TRACHEAL CARTILAGE FRACTURE WITH THE PERCUTANEOUS DILATATIONAL TRACHEOSTOMY, CIAGLIA METHOD

- Case Report -

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Surgical tracheostomy was first introduced by an ENT surgeon (Chevalier Jackson) in 1900. In 1955, Seldinger, a Swedish radiologist, introduced a way of insertion of a tube with the aid of a guidewire into the hollow spaces of body, such as blood vessels. In 1985 Pasquale Ciaglia performed percutaneous dilatational tracheostomy (PDA) with the Seldinger method.

Tracheostomy nowadays is usually performed as PDT in the ICUs1. Most of the PDT methods are performed with the Seldinger method. The basic difference between the various PDT methods, however, is in both the way of dilation and the way of dilator entrance (antegrade vs retrograde). In the Ciaglia method, several dilator tubes are used for tracheal dilation2.

Case Report

A 29 year old man was admitted to ICU because of convulsions and decline in the level of consciousness, with the diagnosis of encephalitis. He underwent an endotracheal (ET) intubation and was put on mechanical ventilation. Twenty days after ICU admission, because of the anticipated long duration of ET intubation and low level of consciousness, a PDT was performed with the Ciaglia method.

Patient was sedated with fentanyl and midazolam. Oral cavity and pharynx were locally anesthetized with lidocaine. The ET tube was withdrawn as tube cuff was placed between vocal cords using bronchoscope. Angiocath was inserted between the first and second tracheal cartilages and a guidewire was inserted through it. The angiocath was then withdrawn and dilator was guided to trachea. During insertion, the inferior (second) cartilage got broken as confirmed by the bronchoscope. The tracheostomy tube was inserted and its correct position confirmed with bronchoscopy and chest x-ray. The patient was under close observation, and two weeks later, he was weaned from ventilator. For the following two months patient did not have any complication due to the fractured tracheal cartilage.

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Discussion

Patients with long duration of ET intubation require tracheostomy. The indications for surgical tracheostomy and PDT are the same. The advantages of PDT over the surgical method, consists of decreased bleeding, less tissue incision and injury, less complications, its rapid and cost saving\textsuperscript{3-6}. In addition, long term complications, such as tracheal stenosis and late wound healing, are less with PDT method\textsuperscript{7,8}. In view of such advantages of PDT, nowadays patients in ICU undergo PDT unless a contraindication exists\textsuperscript{9,10}. Anterior neck infection and coagulopathy are absolute contraindications for PDT method. Large goiter, previous history of neck surgery, less than 17 years old, hypoxemia with positive end expiratory pressure more than 20 cmH\textsubscript{2}O, FiO\textsubscript{2} more than 70\%, morbid obesity, or inability to define the tracheal cartilage, thyro-hyoid distance less than 3 cm and emergent situations, are relative contraindications\textsuperscript{11-13}.

Tracheal cartilage fracture is one of the complications of PDT with the Ciaglia method attributable to tracheal anatomy (trachea is angulated backwards as it inserts in the thorax). In the performance of PDT at upper levels, therefore, more force is needed and inserting dilator into the intercartilage space near cricoid cartilage (between the first and second tracheal rings), increases the risk of a fracture. Because the cricoid cartilage is denser than other cartilages, the inserting force and pressure on it are transported to lower tracheal rings, thus increasing the risk of cartilage fracture, especially in patients with short neck and limitation of neck movement.. Performing PDT with Ciaglia method from the lower levels of trachea produces less force angle, so dilator and trachea are positioned in nearly straight line (Fig. 1, 2).

It is recommended, therefore, that PDT with Ciaglia method be done in lower levels of trachea, than in the first tracheal cartilages.

**Fig. 1**
PDT at upper levels of trachea produces increased pressure on lower cartilage rings.

**Fig. 2**
PDT at lower levels of trachea produces less force angle, bringing dilator and trachea to a nearly straight line.