PROLONGED ENDOTRACHEAL INTUBATION IN INFANTS AND CHILDREN

BY

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SUMMARY

A series of sixty-one cases of prolonged pernasal intubation in children for conditions which would otherwise need tracheostomy is presented. One serious complication, namely subglottic cicatricial stenosis of the trachea, has occurred and is discussed. There is a definite place for prolonged pernasal intubation in children under 5 years of age as an alternative to tracheostomy. The most important single element in achieving success with this technique is to choose the smallest size tube which gives a quiet (adequate) airway and reasonable access for aspiration of secretions.

The management of acute respiratory disease in infants is a problem in any hands. Tracheostomy, although frequently a lifesaving measure, nevertheless carries a high incidence of complications and a high mortality in infants and small children. Table I summarizes our experience with tracheostomy in this hospital over the 11-year period 1950–60.

Table I

<table>
<thead>
<tr>
<th>Admissions for “croup”*</th>
<th>Tracheostomy</th>
<th>Deaths</th>
<th>Overall mortality</th>
<th>Tracheostomy mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,829</td>
<td>59</td>
<td>18</td>
<td>1 %</td>
<td>30 %</td>
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</tbody>
</table>

In other words, during this period, 3 per cent of all admissions for croup* had a tracheostomy and of these cases, 1 in 3 died. Few, if any, of these operations were performed in a theatre by a trained surgeon and none had a general anaesthetic. Of these 18 deaths, 5 patients died during or very shortly after tracheostomy, 7 as a result of pneumothorax following tracheostomy, and 6 from bronchopneumonia or purulent bronchitis. In retrospect, therefore, many of these tracheostomies were carried out too late, and earlier operation might have reduced the mortality figures by about one-third. Earlier operation under endotracheal general anaesthesia might possibly have further reduced the mortality by almost another third.

In the last four years in this hospital, almost all tracheostomies have been done in an operating theatre by a trained surgeon under endotracheal general anaesthesia. The dramatic change that occurs in the patient’s condition after intubating and re-establishing a clear airway has to be experienced to be appreciated. Table II shows the figures for the next four years individually for each year.

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None of the recorded eight deaths was related in any way to the operation of tracheostomy or its complications. The decrease in numbers during 1963 and 1964 is due to the introduction of prolonged pernasal endotracheal intubation.

In principle, this is not a new technique (Gillespie, 1941; Neffson, 1949; Scholes, 1920), but even in their heyday when laryngeal diphtheria was the main indication for their use, O'Dwyer's tubes (Northrup, 1894; O'Dwyer, 1887, 1894) or modifications thereof made of silver or vulcanite were highly controversial. Nevertheless, it is clear from the literature that prolonged pernlaryngeal intubation gave acceptable results in the hands of...

* The term “croup” applies here to those conditions in which obstruction, most commonly due to oedematous narrowing of the upper respiratory tract, has occurred. It is characterized clinically by hoarseness, stridor, and occasionally a harsh metallic cough. It is a common sign in many upper respiratory infections in infants, but becomes of grave significance only when the diagnosis is one of either acute laryngotracheobronchitis or epiglottitis.
those who acquired the art of introducing the tubes atraumatically by touch. More recent attempts have been mostly unsuccessful (Sykes, 1960) although with adults isolated cases, often in unusual circumstances, proved more promising (Briggs, 1950; Foregger, 1946; Urry, 1951).

The physical properties of polyvinyl chloride—its malleability and plasticity at body temperatures, coupled with its remarkable biological inertness—make it an almost ideal material for indwelling tubes of many kinds. Using endotracheal tubes of this material, Brandstater (1962) achieved encouraging results in a small series of twelve cases, six of whom were neonates. However, only one of these twelve cases had obstructive laryngotracheitis. During the past two years, therefore, all patients in whom formerly tracheostomy would have been performed have been managed instead with an indwelling pernasal endotracheal tube made of polyvinyl chloride. The purpose of this communication is to review experience of this technique in sixty-one children.

At the point when it was decided that the airway must be secured, the child, if conscious was given an anaesthetic and intubated.

TECHNIQUE
The nature and choice of anaesthetic was decided by the anaesthetist. In most cases, a dangerous degree of upper respiratory obstruction was present. The child was restless, often in spite of previous sedation, and the pulse rate rising. An inhalational induction was the most commonly used approach in these circumstances, using either halothane in oxygen or in 50 per cent nitrous oxide and oxygen with strong assistance to inspiration in order to increase the pressure difference across the obstructed segment of the airway. There was never any need to increase the indicated halothane concentration beyond 2 per cent.

