

*Full Length Research Paper*

# An audit of paediatric tracheostomies in Port Harcourt Nigeria

Onotai LO<sup>1\*</sup>, Etawo US<sup>2</sup>

<sup>1</sup>FWACS, Department of Surgery University of Port Harcourt, Port Harcourt, Nigeria.

<sup>2</sup>Department of Surgery University of Port Harcourt, Port Harcourt, Nigeria.

Received July 12, 2012; Accepted July 29, 2012

**Background:** Airway management in the paediatric age group may be challenging to both the anesthetists and otolaryngologists. Clinicians usually consider tracheostomy only in circumstances where no other alternative is available because of its associated complications. **Objective:** This study was carried out to establish the pattern of paediatric tracheostomies in our setting. It will also highlight the common indications, complications and outcomes of tracheostomized paediatric patients. Lastly, it will obtain baseline data for future studies. **Patients and methods:** A retrospective case series of all paediatric patients, 5 days old to 16 years who had tracheostomies in the department of Ear, Nose and Throat (ENT) surgery of University of Port Harcourt Teaching Hospital (UPTH) and Rex Medical centre (RMC) both in Port Harcourt, Nigeria, from January 2002 to December 2011. Patient records were analyzed for demographic data, indications for tracheostomy, types of tracheostomy, operative technique, complications of tracheostomy and outcome. **Results:** A total of 152 patients had tracheostomy within the study period. There were 104 males and 48 females with M: F ratio of 2.2:1. The age range was 5 days to 16 years with a mean of 4.64 (SD ± 2.35) years. Age group 3-5 years accounted for majority (n=95, 62.50%) of the cases. Upper airway obstruction was the commonest (n=147, 96.71%) indication for tracheostomy and foreign bodies in the larynx ranked highest (n=125, 82.24%) as an etiological factor of the upper airway obstructions. The commonest post-operative complication was post-decannulation airway obstruction (n=22, 14.47%) and there was no mortality associated with the tracheostomies done in this series. **Conclusion:** Paediatric tracheostomy is an important procedure that continues to be a standard surgical technique for paediatric airway management in spite of its associated complications. Upper airway obstruction due to laryngeal foreign bodies was the commonest indication in our setting whereas; post-decannulation airway obstruction was the commonest complication in our series.

**Key words:** Tracheostomy, Airway obstruction, Complications, Laryngeal foreign bodies, Subglottic stenosis

## INTRODUCTION

Tracheostomy is defined as a deliberate surgical procedure aimed at establishing an alternative airway by creating an opening in the anterior wall of the trachea. This opening is maintained with a tube (Bradley, 1997). Other methods of airway intervention include endotracheal intubation, cricothyroidotomy and percutaneous dilatation tracheostomy (Eziyi et al., 2011). The first report of a successful tracheostomy in a

child dates back to 1766 for the removal of an inhaled foreign body (Goodall, 1934).

Generally, the common indications for tracheostomy includes bypassing upper airway obstruction, providing access for prolonged mechanical ventilation, facilitating tracheobronchial tree toileting and as a part of another operation (Daudia and Gibbin 2006; Orji and Ezeanolue, 2010, Deutsch, 2010). A greater proportion of both pediatric and adult tracheotomies in Nigeria are performed to bypass upper-airway obstruction (Eziyi et al., 2011). In our setting upper airway obstruction due to laryngeal foreign bodies has been a common

\*corresponding authors' E-mail: [onotailuckinx@yahoo.co.uk](mailto:onotailuckinx@yahoo.co.uk)

indication for paediatric tracheostomies (Onotai et al., 2012).

In many other countries particularly in the developed world a greater proportion of paediatric tracheostomies are performed to support long term mechanical ventilation (Hadfield et al., 2003).

In one series, subglottic stenosis, bilateral vocal cord paralysis, congenital airway malformations, and tumors were the most common conditions that necessitated pediatric tracheostomies (Simmá et al., 1994).

The management of tracheostomy requires particular care and expertise. It places considerable burden on both patients and parents. The younger the patient the higher the complication rate and the greater the morbidity and mortality associated with it (Dubey and Garap, 1999).

For convenience complications of tracheostomy can be divided into early, intermediate, and late.

