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Clinical experience with Ciaglia's percutaneous tracheostomy

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Abstract During a 6-year period the authors performed percutaneous dilational tracheostomy (PDT) in 304 cases using the technique introduced by Ciaglia in 1985. A following study on 40 patients evaluated late complications of PDT; none of the patients developed laryngotracheal stenosis. In our experience PDT has been a very sure technique of securing the airway.

Key words Airway obstruction · Tracheostomy · Percutaneous dilational tracheostomy

Introduction

Percutaneous dilational tracheostomy (PDT), as described by Ciaglia [6], is a technique that allows the placement of a tracheal cannula by making a small cutaneous incision without wide dissection of pretracheal tissues and exposure of the trachea. The method has a smaller risk of complications than standard tracheostomy [2, 24].

The general indications for tracheostomy include upper airway obstruction, prolonged mechanical ventilation and tracheobronchial hygiene [9, 13]. The advantages of tracheostomy are reduced respiratory effort, better oropharyngeal hygiene, better removal of tracheobronchial secretions, rapid weaning of mechanical ventilation and easy communication of the patient.

The period of time recommended in the literature to proceed from orotracheal intubation to tracheostomy is still a vexing question [10, 17]. Tracheostomy is effected early when required for the patient's condition [16, 18].

However, the emergency situation represents a contraindication to PDT [1]. Other contraindications to PDT are pediatric age, serious obesity, goitre, coagulation disorders, impossible translaryngeal intubation, cutaneous infections, circulatory instability and reduced endocranial compliance. Our experience has shown that these contraindications can be reduced by PDT and with the help of endoscopy and echography [23, 25].

Technique

A kit for PDT available from Cook Medical (William Cook Europe, Sandet 6DK – 4632, Bjaeverskov, Denmark) contains a lancet, a cannula needle, a syringe, a "J" guidewire, a dilator-introducer, a Teflon guide and 7 dilators of increasing diameter, from no. 12 to 36 Fr (Fig. 1). The procedure is generally performed by two surgeons under surgical asepsis. The patient is placed in a supine position with the neck extended.

Important anatomical points are the thyroid and cricoid cartilages and first tracheal ring. A longitudinal incision of 1.5–2 cm is made 1 cm under the cricoid. An orotra-

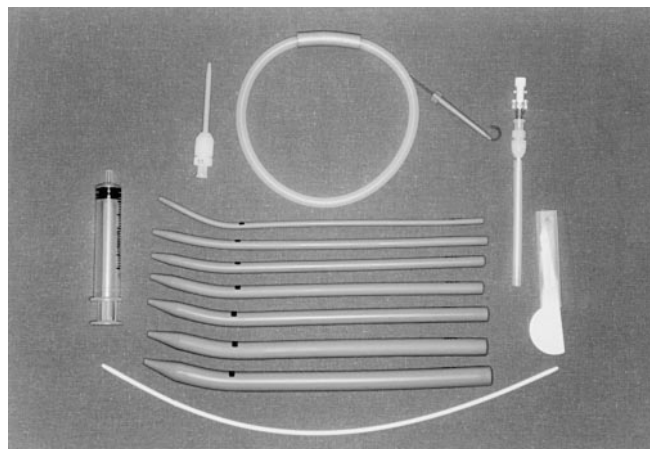


Fig. 1 Components of the PDT kit

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Table 1 Complications of PDT

Complications	Incidence
Pneumothorax	0.3%
Tube displacement	1%
Peritracheal insertion improper	0.7%
Tracheoesophageal fistula	0.3%
Tracheocutaneous fistula	0.7%
Tube occlusion	0.7%
Endoluminal tube displacement	1%
Wound infection	1.7%

cheal tube is withdrawn to a distance of around 18 cm from the lips. The trachea is pricked between the first and second or second and third tracheal rings [3, 4, 6]. A 14 G cannula needle, on a syringe containing physiological solution, is introduced into the trachea through the median line.

The metallic wire is inserted on to the cannula, which is then removed. An initial short dilator, followed by a Teflon guide, are inserted on the wire. The guide-wire allows successive introduction of dilators of increasing diameter. A tracheostomy tube is placed on an intermediary dilator and inserted into the trachea.

Finally, the dilator, guide and wire are removed, although a third operator with a fiberoptic endoscope can verify the positioning of the cannula and wire, as well as

the dilations and the insertion of the tube. According to Ciaglia [20], end-tidal CO₂ should be monitored for possible hypercapnia.