No premedication was given, but a nurse or assistant was detailed specifically to keep a finger on the pulse throughout the entire manoeuvre.

Irregularities of pulse rate, volume, or rhythm gross enough to be picked up by palpation were on no occasion a worry. It was almost always possible to abolish, and always to diminish, rib retraction and other signs of respiratory obstruction with effective and sustained intermittent positive pressure assistance to the respiration. With quiet respiratory effort temporarily re-established direct laryngoscopy was carried out. If this provoked no reaction on the part of the child, a Portex* tube of suitable size was passed through one nostril into the pharynx whence it could often be guided directly through the larynx, assisted, if necessary, with a push by means of Magill forceps. When subglottic oedema was dense the tube often entered the larynx readily, but needed quite a firm push with forceps to get it through the region of oedema. The nasal route was used in all cases. This appeared to cause less disturbance to the patient and in the case of older children ensured that they did not, accidentally or otherwise, bite on the airway.

After intubation the child was “specialled” in a steam tent. The tube was moistened every 15 minutes with normal saline or sterile distilled water and for the first 24 hours tracheobronchial suction was performed half-hourly after the preliminary installation of \( \frac{1}{2} \text{ml of 5 per cent sodium bicarbonate.} \) The tube was changed only when and if signs of obstruction occurred. This was rare, never due to kinking, and only twice due to accumulation of dried secretions at the tip of the tube. Tracheobronchial suction was carried out regularly but with decreasing frequency.

* Thin-walled Portex tubes of appropriate size were used. These are made of polyvinyl chloride, and are obtainable from Portland Plastics Ltd., 197 Knightsbridge Road, London, S.W.7.
as time progressed. Full aseptic precautions with a no-touch technique were maintained. Multiple-hole plastic oxygen catheters, with an end-opening moulded tip, as well as side holes, proved effective and relatively atraumatic suckers. A fine endobronchial suction catheter was occasionally invaluable (Bush, 1963). The size of the catheter was dictated by its efficiency in aspirating the bronchial tree. The finest catheter that resulted in a clinically clear airway was the one of choice.

The pulse and respiration rates were recorded at half-hourly intervals. Fluid balance was kept and charted for at least 24 hours. Vomiting was a not infrequent complication of an indwelling pernasal endotracheal tube. A negative fluid balance over a short period occasionally proved worrying. A sustained drop in urinary output along with other clinical signs of dehydration would have made intravenous therapy mandatory, but did not in fact occur. Antibiotics were given if and as directed by the paediatrician in charge of the case. Culture of the aspirate at the first intubation was useful in this regard. The anaesthetist accepted responsibility for maintaining the airway and supporting respiration. Co-operation and understanding were the keynotes to the management of these cases.

When, on clinical grounds, we felt the tube could be removed, we took it out, usually under general anaesthetic on about the seventh day. The voice was husky and the respiration occasionally croupy for as long as seven days afterwards. The child was left in steam always for 24 hours, and sometimes longer, according to need. If respiratory obstruction recurred, re-intubation was performed.

The clinical grounds referred to above were at first somewhat nebulous and each case was very much one of trial and error. In the latter part of the series, however, three clear-cut criteria emerged which, if all three were present, ensured with some degree of certainty an uneventful extubation. These criteria were:

(a) Temperature normal for at least 24 hours, preferably 48–72 hours.
(b) Return to normal health as indicated by the child’s alertness and interest in his toys, his surroundings, and his food.
(c) A loose-fitting tube. Evidence of this was shown by an obvious cough around the tube during aspiration. It was not a common sign, but quite characteristic when present.

On discharge, the child was given an appointment for check laryngoscopy in three months’ time.

RESULTS

Table III, and figures 1 and 2 summarize our experience with these cases. It can be seen from the wide variety of conditions for which intubation was undertaken that the only common factor in these patients was the need to secure a clear airway. Figures 1 and 2 emphasize two further facts; these are that some 80 per cent of the patients in the series were intubated for a total period of less than two weeks and that 79 per cent of them were less than 4 years old.