Early complications include; acute hemorrhage which may either be primary or reactionary, pneumomediastinum, accidental decannulation, subcutaneous emphysema and tubal obstruction. Local infection at the tracheostomy site and secondary hemorrhage are examples of intermediate complication while difficult decannulation due to subglottic stenosis, peristomal granulation tissues and psychological dependence on the tube are examples of late complications.

Acute hemorrhage can be avoided when the surgeon pays specific attention to the thyroid isthmus by ligating the divided ends properly and sticks to the midline during dissection of tissues. Subcutaneous emphysema can be avoided by using a tight-fitting tube in the trachea and making sure that the wound is not closed too tightly (Primuharsa et al., 2006). In infants, the apex of the lung extends into the root of the neck.

Therefore, the surgeon must stay in the midline of the neck to prevent violation of the pleural space (McMurray and Prescott, 1999).

Furthermore, subglottic stenosis is generally caused by poor surgical technique by either inserting the tube too high or too close to the cricoid cartilage.

In some cases it may be due to impaction of foreign bodies in the larynx (Onotai et al., 2012). Tube dislodgment and blockage have been found to be the most important complications associated with mortality (Prescott, 1992).

There is paucity of information on paediatric tracheostomy in our setting coupled with the high morbidity and mortality associated with paediatric tracheostomies in Nigeria.

This study was carried out to establish the pattern of paediatric tracheostomies in Port Harcourt.

It will also highlight the common indications, complications and outcomes of tracheostomized paediatric patients.

Finally, it will obtain baseline data for future studies.

## **PATIENTS AND METHODS**

This was a descriptive retrospective study of 152 paediatric patients, age range 5 days old to 16 years who had tracheostomies in the department of Ear, Nose and Throat (ENT) surgery of University of Port Harcourt Teaching Hospital (UPTH), Port Harcourt and Rex Medical centre (RMC), Port Harcourt within the period of January 2002 and December 2011. Both hospitals serve as referral centers for otolaryngological cases.

Patient records were retrieved from the Children Emergency Ward (CHEW), ENT ward and theatre registers of UPTH and from the ward and theatre records of RMC. The data analyzed were demographic data, indications for tracheostomy, type of tracheostomy, operative technique, complications of tracheostomy and outcomes (mortality and morbidity).

## **OPERATIVE TECHNIQUE**

All tracheostomies were done under general anaesthesia using face mask, augmented with Lidocaine (1%), used along with 1:100,000 adrenaline for local infiltration of the neck. Neck incision was a vertical skin incision and an anterior wall of the tracheal was slit open between the 3<sup>rd</sup> and 4<sup>th</sup> tracheal rings in all the cases. There was no removal of a segment of the anterior wall of the trachea in the form of a window as commonly done in adult patients.

## **SIZE OF TRACHEOSTOMY TUBE**

There was appropriate selection of tracheostomy tubes for all the patients. The optimal size of the tracheostomy tube depends on the clinical indications for the procedure and the size of the airway. A general rule applied was "the tube should be three fourths of the diameter of the trachea".

## **WEANING PROCESS**

Two fundamental criteria for weaning patients with tracheostomy were used (1) the original need for the tracheostomy tube was no longer present and (2) the patient was able to maintain a safe and adequate airway independent of the tracheostomy tube. The decannulation method utilized in our series was the traditional decannulation technique which involves sequential downsizing of the tube followed by occlusion of the smaller tracheostomy tube inserted after initial assessment of the child for the absence of aspiration during feeding and the absence of suprastoma and peristoma granulation tissues by plain soft tissue neck radiograph. The patient was then observed during the

**Table 1:** Age distribution of patients n=152

Age range (Years)	Number	Percentage (%)
0- 2	35	23.03
3-5	95	62.50
6-8	10	6.58
9-11	7	4.60
12-14	3	1.97
15 and above	2	1.32

**Table 2:** Indications for tracheostomy. N=152

INDICATION	NUMBER OF CLASES	PERCENTEGE (%)
<b>Emergency (Upper airways obstruction)</b>		
Foreign bodies in the larynx	125	82.24
Foreign bodies impaction in the upper esophagus	4	2.63
Juvenile laryngeal pappilloma	4	2.63
Infection (acute epiglottitis, retropharyngeal abscess)	4	2.63
Obstructive sleep apnoea	2	1.32
Laryngomalacia/ tracheomalacia	2	1.32
Acquired subglottic stenosis from previous tracheostomy	4	2.63
Corrosive ingestion	2	1.32
<b>Elective (Anticipate difficulty intubation)</b>		
Cystic hygroma of the neck	2	1.32
Temporomandibular joint ankylosis	1	0.66
<b>Tracheo-bronchial tree toileting</b>		
Vegetable foreign body (groundnut seed) in the Tracheobronchial tree	2	1.32

day with the occluded tube and if well tolerated, the process was repeated during the night and the tube removed if no problems occur. The patient was further observed for another 48hours before considered fit for discharge from the hospital (Daudia and Gibbin, 2006).

