

TRACHEOSTOMY IN CHILDREN WITH CROUP:  
A RETROSPECTIVE STUDY OF THE MORTALITY AND MORBIDITY  
AT THE HARTFORD HOSPITAL

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UPPER AND LOWER respiratory tract obstruction, particularly as seen in acute croup, is a well-recognized paediatric emergency which requires rapid mechanical relief. Until recently the most prevalent method of achieving this was through the use of a tracheostomy, the hazards of which, particularly in the young age group, are well known.

Throughout the period of this study it has been the policy of the paediatric department of the Hartford Hospital that any "croupy" child be seen by the attending paediatrician, an anaesthesiologist, and an otolaryngologist for evaluation of the need for surgical relief of respiratory distress.

This retrospective study was undertaken to evaluate the problems encountered with tracheostomies in children with the diagnosis of croup and to evaluate the "team approach" to croup, with its inherent inefficiency and possibility of delay, which are major hazards in the relief of acute respiratory distress.

MATERIALS AND METHODS

The records were examined of all patients under five years of age who were admitted to the Hartford Hospital with a diagnosis of croup during the years 1961 through 1965. There were 373 cases during the five-year period. Twenty-six (6.9%) of these children required tracheostomies.

Sixteen paediatricians referred the tracheostomy cases. They were seen by one of the staff anaesthesiologists on call and the operations were performed by five surgical consultants, three surgical residents, and one anaesthesiologist.

The Jackson tracheostomy tube was used through a transverse surgical incision. Decannulation was performed on the floor after graduated plugging demonstrated an adequate airway. Patients were almost always discharged the day following decannulation.

The ages of those patients requiring tracheostomies are indicated in Table I.

TABLE I  
AGES OF PATIENTS  
REQUIRING TRACHEOSTOMY

<1 year	3
1-2 years	6
2-3 years	5
3-4 years	7
>4 years	5
Total	26

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## RESULTS

Figures given relate to the patients who underwent tracheostomies unless stated otherwise.

*Mortality*

There were two deaths, representing 7.6 per cent of the tracheostomized patients or 0.5 per cent of the entire series. In each case the child had had a respiratory and cardiac arrest and tracheostomy was done as an emergency, in the emergency room in one case and in the ward "fog" room in the other.

*Morbidity*

Three children had complications (11.5%). Vomiting and aspiration during attempted endotracheal intubation occurred once, with a resulting minimal pneumonitis and late hoarseness which cleared spontaneously in two months. Asymptomatic subcutaneous cervical emphysema occurred once. The third complication was a small asymptomatic pneumothorax found on post-tracheostomy X-ray in a child operated on in her bed with an endotracheal tube in place. The child had had a previous tracheostomy.

Three-year follow-up has revealed no late morbidity.

*Duration of intubation*

The longest period of intubation was 14 days; the shortest (excluding the two deaths) was 3 days. The average duration was 5.8 days. No statistically valid comment can be made regarding the relationship of age to duration of intubation, but there was no difficulty with extubation in any of the children regardless of their age.

*Location of operation*

Four tracheostomies were performed as emergencies in sites other than the operating room. Two of these are represented in the mortality and one in the morbidity figures.

*Preoperative intubation*

In four children intubation was impossible to accomplish and tracheostomy was done without it. Two of these children were represented in the mortality figures and one in the morbidity figures. In the latter case it was possible to pass a bronchoscope during the tracheostomy.

## COMMENTS

In discussing nasotracheal intubation, Allen and Steven state, "If a hospital has an efficiently run respiratory unit in which babies and infants with tracheostomies are effectively managed with no incidence of pneumothorax or surgical emphysema, no crises due to dislodged tracheostomy tubes and no trouble when decannulating and closing the tracheostomy, then obviously intubation has no place."<sup>1</sup>

In Allen's article and other more recent publications,<sup>2-4</sup> it becomes obvious that there are complications inherent in nasotracheal intubation alone and tracheostomy alone, and complications common to both.

Mortality and morbidity data from the Hartford Hospital series of tracheostomies are compared in Table II with those from Allen's<sup>1</sup> and Striker's<sup>5</sup> series of nasotracheal intubations in a similar age group.

TABLE II  
COMPARATIVE DATA ON NASOTRACHEAL INTUBATION  
AND TRACHEOSTOMY

	Mortality (%)	Morbidity (%)
Hartford tracheostomy series (26 cases)	7.6*	11.5
Allen nasotracheal intubation series (43 cases)	2.3	†
Striker nasotracheal intubation series (11 cases)	9.1	61

\*Each of these deaths was associated with respiratory and cardiac arrest occurring prior to tracheostomy; they are thus not related to tracheostomy *per se* but to delay in the decision to provide relief of respiratory distress. In each instance attempts to pass an endotracheal tube failed and thus the use of nasotracheal intubation might have been impossible.

†Twenty-one of Allen's 61 cases required reintubation one or more times but were ultimately all right. He does not specify in the article whether the bulk of the 21 were in his group of 43 upper respiratory distress patients or in the group of 18 with lower respiratory distress.

Operation was performed without prior endotracheal intubation only in those cases in which an attempt was made at intubation but failed owing to technical problems. Oliver *et al.*<sup>6</sup> reported a 16 per cent incidence of pneumothorax or pneumomediastinum in 294 children when no endotracheal tube was present during the tracheostomy. This was reduced to 4.8 per cent by the use of such a tube. Allen<sup>1</sup> reported an 11 per cent mortality due to pneumothorax in 59 tracheostomies, none of which was performed under general anaesthesia with an endotracheal airway. In a subsequent series of 52 tracheostomies performed under general anaesthesia with an endotracheal airway, there were no deaths related to the operation.

The results of this survey of the mortality and morbidity from tracheostomies performed on children under five years of age for upper respiratory distress caused by croup indicate that no overall change in the current policy at the Hartford Hospital need be undertaken.

#### SUMMARY

1. Of 373 cases of croup, 6.9 per cent were operated on with a mortality of 7.6 per cent and morbidity of 11.5 per cent.
2. There is a great need for careful, constant evaluation of the child with croup and prompt operation should fatigue, irritability, and increasing pulse rate develop.

3. Endotracheal intubation should be carried out as the initial emergency step.
4. Tracheostomy should be performed in the operating room with adequate anaesthesia, assistance, exposure, and time.
5. We do not feel there is an indication at our hospital for changing to prolonged nasotracheal intubation in the treatment of upper airway respiratory distress, and we would recommend that other hospitals similar to ours evaluate their existing results prior to changing.

#### RÉSUMÉ

On rapporte une étude rétrospective d'enfants au dessous de cinq ans souffrant du croup et chez qui on a pratiqué une trachéotomie. Sept pour cent de tous les cas de croup ont du subir une trachéotomie. Chez le groupe de trachéotomisés le taux de mortalité a été de 7.6 pour cent (deux malades), mais ces deux cas avaient dû être trachéotomisés d'urgence après arrêt respiratoire et cardiaque. Onze et demi pour cent des cas ont présenté des complications mineures qui n'ont requis aucun traitement spécial.

Si nous comparons notre travail aux autres séries rapportées d'intubation nasotrachéale prolongée pour détresse respiratoire, nous croyons que nos méthodes nous ont donné d'aussi bons résultats et qu'il n'y a pas lieu de changer nos habitudes pour le moment.

Il est très important cependant de suivre de près l'enfant souffrant de croup, et d'intervenir rapidement s'il présente de la fatigue, de l'irritabilité et une accélération du pouls.

#### REFERENCES

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