| Table III |
| Indication for intubation. |
| \( (A) \) ACUTE UPPER AIRWAY OBSTRUCTION | \( (B) \) THREATENED OBSTRUCTION AND RESPIRATORY INSUFFICIENCY |
| Laryngotracheobronchitis | Poisonings—barbiturates, strychnine and organic phosphate |
| Oedema of epiglottis and larynx due to inhalational burn | Unconsciousness: head injury |
| Acute epiglottitis | Unconsciousness from other causes: |
| Supraglottic submucous cyst | Meningitis, encephalitis, status epilepticus |
| Post-laryngofissure as a temporary dilator | Fulminating staphylococcal pneumonia |
| Bronchitic element predominating: Bronchiolitis and bronchospasm | |
| Laryngomalacia | Pierre Robin syndrome |
| Total 43 | Total 18 |

Altogether there were ten deaths. None of these was related to intubation itself. Nine of them occurred in patients listed, in group B of table III. The tenth was a feeble neonate with a severe degree of laryngomalacia along with other troubles, namely spina bifida with meningo-myelocele, talipes equinovarus, as well as probable intracranial birth injury. Again, the tube had nothing to do with her ultimate demise. Of the
ten who died, permission for autopsy was given in seven instances. In six of these, the larynx and trachea showed no more than patchy superficial abrasions with no evidence of any underlying tissue reaction. The pathologist’s comment was that he had seen worse in some cases following endotracheal anaesthesia.

The seventh, a child of 6 admitted and remaining unconscious and apnoeic was artificially ventilated for three days. At post-mortem examination there was dense supraglottic and epiglottic oedema. There was subglottic diffuse haemorrhagic necrosis as far as the cricoid and there was oedema of the cords. Subepithelial and submucosal haemorrhages were also visible in other parts of the body. The clinical diagnosis of a fulminating septicaemia was never proven, but no other cause of death was apparent.

Experience with mechanical pulmonary ventilation indicates that there is more evidence of reaction even in survivors, than when a ventilator is not required. This reaction is possibly traumatic in nature, due to movements of the ventilator head, relative to the patient, pushing the tube up and down the larynx, as well as to the need for a reasonably well-fitting tube to give some semblance of an airtight seal. However, mechanical ventilation was used in only six cases, from which small number no firm conclusions can be drawn. Of the remaining three who died, laryngoscopy at death showed no abnormality incompatible with complete recovery.

Follow-up laryngoscopy has been refused by two parents and the appointment not kept by a number of others. Altogether, thirty-three laryngoscopies have been carried out under general anaesthesia at intervals of three and, if necessary, again at six months after the initial illness. In all except three patients the larynx was within normal limits at three months and, in these three, appearances were normal at six months—a pinhead-sized granuloma having disappeared from one or other cord in the meantime. Those who have not returned can be presumed to be functionally normal at least.

Of the 61 cases, 23 required re-intubation on one or more occasions, but were ultimately extubated satisfactorily. The remaining 28 survivors were extubated satisfactorily at the first attempt. Five cases warrant mention in some detail.

CASE 1. A big well-built boy of 9, lying unconscious with severe head injuries and multiple other injuries, had an ordinary red rubber Magill tube in place for 24 hours before changing to a Portex tube. As protective reflexes returned 4 days later, the tube was removed, but had to be repeatedly replaced for shorter or longer periods to aspirate secretions or relieve obstruction from laryngotracheal oedema and superficial slough. Tracheostomy was performed in the end, was easy to manage in such a big boy, and in this instance would have been better performed at the very beginning.

CASE 2. A boy of 7 came in with an unusually virulent and severe attack of laryngotracheobronchitis. So dense was the oedema that a Portex tube could not be pushed through the oedematous segment. Again because of his size, after establishing the diagnosis by bronchoscopy, a tracheostomy was carried out and managed without any trouble, the preliminary attempt with a Portex tube having achieved only partial relief. This was the only case in the series subjected to bronchoscopy which was done to exclude some other cause for his respiratory distress in the face of persistent obstruction after intubation. It is of interest that a No. 4 Oxford tube—stiffer and tapered—gave a perfect airway for the anaesthetic for tracheostomy where the Portex tube had failed to pass.
CASE 3. Subglottic stenosis occurred in a little girl of 4 years. This child had a history of repeated attacks of croup every winter since birth, but had never had to be brought to hospital. On her first admission, however, she was severely obstructed and needed immediate relief. At 2 a.m. a misunderstanding about her age occurred. The anaesthetist understood she was 8 years old and intubated the larynx with a size 3 Portex tube (5.5 mm New British Standard). A 4.5-mm or even a 4-mm would normally have been used. This was noticed next day, but no action taken as the child seemed to be tolerating it quite well. Six days later the tube was removed, but had to be replaced within 12 hours. This time a No. 2 (5 mm) tube was used. Three days later extubation was again attempted without success, and within 24 hours the tube had to be replaced. Four days later it was again removed and after a further 4 days the child was sent home, the voice still slightly hoarse but otherwise well, for the usual follow-up.

