of the tube and the neck plate should be made from one piece of corrosion resistant material; (*ii*) The patient should go home with at least two sets of tracheostomy tubes so that they can be used alternatively; (*iii*) There should be a definite limit for the use of the tube; and (*iv*) Regular follow up and careful examination of the tracheostomy tube is mandatory.

Tracheostomy is a life saving procedure in cases of airway obstruction. But in patients who have been tracheostomized for long, a broken tube can itself lead to airway obstruction. This fact should be borne in mind by every staff involved in intensive care.

REFERENCES

1. Bassoe HH, Boe J. Broken tracheostomy tube as a foreign body. Lancet 1960, 1: 1006-1007.
2. Kakar PK, Saharia PS. An unusual foreign body in the tracheobronchial tree. J Laryngol Otol 1972, 86: 1155-1157.
3. Maru YK, Puri ND, Majid A. An unusual foreign body in the tracheobronchial tree. J Laryngol Otol 1978, 92: 1045-1048.
4. Majid AA. Fractured silver tracheostomy tube: A case report and literature review. Sing Med J 1989 30: 602-604.
5. Okafor BC. Fracture of tracheostomy tubes: Pathogenesis and Prevention. J Laryngol Otol 1983, 97: 771-774.
6. Sood RK. Fractured tracheostomy tube. J Laryngol Otol 1973, 87: 1033-1034.
7. Ming CC, Ghani SA. Fractured tracheostomy tube in the tracheobronchial tree. J Laryngol Otol 1989, 103: 335-336.
8. Bowdler DA, Emery PJ. Tracheostomy tube fatigue. An unusual case of inhaled foreign body. J Laryngol Otol 1985, 99: 517-521.