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COMPARATIVE STUDY BETWEEN CONVENTIONAL SURGICAL TRACHEOSTOMY AND PERCUTANEOUS DILATIONAL TRACHEOSTOMY IN CRITICALLY ILL PATIENTS

THESIS

Submitted to the Faculty of Medicine
University of Alexandria
in partial fulfillment of the requirement for

Master Degree of Critical Care Medicine

By

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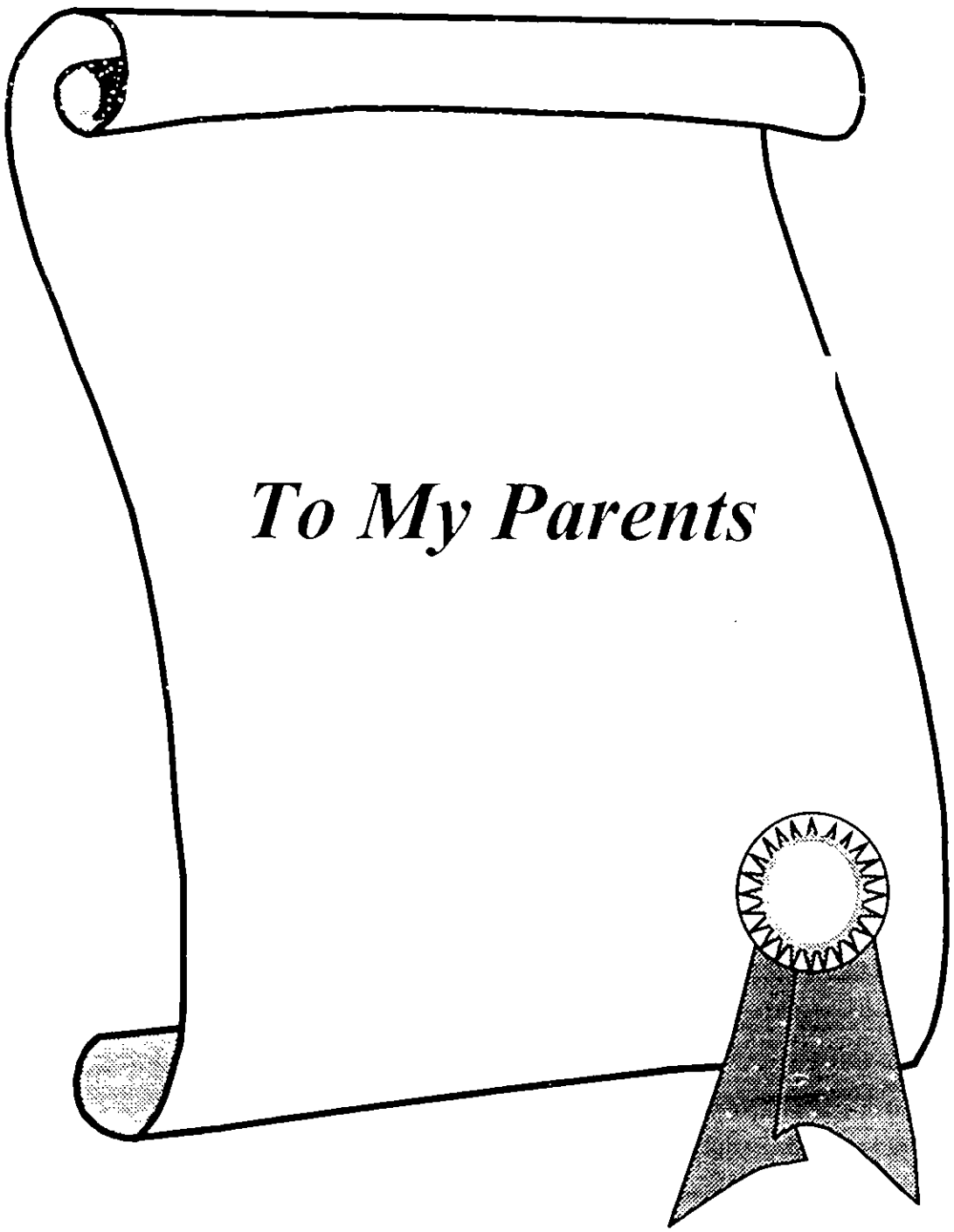
To My Parents

ACKNOLEDGEMENT

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INTRODUCTION

INTRODUCTION

DEFINITION:

Tracheostomy in general, refers to the creation of an opening into the trachea. [1]

HISTORICAL BACKGROUND:

Tracheostomy was probably performed in Ancient Egypt and the first elective tracheostomy is attributed to *Asclepiades of Bithynia* around 100 B.C. [2,3] In the 19th century, tracheostomy became an established procedure for upper airway obstruction secondary to foreign body, trauma and infections such as diphtheria and croup. [4]