Ten days later she was brought back apparently with a fresh attack of severe croup. Close questioning disclosed that her voice had never become completely normal in the interim. Oedema was so dense that a 3-mm Oxford tube had first to be passed as a dilator. Ultimately, a 4.5-mm Portex tube was introduced and left in position for 7 days after which it was removed uneventfully under sedation. A week later she was sent home well, although her voice was still a little hoarse.

Five days later, she was re-admitted with acute croup. Early next morning airway relief became imperative, and a 4.3-mm Portex tube was passed through the nose after a preliminary dilation with a 4-mm tube. Four days later direct laryngoscopy under general anaesthetic showed a normal left cord, a granuloma anteriorly on the right cord, and very little subglottic oedema. The tube was therefore removed and remained out. In view of her previous troubles, it was decided to keep her in hospital until her voice was clear and appearances normal on direct laryngoscopy.

Ten days later when slight huskiness had been the only functional abnormality, she awoke in respiratory distress and rapidly deteriorated. Under general anaesthetic general agreed subglottic narrowing was observed and again a 4.5-mm tube passed after preliminary dilation with a 4-mm tube. The length of the case points at this moment makes it clear that a progressive subglottic stenosis rather than oedema was now unmistakably recognized. This tube was left in 1 week and 24 hours after removal laryngoscopy showed: "Both cords red and granular, trachea reddened, somewhat stenosed and showing tendency to form small areas of slough. Should have tracheostomy, and larynx rested. Suggest further laryngoscopy about 2 weeks later." An elective tracheostomy was then performed and 4 days later at laryngoscopy "...the appearances are those of early cicatricial stenosis". A belated course of steroid therapy was now prescribed, but although adequate in dosage, to judge by the rapid gain in weight and other marked side effects, it had no observable effect on the progress of events. A month later at laryngoscopy "...the cords have returned to a virtually normal state. One cm below the glottis there is a virtually complete stenosis..." After a further few days of training for Mother, this little girl was sent home with a permanent tracheostomy. The present plan is to defer a definitive operation on the upper trachea and cricoid until she is older. The vocal cords and larynx itself are normal and with an adequate airway re-established in her teens she should have a normal voice. She is able to talk quite well in a whisper and should improve further when she learns to block off the tracheostomy opening with a finger for voice production.

CASE 4. This child of 7 years was convulsing repeatedly when admitted. Paralysis was induced and ventilation controlled with the help of tubocurarine and a mechanical ventilator for 36 hours, but she remained unconscious for a further 4 days with a Portex tube in position. Ten days after the initial intubation, she was regarded as well enough to permit extubation. At extubation, the trachea and larynx were observed to be coated with a tenacious slough. Culture returned a report of Ps. pyocyanea. She struggled along for 24 hours without respiratory function, but as soon as her condition began to deteriorate re-intubation was carried out and in the light of past experience with these older patients an elective tracheostomy was performed at a convenient time on the next day. A week later, the tracheostomy was decannulated without difficulty after a period of progressive coughing off. She was sent home with a hoarse voice but an apparently adequate airway. She was asked to report back in a week for a check on her larynx. On her return, she was still abnormally hoarse and laryngoscopy under general anaesthesia revealed an adhesion of the cords across the tips of the vocal processes of the arytenoid cartilages. This adhesion was divided and subglottic oedema observed to be still present. A 4.5-mm Portex tube was introduced to maintain the airway and keep the adherent areas apart. She was then re-admitted to the ward. Four days later, at laryngoscopy, "Both cords are very granular and show very little movement. There is an apparent adequate subglottic airway". A week later laryngoscopy showed the "tube surrounded by friable glottic granulation tissue. Cords recognizable but granular". An intermittent attack of measles postponed the next check. Ten days later the patient found herself able to talk around the tube if she first blocked it off. It was removed next day under sedation only, and her voice improved daily thereafter. A week later laryngoscopy revealed "great improvement. Much of the granulation tissue has disappeared. There is none in the subglottic region. The cords are thickened". At the three month follow-up the voice was clear and laryngoscopy revealed a normal larynx.

