Birth of Airway Surgery and Evolution over the Past Fifty Years

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KEYWORDS

• Airway surgery • History • Evolution of airway surgery

KEY POINTS

- Significant developments in airway surgery took place following the introduction of mechanical ventilators and intubation with cuffed endotracheal tubes during the worldwide epidemic of poliomyelitis in the early 1950s.
- In the early 1960s, it was generally accepted that surgeons could remove no more than 2 or 3 tracheal rings (2-cm rule) and predictably be able to reconstruct the airway.
- In the adult patient, about half the tracheal length can now be circumferentially resected and continuity restored by primary end-to-end anastomosis.
- The most prominent pioneers in airway surgery were Dr Frederick G Pearson from Toronto, Dr Hermes C Grillo from Boston, and Mr Louis Couraud from Bordeaux, France.

INTRODUCTION

Significant developments in airway surgery mainly took place following the introduction of mechanical ventilators and intubation with cuffed endotracheal or tracheostomy tubes during the worldwide epidemic of poliomyelitis in 1952. The first mechanical ventilators, which were simple volume units, were designed in Denmark. Meanwhile, Swedish engineers created the more sophisticated Engstrom Ventilator, which possessed both volume and pressure controls. By the late 1950s, these Engstrom units were in common use throughout Europe and North America. At the time, both the endotracheal and tracheostomy tubes were thick-walled and rigid, and the balloons were round and firm. The plethora of tracheal injuries that followed the use of such tubes provided surgeons with extensive experience with resection and reconstruction of secondary stenotic tracheal lesions.

In the early 1960s, it was generally accepted that surgeons could safely remove no more than a few centimeters of trachea because it was believed that tracheobronchial tissues healed poorly as compared with those of the stomach, intestine, and even skin.[1] It was also believed that both the rigidity and poor blood supply of the cartilaginous airway structure were major handicaps. Finally, it was thought that anesthesia could be difficult to maintain during airway reconstruction.

The most important contributors to the birth and evolution of airway surgery were Dr Frederick Griffith Griff Pearson from Toronto, Ontario, Canada (1926–2016) (Fig. 1); Dr Hermes C Grillo from Boston, Massachusetts, USA (1923–2003) (Fig. 2); and Mr Louis Couraud from Bordeaux, France (1929–2016) (Fig. 3). Other notable contributors were Professor Mikhail Perelman from Moscow in the Soviet Union and Mr Henry Eschapasse (1919-present) from Toulouse, France (Fig. 4).

Looking back is a respectful pursuit because it pays tribute to the heritage and pioneers (Fig. 5) of airway surgery while providing some insight into the roots and evolution of our profession in this field.

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Fig. 1. Dr FG Pearson from Toronto, Ontario, Canada (*on the left*) receiving an award for his work on airway surgery from Professor Francisco (Paco) Paris Romeu from Valencia, Spain, President of the European Society of Thoracic Surgery.

PATHOGENESIS OF BENIGN TRACHEAL STRICTURES AND BIRTH OF AIRWAY SURGERY

Before the early 1970s, numerous factors were thought to be associated with the occurrence of benign tracheal strictures (**Box 1**) but its true etiologic origin remained a mystery. In 1968, Drs Griff Pearson and Melvyn Goldberg[2] from Toronto made the observation that high ventilator pressures (therefore, high pressure between the endotracheal tube cuff and tracheal wall) were likely the most important pathogenetic factors in the development of benign tracheal strictures. In this seminal paper, they wrote the following:

> *In seven patients, stenosis developed in the mediastinal trachea at the level of the inflatable cuff. In each patient, the lesion was identified as a firm, concentric, fibrous stenosis. It is assumed that pressure between the cuff and the tracheal wall led to circumferential mucosal ulceration and injury to underlying connective tissue and cartilage with subsequent healing by concentric scar contracture.*

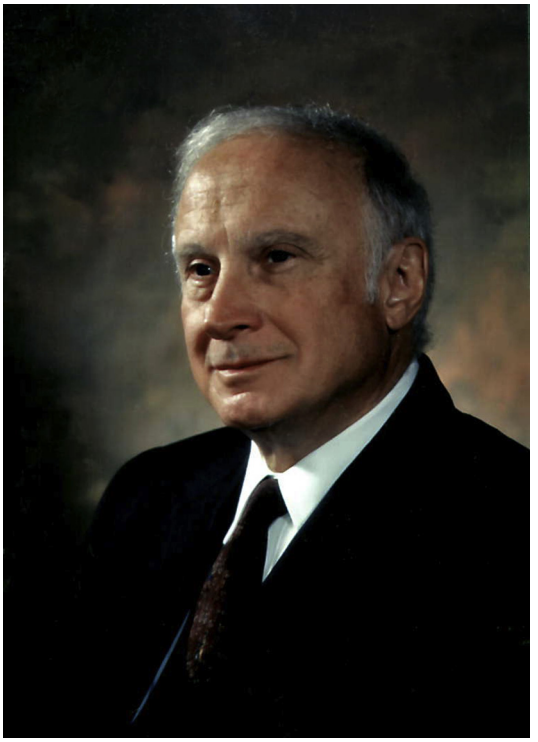

Fig. 2. Dr Hermes C Grillo from Boston, Massachusetts, USA, a true legend in airway surgery.

Fig. 3. Mr Louis Couraud from Bordeaux, France, a world expert in laryngotracheal surgery.

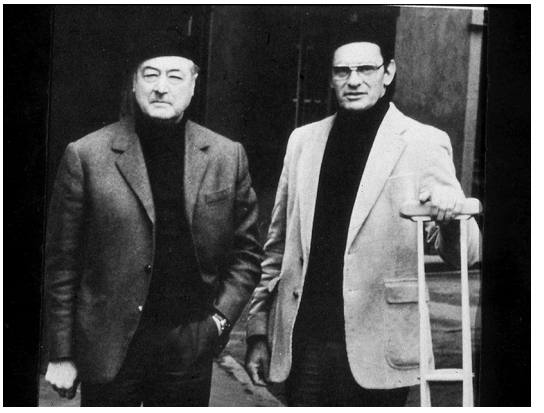

Fig. 4. Mr Henry Eschapasse from Toulouse, France (*left*), a world expert in airway neoplasms with Dr FG Pearson. The photograph was taken in 1981 before a meeting on tracheobronchial surgery held in Bordeaux.