The data was entered into the version 16 of the Statistical package for social sciences (SPSS16). Simple descriptive statistics in the form of mean, frequency distribution tables and percentages were used to illustrate data.

## RESULTS

A total of 152 patients had tracheostomy within the study period. There were 104 males and 48 females with M: F ratio of 2.2:1. The age range was 5 days to 16 years with a mean of 4.64 (SD  $\pm$  2.35). The 3 to 5 year age group accounted for the majority (n=95, 62.50%) of the cases (Table 1). Upper airway obstruction was the commonest (n=147, 96.71%) indication for tracheostomy (Table 2), with laryngeal foreign body as the most common source of this (n=125, 82.24%) (Figure 1-3).

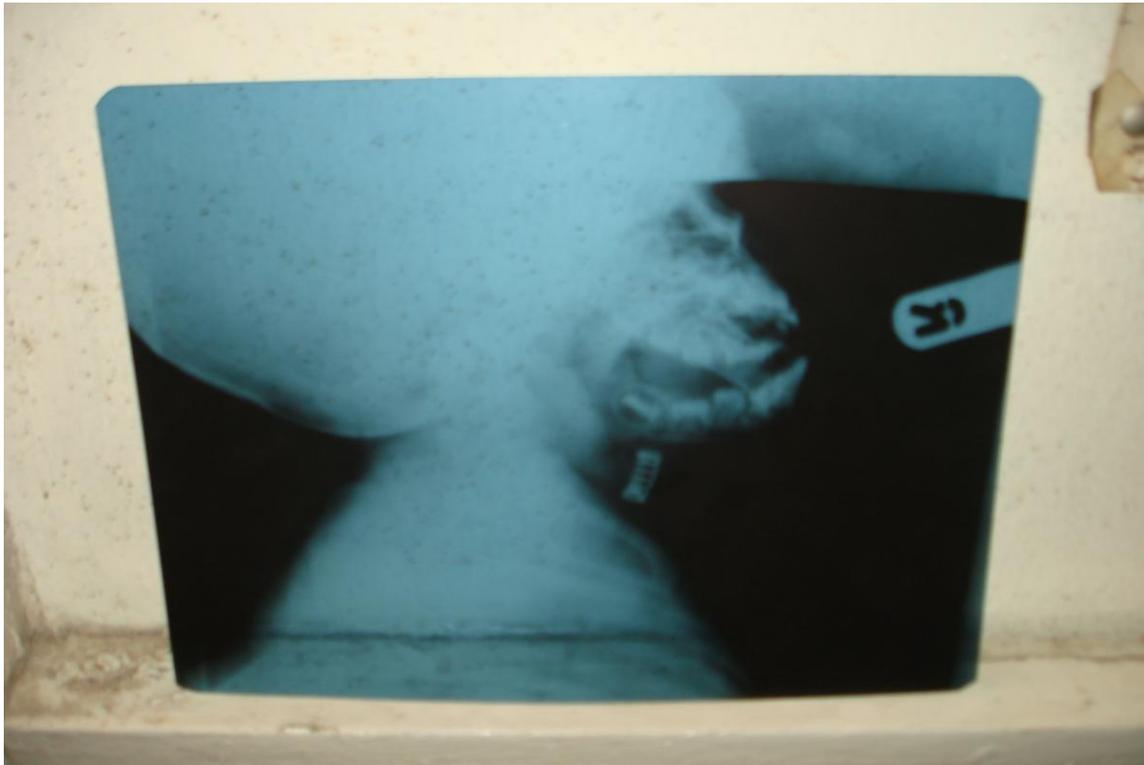
A neonate with the diagnosis of cystic hygroma had elective tracheostomy on account of anticipated difficult intubation (Figure 4 and 5). Severe respiratory distress

was the most common clinical presentation (n=140, 92.11%). Most patients had emergency tracheostomy (n=120, 90.9%). The duration of tracheostomy ranged from 7 days to 6 months. The commonest post-operative complication was post decannulation airway obstruction (n=22, 14.47%). Two patients had surgical decannulation (n=2, 1.32%). The majority of the patients (n=130, 85.53%), presented to the hospitals after 48hours and there was no mortality associated with the tracheostomies done in this series (Table 3).