CASE 5. The last case was the first in this series. A neonate, in respiratory distress from laryngeal obstruction, he had had a traditional tracheostomy performed and difficulty was experienced when attempts to decannulate were made 2 weeks later. A 3-mm tube was inserted and the tracheostomy was left to close. Difficulty in removing the Portex tube was also encountered and altogether it was reinserted 11 times. In the end we gave up trying and left him to "grow around his tube". This, in fact, is what happened and after he could be heard snuffling and coughing around his tube, it was finally removed uneventfully after a total period of 9 weeks.

DISCUSSION

The results outlined above explain why intubation has been given such a prolonged trial in this hospital. Tracheostomy carried out by the occa-
sional surgeon (usually a medical registrar or physician) under bad conditions and with the patient often in extremis gave understandably poor results (table I). Almost half the deaths in the series could be attributed directly to the surgical complications of the operation of tracheostomy itself.

Table II shows an improvement in overall results when the operation is performed under the best conditions possible, including endotracheal general anaesthesia. In this series no deaths were attributable to the operation of tracheostomy alone, but, once established, maintenance of the patient still presented many problems. The smaller the patient the greater the difficulties.

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 a dislodged tracheostomy tube, and no trouble when decannulating and closing the tracheostomy, then obviously intubation has no place. This, however, has never been our experience. Tracheostomy in infants still suffers, in spite of improvements in technique and overall results, from the following complications:

- Dislodging of the tube during a spasm of coughing; this may precipitate a serious emergency.
- Surgical emphysema of the neck.
- Surgical emphysema of the mediastinum.
- Pneumothorax.
- Nursing problems; the younger the patient, the less neck there is for attaching and handling the tube.
- Decannulation problems.

Prolonged pernasal intubation virtually abolishes all these difficulties. The nursing staff unanimously prefer to manage, as a tracheostomy, a small stump of Portex tube projecting from the convexity of a baby’s face rather than attempt to handle an insecure tube buried under the folds of the same baby’s chin.

There are still troubles with decannulation, but these are never major. To re-insert an endotracheal tube is always easier than on the first occasion. To re-open a rapidly granulating and closing tracheostomy track can give rise to difficulty even in experienced hands.

The spread of infection down the tube is a problem equally common to either technique. Masks and rigid aseptic precautions on the part of all those handling the patient will minimize this, but the presence of an endotracheal foreign body which bypasses all the normal defences is a disadvantage common to both methods and demands die utmost vigilance in keeping its effects to a minimum.

Humidification is another problem common to both techniques and requires constant attention. In neonates and very small babies (under 3 months of age) the presence of the tube seems to cause minimal upset. Beyond the regular quarter-hourly instillation of fluid no further measures seem to be necessary to prevent crust ing or inspissation of secretions. In the series presented here the incidence of secondary infection and of crust ing in the tube was nil in babies under 3 months of age. Over the age of 3 months more active measures to humidify the inspired atmosphere are essential. The traditional steam tent has been reasonably satisfactory, but more efficient nebulizers are available and are better. The reliability, cheapness and ready availability of steam are the main reasons for its use in this series.

One incontrovertible advantage of the tube is that in a respiratory emergency it can be removed by the nurse attending the case with immediate relief of trouble. After removal of the tube there is always a brief period of a quarter to half an hour in which the airway remains clear. A baby who has dislodged his tracheostomy tube into the tissues of his neck is not always relieved by removing the tube and may be in severe straits by the time someone capable of guiding the tube back into the trachea is at hand.

As the age of the patient increases and the neck enlarges relative to the trunk and head, tracheostomy becomes progressively easier to manage and the patient’s reaction to the tube appears to become progressively less favourable. Our chief difficulties have been encountered in older children.

With these older children (4 years and over), in whom tracheostomy is much less of a problem, intubation is occasionally more distressing and frightening than tracheostomy. Others tolerate the tube calmly and with understanding (fig. 3). It is reasonable with these older patients to undertake
a trial of the tube and to proceed thence to an elective tracheostomy if such a course appears desirable or necessary.

Four cases of intubation for lower respiratory obstruction—bronchiolitis with intense bronchospasm—are cited in Table III. Intubation in these four gave disappointing results. The tube, acting as a foreign body, aggravated the bronchial reaction and this was made even worse by repeated suction. There seems to be little place for prolonged intubation where the obstruction is distal to the trachea.

At this point two questions become relevant:

(a) Where can this technique reasonably be attempted and practised?

(b) Who performs the intubation?

