

Section of Laryngology

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Tracheostomy: Its Management and Alternatives

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In the past decade a controversy (Crul & Wolffensperger 1965, Aberdeen & Glover 1967, Atherstone & Ryder 1967, Kuner & Goldman 1967, *Lancet* 1967, VerMeullen & Birck 1968) has arisen over the relationship between tracheostomy and prolonged therapeutic endotracheal intubation. Before considering if intubation does in fact offer an acceptable alternative to tracheostomy, it is worth looking at the evolution of the two procedures.

Tracheostomy, which dates back into antiquity, is much the older procedure and has five periods in development as compared to intubation which has two periods, the first of which originated in the latter part of the nineteenth century. The first tracheostomy is a matter of conjecture. Wright (1914), quoting from Jochim's translation of the Ebers papyrus, written about 1500 BC, refers to a passage describing 'incision of a fatty tumour in the throat taking care of the vessels'. In the sacred book of Hindu medicine – the Rig Veda, compiled between 2000 and 1000 BC – mention is made of 'the bountiful one, who can cause the windpipe to reunite when the cervical cartilages are cut across, provided they are not entirely severed'. More direct are Gordon's (1947) claims that 'Homer refers to the operation of relieving choking persons by cutting open the trachea', and that 'Alexander the Great punctured the trachea of a soldier with the point of his sword when he saw the man choking from a bone lodged in his throat'. Most historians, however, accept the writings of Aretæus (second century AD)

and Galen (second to third century AD) about the Greek physician Asklepiades carrying out the operation about 100 BC. A painting in the National Gallery, 'The Death of Procris' by Piero di Cosimo (1462–1521) of the Florentine School, has been claimed (Brooks 1967) to show a tracheostomy incision. Despite this, and other hearsay evidence, it is not until 1546 that the first definite account of a tracheostomy by the surgeon concerned (Brasavola) can be found, and this first period of approximately 3,000 years in the evolution of tracheostomy can aptly be called that of 'legend'.

The second period in the evolution of the operation lasted from 1546 to 1833; during this time few surgeons had the courage to carry out the procedure and it was regarded with great suspicion. Typical of their attitudes were the remarks of Fabricius (1660): '... the terrified surgeons of our times have not dared to exercise this surgery and I also have never performed it', and '... in the end even the mention of this operation terrifies the surgeons; hence it is called a scandal.' Goodall (1934) could only find details of 28 successful tracheostomies in these 287 years, and this was certainly the period of 'fear'. Almost all the tracheostomies performed were to relieve upper respiratory tract obstruction, though its use was suggested to resuscitate the drowned.

In 1833 Trousseau reported: 'I have now performed the operation in more than 200 cases of diphtheria, and I have had the satisfaction of knowing that one-fourth of these operations were successful'. This was a notable advance in the management of diphtheria and heralded the commencement of the third period in the evolution of tracheostomy. Throughout this 99-year period, which extended to 1932, the operation was still used mainly in the management of respiratory obstruction due to a wide variety

¹ Dr McClelland died on June 27 1971

of causes, though it was also employed to rest the larynx in chronic tuberculosis and syphilis, and preoperatively for certain head and neck operations. Several large series were recorded (Lovett & Munro 1887, Prescott & Golthwaite 1891, Krause 1892), and much of the literature was concerned with variations in surgical technique, modifications to the cannula, and postoperative complications. Jackson (1909, 1921, 1935) clarified many debatable aspects, particularly the argument concerning high versus low tracheostomy and the danger of general anaesthesia in acute respiratory obstruction. Because tracheostomy was usually an emergency operation in patients with acute asphyxia it became dramatized in both medical and lay minds. This is exemplified by Cronin (1948) in his novel 'Shannon's Way', and without question this third period was that of 'drama'. However, as the incidence of acute respiratory obstruction began to diminish, due to a large extent to the conquest of diphtheria by immunization, tracheostomy gradually became less and less frequent.