## DISCUSSION

In our series, the commonest indication for paediatric tracheostomy was upper airway obstruction which was in agreement with the findings of Mukherjee (1977), Okafor (1981), Okeowo (1983) and Okoye (2000). Over the years the use of pediatric tracheostomy for airway management has evolved and the indications have changed with prolonged intubation for ventilation being the commonest indication these days (Hadfield et al., 2003). In the past, infective conditions such as acute epiglottitis and laryngotracheobronchitis were major indications for tracheostomy but the judicious use of antibiotics, endotracheal intubation and conservative management in the paediatric intensive care unit has

**Figure 1:** Lateral soft tissue radiograph of the neck showing a metallic spring in the larynx of a child



**Figure 2:** The metallic spring after extraction from the larynx of the child



reduced the incidence of these indications (Primuharsa et al., 2006; Parilla et al., 2007; Gilyoma et al., 2011).

Laryngeal foreign bodies were the commonest cause of upper airway obstruction in our series which agrees with the findings of Dubey and Garap (1999) and Eziyi

et al., (2011). However, this contradicted the findings of Ogunleye et al., (2001) and that of Adoga and Ma'an (2010) who found recurrent respiratory pappilloma to be responsible for most of the upper airway obstructions in their series.

**Figure 3:** The child who aspirated the metallic spring with tracheostomy tube insitu



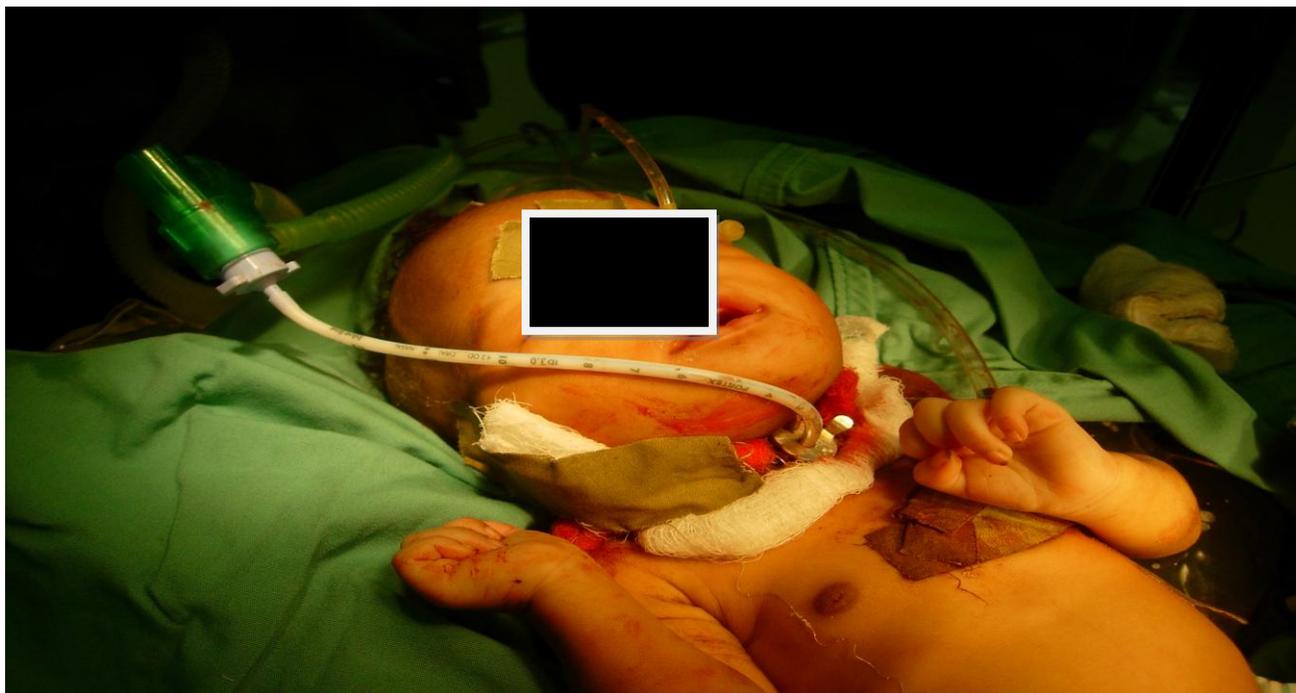
**Figure 4:** A neonate with a huge cystic mass