Tracheostomy was viewed as a very dangerous operation until Chevalier Jackson had defined the surgical principles of the procedure in 1909; which are still in use today. Jackson emphasized a long incision, good exposure, division of the thyroid isthmus, and in a later publication; avoidance of incision of the first and second tracheal rings. [5]

Although the operation became codified, the development of endotracheal intubation greatly facilitated the procedure by removing its emergency status in numerous cases. Also control of diphtheria by immunization and the availability of antibiotics for the treatment of upper airway infections made tracheostomy an elective procedure for most patients.[6,7] And so the indications of the procedure extended beyond upper airway obstruction to encompass treatment of Chronic Obstructive Pulmonary Diseases; (COPD) after the realization that tracheostomy

reduces the pulmonary dead space, provides access for clearing of abundant pulmonary secretions in numerous pathologies and improves the patient's comfort during weaning from mechanical ventilation. Probably the most dramatic medical advance attributable to tracheostomy was in the management of poliomyelitis-induced respiratory paralysis by using tracheostomy to deliver positive pressure ventilation. [8,9,10]

In 1960, the indications for tracheostomy were clarified and sterile suction and cannula modifications were introduced. Cuffed tracheostomy tubes appeared, which presented new problems such as tracheal stenosis, obstruction of the tube lumen by prolapsed cuffs, and even extrusion of the tracheostomy tube resulting in fatalities.[11,12,13] Although the introduction of low-pressure cuffs for tracheostomy tubes certainly helped in reducing these complications, these cuffs were also used for endotracheal tubes, allowing for prolonged intubation, and a new controversy began on the duration of prolonged endotracheal intubation. The appropriate timing of tracheostomy in intubated patients is yet to be defined. [14,15,16]

Several publications have described a prohibitively high rate of complications with surgical tracheostomy; so several devices are therefore proposed to create a puncture in the pretracheal skin and soft tissues to allow access to the tracheal lumen. This procedure is called *percutaneous tracheostomy* and is proposed as a new bedside procedure with lower morbidity and mortality rates. [11,17,18,19]

Shelden et al in 1955 were the first to describe a technique for percutaneous tracheostomy.[20] Unfortunately, blind cannulation of the trachea with a bladed instrument following its transfixion with a barbed

needle limited the usefulness of this device. In 1969, Toy & Weinstein were the first to incorporate both a guide and a dilator to allow safe passage of the percutaneous tracheostomy cannula. Several other guide-wire based percutaneous tracheostomy techniques have been described but have not gained wide spread popularity. In 1985, Ciaglia introduced a modification of Toy's technique that involved serial dilations of the trachea over a Seldinger wire. [21,22]

Nowadays, two main techniques are used to dilate the anterior tracheal wall; the first one involves serial dilations using progressively larger dilators as described by *Ciaglia*, and the other involves one step dilation using forceps; *Grigges' forceps.* [18,21]

Recently, one step dilation of the trachea using twisting dilator; *PercuTwist*, enables safe percutaneous dilation of the trachea without any pressure from start to finish, as the anterior tracheal wall can be lifted during dilation. Most recently, a translaryngeal tracheostomy technique has been introduced by *Fantoni.* [23]

ANATOMY OF THE TRACHEA: [24,25]

The trachea is a cartilaginous and membranous tube, about 10- 11 cm. long, continued downwards from the lower part of the larynx. It reaches from the level of the 6th cervical vertebra to that of the upper border of the 5th thoracic vertebra, where it divides into two principal bronchi, one for each lung. The trachea for the main part, lies in the median plane, though its point of bifurcation usually lies a little to the right of this. During deep inspiration the bifurcation descends and may come to lie opposite the 6th thoracic vertebra. The trachea is very mobile

and can extend and shorten very rapidly. It is not quite cylindrical, being flattened posteriorly; its external diameter from side to side is about 2 cm. in the adult male and 1.5 cm. In the adult female. In children, the trachea is smaller, more deeply placed, and more movable than in the adult. The diameters correspond roughly with the age in years.

Relations of the trachea:

The *cervical part* of the trachea is covered anteriorly with the skin, superficial fascia, and deep fascia. It's crossed by the jugular arch connecting the anterior jugular veins and overlapped by the sternohyoids and the sternothyroids muscles. The second, third, and fourth rings of the trachea are crossed by the isthmus of the thyroid gland. Immediately above the isthmus, an anastomosing vessel connects the two superior thyroid arteries. Below the isthmus, it's related in front; to the pretracheal fascia, the inferior thyroid veins, the remains of the thymus gland, and the arteria thyroidea ima; when it exists. Posteriorly, the trachea is related to the oesophagus; which intervenes between it and the vertebral column, the recurrent laryngeal nerves ascend; one on each side in or just in front of the grooves between the sides of the trachea and the oesophagus. Laterally, the trachea is related to the lobes of the thyroid gland; which descend to the level of the 5^{th} or 6^{th} tracheal rings, and to the common carotid arteries and the inferior thyroid arteries.