It was during the height of this dramatic period that Macewen in 1880 published the first definite account of prolonged therapeutic endotracheal intubation in upper respiratory tract obstruction as an alternative to tracheostomy. He described passing metal tubes in two conscious patients which were eventually removed 35 and 36 hours later. It is of interest that the tubes were changed several times, and were cleaned with a small brush to remove excessive secretions on many occasions. The main advantages of intubation compared to tracheostomy were the avoidance of anaesthesia and surgery in very ill, toxic patients. Macewen soon appreciated this and undoubtedly used intubation in many cases of diphtheria (James 1970). A few years later O'Dwyer (1887) in America reported encouraging results in 50 patients with diphtheria, and also pointed out the value of intubation in chronic laryngeal stenosis (O'Dwyer 1894). This was the period of 'initiation' for prolonged therapeutic endotracheal intubation but it appears to have been relatively short-lived. The principal reason why intubation did not gain more popularity was the technical difficulty of the manoeuvre; and it was not until after Magill & Rowbotham (1921) placed intubation for the administration of anaesthesia on a firm footing that it could become, more than 30 years later, a serious rival to tracheostomy.

The fourth period in the evolution of tracheostomy, which lasted for 33 years, began in 1932 with Wilson's suggestion that it might be of value in poliomyelitis if the conventional treatment by postural drainage failed to prevent contamination of the trachea with subsequent

pulmonary infection. From his suggestion two potential benefits of the operation were realized: namely, protection against inhalation of foreign matter into the trachea, and removal by suction of retained secretions in the lower respiratory tract. As a result tracheostomy was reported in the management of other patients with poliomyelitis (Galloway 1943, 1946, 1947), tetanus (Turner & Galloway 1949), head injuries (Bryce-Smith 1950), chest injuries (Carter & Giuseffi 1951), barbiturate intoxication (Lewy & Sibbitt 1951), after neurological operations (Taylor & Austin 1951), and following other types of major surgery (Atkins 1952). The period of 'enthusiasm' had begun and it became fashionable to say: 'if you think of tracheostomy - do it' or 'you should have done it'. An important development during this period was the European poliomyelitis pandemic of 1952, in which Ibsen instituted intermittent positive pressure ventilation through a tracheostomy as a means of artificial ventilation of the lungs (Lassen 1953), and this added considerable fuel to the fire of enthusiasm. One result of this enthusiasm was that the indications for tracheostomy, which once had been dominated by upper respiratory tract obstruction, became lost as the value of the operation was described in a wide variety of diseases. At the same time many enthusiasts, after quoting only a small series of patients, failed to pay attention to the complications. Consequently the tendency occurred not to think of a specific indication but rather the patient's disease, and to minimize the complications of tracheostomy.

In the midst of this enthusiasm for tracheostomy there were some isolated reports of intubation as an alternative (Briggs 1950, Urry 1951, Barton 1953, Hunter 1960), but they received little attention other than from those concerned with the management of barbiturate intoxication in Scandinavia (Clemmesen 1954, Bergstrom 1960).

The fifth and present period in the evolution of tracheostomy began in 1965 as the controversy with intubation commenced. For tracheostomy it is the period of 'rationalization' compared with the period of 'challenge' for intubation. In 1962, Brandstater had shown intubation to be a feasible alternative by successfully managing 12 newborn infants, for up to 6 weeks, by artificial ventilation through endotracheal tubes. However, it was dissatisfaction with tracheostomy (McClelland 1965, McDonald & Stocks 1965) that initially caused the pendulum to swing in favour of intubation (Allen & Steven 1965, Thomas *et al.* 1965, Fearon *et al.* 1966, Rees & Owen-Thomas 1966, Holmdahl & Lindholm 1967, Markham *et al.* 1967). Despite what amounted

to enthusiasm for intubation, it was soon realized that intubation was not a procedure without complications (Owen-Thomas 1967, Abbott 1968, Bryce *et al.* 1968, Harrison & Tonkin 1968, Hatch 1968, Hedden *et al.* 1969, Lindholm 1969, Stocks 1970), and it is now becoming apparent that intubation and tracheostomy should be regarded as complementary rather than antagonistic to each other.

Intubation could only replace tracheostomy if it was possible to show unequivocally that the complications were less frequent and less severe in comparison to those of tracheostomy, in similar patients over an identical period of time. To carry out a scientific trial to prove such a point would be virtually impossible for a variety of reasons: (1) Many patients are intubated as an essential preliminary to tracheostomy. (2) Some patients after intubation later require tracheostomy. (3) A large number of patients would have to be considered, as there is little value in comparing the complications occurring in hypotensive head injury with those in a newborn infant suffering from the respiratory distress syndrome. (4) It would be unethical to allocate patients on a strictly random basis to an 'intubation' or a 'tracheostomy' group.