Furthermore, our study revealed male predominance which agrees with the study of Dubey and Garap (1999). The reason for male predominance in our series

could be attributed to the upper airway obstruction due to laryngeal foreign bodies. More males have been found to have a higher incidence of laryngeal foreign

**Figure 5:** The neonate being ventilated through a tracheostomy tube after excision of the neck mass



**Table 3: Complications of tracheostomy.** n=152

Complication	Number of cases	Percentage (%)
Tube obstruction	10	6.58
Subcutaneous emphysema	5	3.29
Difficulty in decannulation (post decannulation airway obstruction)		
a).Tracheostomy tube dependence	12	7.89
b). Laryngeal stenosis	10	6.58
None	115	75.66

bodies than their female counterparts. Besides, the male children are also more susceptible to foreign body aspiration because of their more inquisitive and exploring nature (Onotai et al., 2012).

The majority of the patients who had tracheostomy in our series were in the age group 3-5 years. This finding agrees with the earlier work of Okoye (2000), who reported that majority of children below 5 years of age had tracheostomies. However, this is at variance with other reports which stated that more tracheostomies were done for patients within the first year of life (Freezer et al., 1990; Ang et al., 2005) and in the 6-10 year age group (Adoga and Ma’an, 2010).

Emergency tracheostomy was the commonest type of tracheostomy done in our series. This could be explained by the fact that majority of our patients

presented late with acute upper airway obstruction that needed quick response. Okoye (2000), reported a similar experience and recently Onotai et al., (2012) reported the same experience. However, we are aware that majority of cases were done as elective tracheostomies in a paediatric surgical centre in the United Kingdom and their main indication was for assisted ventilation (Corbett et al., 2007).

Several complications of paediatric tracheostomies have been reported by various researchers (Prescott, 1992; Midwinter et al., 2002). Complications with rates as high as 40-46% has been reported in the past by Midwinter et al., (2002) and Fraga et al., (2009). Adoga and Ma’an (2010) reported a complication rate of 15.2% in their series. However, we found a complication rate of 30.92% which was also on the high side. The

reasons for the high complication rate encountered in our series could be as a result of late presentation of the patients to hospitals, the injury caused by the impacted foreign bodies in the larynx and probably from poor surgical technique.

Post decannulation airway obstruction was found more in the younger age group and this was mainly due to psychological dependence on the tube and subglottic stenosis. Prescott (1992) also found subglottic stenosis as a common cause of post decannulation airway obstruction. Arguably, the psychological dependence on the tracheostomy tube in our series may have been over diagnosed. However, only 2 patients had surgical decannulation. The patients with subglottic stenosis posed some management challenges to us because we lacked appropriate facilities in our centres for laryngeal frame work surgeries. We had to refer them to other hospitals for further expert management. Besides, employing a safe surgical protocol and appropriate post operative management of tracheostomized paediatric patients will definitely help to curb the morbidity rate of paediatric tracheostomies.

## CONCLUSION

Paediatric tracheostomy is a precious procedure that continues to be a standard surgical technique for paediatric airway management in spite of its associated complications. Upper airway obstruction due to laryngeal foreign bodies was the commonest indication in our setting whereas; post-decannulation airway obstruction was the commonest complication in our series.