Our reply is:

(a) Any institution that regularly has to manage tracheostomies in children under 5 years of age and is not satisfied with the results in this age group could reasonably give a trial to intubation with polyvinyl chloride tubes. The younger the patient the easier it is to manage the tube. Dexterity with thin strips of sticking-plaster in fixing the tube is an asset, and a loop of linen thread tied firmly to the tube at the point of egress from the nose with the loose ends fixed on either cheek by small squares of sticking-plaster averts embarrassment if the tube is inadvertently inhaled into the nasal cavity during a spasm of coughing.

(b) Reference to Table III shows that the majority (43) of patients were in respiratory distress at intubation. For these we have used the method described. Patients in group B presented no difficulties. A suitable dose of suxamethonium, preceded or not by thiopentone according to the state of consciousness, was all that was necessary. Any anaesthetist who is competent to give an endotracheal anaesthetic for tracheostomy in any given case could reasonably attempt prolonged intubation as an alternative if he so desires.

It is felt that this technique offers: freedom from the surgical complications of tracheostomy; greater ease of nursing management; less trouble with extubation; and as already mentioned, prompt removal of the tube in emergency gives immediate temporary relief.

Whether the technique proves ultimately of value or not, two further factors deserve mention. Intubation on the spot in an emergency can then be followed by an elective tracheostomy under optimal conditions at any time during the next 24 to 36 hours. The same can be said of hospitals providing a “Flying Squad” type of emergency service. If a competent anaesthetist is on call as a member of the team, intubation on the spot followed by tracheostomy later is more practicable than emergency tracheostomy in the first instance.

The one serious complication that has occurred in this series is subglottic cicatricial stenosis of the trachea. This is a known hazard of routine tracheostomy, though nowadays rare because the surgeon knows how to prevent its occurrence. Unfortunately one cannot say yet whether tracheal stenosis is an unavoidable complication of prolonged intubation or not, as the patient in question had an oversize tube in place for 6 days without relief. In retrospect, one assumes that an ischaemic pressure necrosis of the mucous membrane lining the cricoid ring occurred, as the stenosis is in this region.
Experience in this case confirmed the already strengthening conviction that an adequate airway is the only essential factor to be constantly borne in mind. The diameter of the tube selected is, except for neonates, always one size smaller than one would normally use in routine general anaesthesia. With the older, bigger children it can quite safely be two or even three sizes smaller and still remain functionally effective.

It is our present intention to continue to use prolonged pernasal intubation as an alternative to tracheostomy until some definite and clear-cut contraindications emerge.

ACKNOWLEDGEMENTS

We are grateful to the Medical Superintendent, Dr. M. T. Cockburn, for permission to publish these findings; to the paediatricians of the Adelaide Children’s Hospital, for their ready co-operation and encouragement in the management of these children; to Mr. P. G. Jay, Senior Honorary E.N.T. Surgeon, for his part in conducting almost all the laryngoscopies; and to the nursing staff whose tireless vigilance is vital to whatever degree of success this technique may claim.

REFERENCES


INTUBATION TRACHEALE PROLONGEE CHEZ LES NOURRISSONS ET LES ENFANTS

SOMMAIRE

On présente une série de 61 cas d’intubation pernasale prolongée chez des enfants, pour des affections qui auraient autrement nécessité une trachéostomie. Une complication grave s’est produite, la sténose sous-glottique cicatricielle de la trachée, et on la discute. L’intubation pernasale prolongée a une place définie chez les enfants de moins de cinq ans, comme alternative à la trachéostomie. Le seul élément important pour réussir avec cette technique est de choisir le tube de la plus petite taille qui donne une voie aérienne silencieuse (suffisante) et un accès raisonnable pour l’aspiration des sécrétions.

LANGFRISTIGE ENDOTRACHEALE INTUBATION BEI SAUGLINGEN UND KINDERN

ZUSAMMENFASSUNG

Es wird eine Serie von 61 Fällen beschrieben, wo bei Kindern unter Bedingungen, die sonst eine Tracheotomie erfordern hätten, eine langfristige pernasale Intubation vorgenommen wurde. Es trat eine ernsthafte Komplikation auf, eine subglottische Narbenstenose der Trachea, die diskutiert wird. Bei Kindern unter fünf Jahren hat die langzeitige pernasale Intubation als Alternative zur Tracheotomie ihren festen Platz. Die wichtigste technische Vorbedingung, die erfüllt werden muß, um mit dieser Methode Erfolg zu haben, ist die Wahl des kleinstmöglichen Tubus, der noch eine ruhige (angemessene) Passage der Luft zuläßt und einen vernünftigen Zugang zum Absaugen von Sekreten gewährt.