The most practical approach is to summarize from the numerous published series the advantages and disadvantages of intubation in relation to tracheostomy.

Advantages of intubation: (1) Easily and rapidly performed. (2) If necessary, re-intubation is a simple procedure. (3) 'Operative' complications are minimal. (4) Less risk of spread of infection, as there is no surgical wound. (5) No tracheal or skin scarring as sequelæ of incision. (6) Fewer decannulation problems. (7) Lower mortality. (8) Extubation is a minor procedure should the patient no longer require an artificial airway.

Disadvantages of intubation: (1) More uncomfortable and unsightly. (2) Tracheal suction of retained secretions is more difficult. (3) An oral endotracheal tube can be bitten through by a semiconscious patient. (4) A nasal endotracheal tube may cause necrosis of the nasal cartilages or scarring of the external nares. (5) Minor changes in the patient's voice for a variable period after extubation. (6) Risk of laryngeal lesions.

Of these disadvantages by far the most serious is the risk of laryngeal lesions, which range from œdema to chronic subglottic stenosis and fibrous fixation of the arytenoid cartilages. Some degree of œdema is probably inevitable in every patient intubated for more than a few

hours; but by careful management permanent sequelæ can be reduced to less than 5% of patients (Tonkin & Harrison 1966, Northway *et al.* 1967, Lindholm 1967, Stocks 1970) – a figure that compares favourably for the incidence of functional tracheal stenosis following tracheostomy (Deverall 1967, Kucher *et al.* 1967, Pearson *et al.* 1968, Stoeckel 1970). Many factors influence the incidence of laryngeal lesions and certainly the duration of intubation cannot be held solely responsible. Of equal, if not greater, importance are the shape, size and material of the endotracheal tube as well as movement and the amount of laryngeal activity. No definitive time limit can be laid down for the maximum permissible period of intubation; Wylie (1950) described the development of a laryngeal granuloma after 15 minutes' intubation in course of anaesthesia, whereas Stocks (1970) recorded a patient intubated for 227 days without serious effects – but at the present time it is generally felt that intubation should not be prolonged further than 5 days in adults and 10 days in the newborn.

If these, or any other, time limitations are selected as criteria for the duration of intubation, then the indications for intubation, though similar to those for tracheostomy, have to be considered in relation to the expected duration of the patient's disease. For example, intubation should be selected as the first choice for barbiturate intoxication, or until it is clear how an unconscious head injury is going to progress; but tracheostomy ought to be employed from the outset in adult patients with severe tetanus or polynuritis. Should there be any doubt as to the need for tracheostomy the motto of the period of 'enthusiasm' may profitably be modified to: 'if you think of tracheostomy – intubate and think again'.

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Dr G T Spencer also presented a paper.

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Diagnosis, Treatment and Management of Speech Defects in Childhood

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Speech Disorders in Childhood

Prevalence of Speech Defects

A large number of different figures have been given for the prevalence of speech defect in childhood. In the 'thousand family' study in Newcastle, Morley (1957) found that 14% of 5-year-old children had severe defects of articulation and that these were so marked in 4% of them that teachers found that they were unintelligible.

In the 11,000 7-year-old children studied in a national survey by Pringle *et al.* (1966) 4.5% of boys and 2.3% of girls were considered to have 'markedly poor oral ability' and 20.9% of boys and 15% of girls were considered by their teachers to have 'below average oral ability'; 16.2% of boys and 11.4% of girls were not fully intelligible on testing and stammering was found on examination in 1.3% of boys and 0.8% of girls.

It is clear from these and similar statistics that the problem of speech defects in the community is considerable and its importance is increased by the fact that children with significant speech defects very often have difficulty in learning to read and spell. Paradoxically, very little instruction is given about speech disorders to nurses, health visitors, social workers, dentists and medical students in their ordinary curricula.

It is often found that children with speech defects are immediately transferred to the care of the speech therapist for diagnosis as well as treatment without an adequate medical examination having been performed. All too often the speech therapist is newly qualified and relatively inexperienced, and may have to diagnose by 'hunch' and treat by intuition. In contrast, the well-qualified experienced speech therapist will make a meticulous and scientific assessment of a child's speech disorder, using tests of expressive language, comprehension, hearing and articulation.