A HISTORY OF TRACHEOSTOMY:

SI SPIRITUM DUCIT VIVIT (CICERO)

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SUMMARY

Tracheostomy is one of the oldest, one of the simplest and one of the most valuable operations in surgical practice. Yet, despite its antiquity, it was but rarely performed until the beginning of the 19th century and until less than twenty years ago its use was limited to surprisingly few conditions. Only during the last two decades has tracheostomy come to be accepted in the treatment of lower airway obstruction and for artificial ventilation, and these today constitute the chief indications for its use. For the previous 2,000 years, tracheostomy was used solely for upper respiratory obstruction.

Long before the dawn of modern, scientific medicine, the operation of tracheostomy was known and performed. Mention of the operation is first found in the writings of two Greek physicians: Galen (2nd century) who credited Asclepiades with being the originator of the operation, and Aretaeus (2nd century). Asclepiades flourished as a physician in Rome about the end of the 2nd century B.C., and is stated to have been the first also to use music in the treatment of the insane. He apparently operated for synanche, a group of miscellaneous inflammatory conditions of the floor of the mouth, larynx and head. This remained the only indication until after the Renaissance.

According to the writings of the surgeon Paulus Aegineta (probably 4th century), one Antyllus, who lived in the 2nd century, was the next to perform tracheostomy. He is stated to have operated with the patient in the sitting position and with the head extended.

There is no record about the outcome of these operations, but in the same century (the 2nd) a success was claimed—but in a sheep: "In our village there was a sheep who suffered an injury to her windpipe. Hollow reeds were introduced into the windpipe and the sheep lived" (Babylonian Talmud).

Fourteen centuries passed before the first successful tracheostomy in man. During this time progress was slow. It seems that the belief held by the ancients, that cartilaginous tissue would not reunite after incision, greatly impeded the further trial of the procedure. Caelius Aurelianus (5th century) stated: "Laryngotomia is a futile and irresponsible idea set forth by Asclepiades".

Albucasis (1013–1116) contributed to the history of tracheostomy by suturing a tracheal wound and demonstrating its ability to heal in a servant girl who had tried to commit suicide by cutting her throat. Avenzoar (1126–1198), when still a medical student, successfully performed the operation in a goat.

Brasavola (1546) is the first to record a successful case in a human. He saved the life of a patient who was nearly dead from suffocation owing to an "abscess in the windpipe". Following Brasavola's case, Fabricius (1617) described the technical details of the operation. He relates that at the time it was known as the "Scandal of Surgery" and he himself declined to perform it. However, he recommended a vertical incision of the skin and the use of a tube.

The next reported successful cases are by Habicot (1620) who reported on four patients who recovered; he published the first book on tracheostomy. Twenty-three other successful cases were reported over the next 200 years. Some of these operations were for the relief of airway obstruction, either by a foreign body or as a result of trauma, but most were for synanche.

Although in 1646 Moreau first recommended...
operating with the patient in the recumbent position, the upright position persisted for a further two centuries until a fatal case of syncope in a sitting patient led Trouseau to adopt the dorsal decubitus (Goodall, 1934a).

George Martin of Scotland was the first Briton to carry out the procedure successfully (Martin, 1730). He was also the first to recommend a double lumen tube and he remarked that the wound closed spontaneously following removal of the cannula (Martin, 1730).

According to Goodall (1934b) the first tracheostomy in a child was performed successfully by Caron in 1766, for the removal of a foreign body—a bean. Bretonneau demonstrated the possibilities of tracheostomy in the treatment of diphtheria, by operating on and saving a 5-year-old girl (Bretonneau, 1826). His pupil Trouseau reported in 1833 that he had operated 200 times and saved more than fifty children with advanced diphtheria (Nelson, 1957). This report convinced the doubters and detractors of the operation, and tracheostomy became widely acceptable to the medical profession. Trouseau also invented the dilator to spread the tracheal opening while inserting the cannula. His instrument is still in use today. Furthermore, he emphasized the advantage of early, deliberate operation and realized that the main object of tracheostomy was to provide an unobstructed airway. He later recommended tracheostomy for stenosing diseases of the larynx such as tuberculosis and syphilis.