## REFERENCES

- Adoga AA, Ma'an ND (2010). Indications and outcome of pediatric tracheostomy: results from a Nigerian tertiary hospital *BMC Surgery*. 10:2
- Ang AH, Chua DY, Pang KP, Tan HK (2005). Pediatric tracheostomies in an Asian population: the Singapore experience. *Otolaryngol Head Neck Surg*. 133 (2):246-50.
- Bradley PJ (1997). Management of obstructed airway and tracheostomy. In: Kerr AG, Hibbert J (eds). *Scott Brown's Otolaryngology*. 6th (s) Edition. London: Butterworth-Heinemann. 5: 717-8.
- Corbett HJ, Mann KS, Mitra I, Jesudason EC, Losty PD, Clarke RW (2007). Tracheostomy--a 10-year experience from a UK pediatric surgical center. *J Pediatr Surg*. 42(7):1251-4.
- Daudia A, Gibbin KP (2006) . Management of tracheostomy. *Current Paediatrics*. 16 (4): 225-9.
- Deutsch ES (2010). Tracheostomy: Pediatric Considerations. *Respiratory Care*. 55(8) 1082-90.
- Dubey SP, Garap JP (1999). Paediatric tracheostomy: an analysis of 40 cases. *J Laryngol Otol*. 113(7):645-51.
- Eziyi JA, Amusa YB, Musa IO, Adeniji AO, Olarinoye OT, Ameye SA, Adeyemo A (2011). Tracheostomy in south western Nigeria: Any change in pattern? *J. Med. Med. Sci*. Vol. 2(7): 997-02.
- Fraga JC, de Souza JC, Krue J (2009). Pediatric tracheostomy. *J Pediatr (Rio J)*. 85(2):97-03.
- Freezer NJ, Beasley SW, Robertson CF (1990). Tracheostomy. *Arch Dis Child*. 65(1):123-6.
- Gilyoma JM, Balumuka DD, Chalya PL (2011). Ten-year experiences with Tracheostomy at a University teaching hospital in Northwestern Tanzania: A retrospective review of 214 cases. *World J Emerg Surg*. 6:38.
- Goodall EW (1934). The story of tracheostomy. *Br J Child Dis*. 31:167-76.
- Hadfield PJ, Lloyd-Faulconbridge RV, Almeyda J, Albert DM, Bailey CM (2003). The changing indications for paediatric tracheostomy. *Int J Pediatr Otorhinolaryngol*. 67(1):7-10.
- McMurray JS, Prescott CAJ (1999). Tracheostomy in the pediatric patient. In: Cotton RT (ed). *Practical Pediatric Otolaryngology*. Philadelphia: Lippincott-Raven Publishers :575-94.
- Midwinter KK, Carrie S, Bull PD (2002). Pediatric tracheostomy: Sheffield experience 1979-1999. *J Laryngol Otol*. 116:532-35.
- Mukherjee DK (1977). Experience with Tracheostomy in Lagos University Teaching Hospital. *Niger. Med. J*. 7: 412-16.
- Ogunleye AOA, Nwaorgu OGB, Sogebi OA (2001). Upper Airway Obstruction in Nigeria. An aetiological profile and review of the literature. *Trop Doctor*. 31(4):195-97.
- Okafor BC (1981). Tracheostomy: A review. *Niger. Med. J*. 11:1-10.
- Okeowo PA (1983). The role of Tracheostomy in Otolaryngological practice in a developing country. *J Otolaryngol*. 1983; 12(4):231-4.
- Okoye BCC (2000). Tracheostomy in Port Harcourt. *Niger. J. Surgical Sci*. 10: 99-02.
- Onotai LO, Ibekwe MU, George IO (2012). Impacted foreign bodies in the larynx of Nigerian children *J. Med. Med. Sci*. Vol. 3(4) pp. 217-21
- Orji FT, Ezeanolue BC (2006). Update on the pattern of tracheostomies at a tertiary health institution after 27 years. *Niger. J. Otolaryngol*. Vol. 3(1) 2006: 8-15.
- Parilla C, Scarano E, Guidi ML, Galli J, Paludetti G (2007). Current trends in pediatric tracheostomies. *Int J Pediatr Otorhinolaryngol*. 71(10):1563-7.
- Prescott CA. Peristomal complications of paediatric tracheostomy (1992). *Int J Pediatr Otorhinolaryngol*. 23(2):141-9.
- Primuharsa Putra SH, Wong CY, Hazim MY, Megat Shiraz MA, Goh BS (2006). Paediatric tracheostomy in Hospital University Kebangsaan Malaysia - a changing trend. *Med. J. Malaysia*. 61(2):209-13.
- Simma B, Spehler D, Burger R, Uehlinger J, Ghelfi D, Dangel P, Hof E, Fanconi S (1994). Tracheostomy in children. *Eur J Pediatr*. 153(4):291-6.