With the increasing use of the procedure in the latter half of the 19th century, complications became more frequent. During this period, high tracheostomy was favoured because of the speed with which the operation could be performed, and its simplicity as compared to low tracheostomy.

The work of Jackson is an important milestone in the long history of tracheostomy. He standardized the technique and indications of the operation (Jackson, 1909) and later recommended that high tracheostomy should be abandoned as it was the chief cause of laryngeal stenosis (Jackson, 1921). Much of the writings on the subject of tracheostomy in the early part of the 20th century are concerned with recognition of the clinical signs of laryngeal obstruction, development of the technique, and aftercare of the patient. However, the indications for the operation remained fairly static, and Jackson, after devoting more than a quarter of a century to the study of the problem, concluded that mechanical obstruction was the main indication for the operation (Jackson, 1939).

Galloway (1943) reported on the use of tracheostomy to facilitate aspiration of secretions from the bronchial tree in cases of bulbar poliomyelitis. This major contribution marked the end of a 2,000-year-long era in which tracheostomy was used exclusively for the relief of upper respiratory obstruction and ushered in a new concept of the value of tracheostomy as part of the treatment for secretional obstruction of the lower airway.

Carter and Giuseffi (1951), following up the suggestion of Baronofsky et al. (1950), demonstrated the lifesaving value of tracheostomy in the treatment of the badly crushed chest. It is a sobering thought to speculate on the number of lives which might have been saved during the Second World War had tracheostomy been employed for severely crushed chests and severe blast injuries. Von Leden (1952) presented an account of the pathophysiology underlying retained bronchial secretions, an understanding of which led him to recommend tracheostomy for all patients unable to expel tracheobronchial contents efficiently. At present, early tracheostomy is an accepted treatment for all such cases, no matter what the cause. It is most commonly used for severe head and chest injuries, in cases of prolonged coma including neurosurgical patients and barbiturate poisoning and for postoperative pulmonary complications after major surgery. It has also been used for extensive burns, tetanus, eclampsia and botulism.

The latest phase in the application of tracheostomy began in Scandinavia during the poliomyelitis epidemic of 1952–53 and involves, essentially, the use of tracheostomy in the treatment of respiratory insufficiency due to causes other than airway obstruction. The tracheostomy in this instance enables the most effective application of intermittent positive pressure breathing, whether applied manually (Lassen, 1953) or mechanically (Engström, 1954). Norlander and associates (1961), who have treated more than 500 such cases, recommended early tracheostomy in order to improve the alveolar part of total ventilation and to facilitate the removal of secretions by aspiration. If the patient does not subsequently improve
the ventilation is controlled by connecting the tracheostomy tube to a mechanical ventilator. This type of therapy is commonly applied to patients with postoperative respiratory insufficiency, and to those with severe chest injuries and associated paradoxical movements of the chest wall. It has found a place, too, in the treatment of patients with chronic bronchitis with emphysema who hypoventilate due to superimposed acute infection, and in all patients with paralysis of respiration or of the respiratory centre, or in whom pharyngeal protective mechanisms are in danger of failing.

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L’HISTOIRE DE LA TRACHEOTOMIE

SOMMAIRE

La trachéotomie est une des interventions les plus anciennes, les plus simples et les plus précieuses de la chirurgie pratique. Néanmoins, malgré son ancienneté, elle ne fut faite que rarement jusqu’au début du dix-huitième siècle et, jusqu’alors, elle avait recours que dans un nombre étonnamment restreint de cas. La trachéotomie n’a enfin été adoptée qu’au cours des deux dernières décades dans le traitement des obstructions des voies respiratoires basses et afin de permettre la ventilation artificielle — tous cas qui constituent aujourd’hui les indications principales de leur emploi. Pendant les deux mille ans précédents la trachéotomie ne fut employée que dans les obstructions des voies respiratoires supérieures.

GESCHICHTE DER TRACHEOTOMIE

ZUSAMMENFASSUNG