Materials and methods

Our experience from 1992 to the present has been 304 PDT, part of which were performed under endoscopic control. There was no perioperative mortality. Complications are shown in Table 1.

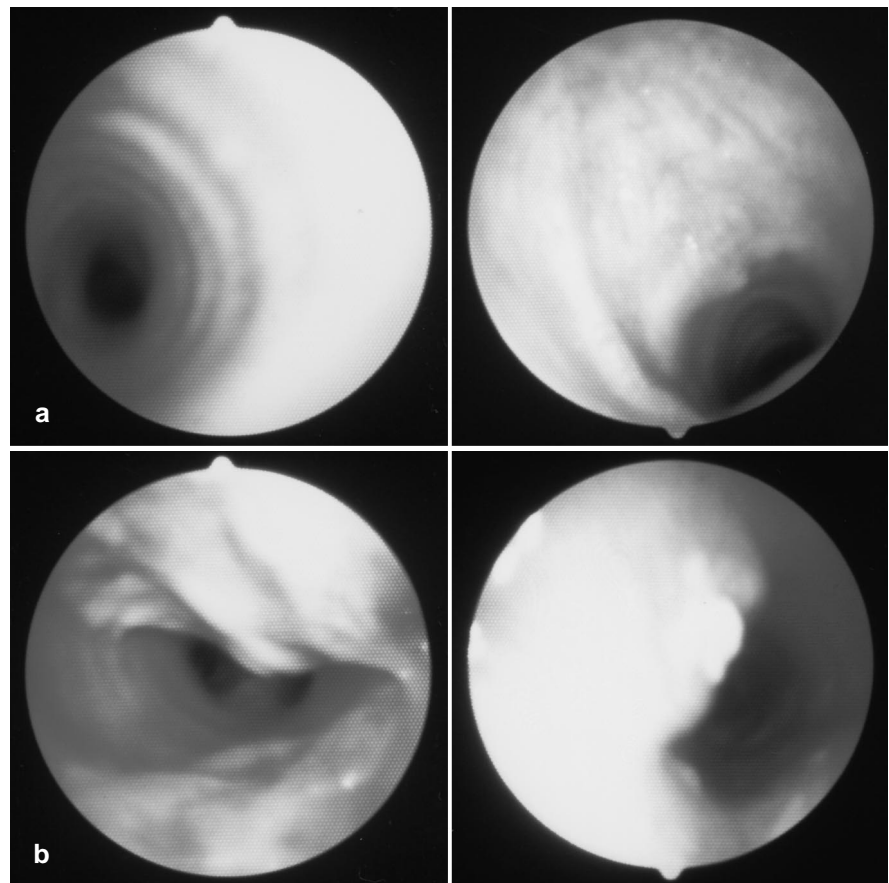
In a retrospective study of 41 patients, we evaluated 21 males and 20 females (ages from 11 to 69 years) who underwent PDT for a period of 7–90 days. The time after extubation was a minimum of 6 days and a maximum of 1115 days. All patients completed a simple questionnaire concerning possible complications of PDT, including laryngotracheal stenosis.

Subsequently, after topical anesthesia with lidocaine (Xilocaine), patients underwent fiberoptic laryngoscopy with video to document any anatomic changes present. In determining the incidence of late complications in the 41 patients, none was found to have disorders of respiration or swallowing related to PDT. No patient developed laryngotracheal stenosis or scarring in the upper airway lumen. Follow-up at 180 days after PDT showed mucosal findings similar to standard tracheostomy (Fig. 2a, b).

Comment

The mortality of the PDT is from 0.1% to 0.5% [12, 25]. Causes of death have been bronchospasm, arrhythmia, extubation and tracheoinnominate fistula [7, 23]. The incidence of complications is between 5.5% and 25%. A

Fig. 2 Mucosal changes of the tracheal lumen after PDT (a) and standard tracheostomy (b)



study of 834 patients by Winkler et al. [26] reported a complication incidence of 9.7%.

In general, PDT complications have been perioperative, immediate postoperative and late. These include bleeding, pneumothorax, tracheostomy tube displacement, improper peritracheal insertion, arrhythmia, subcutaneous or mediastinal emphysema, wound infection, tracheocutaneous fistula, tracheoesophageal or tracheal stenosis, vocal cord paralysis, granulations, residual open stoma and swallowing troubles [15].

Our review of the literature showed that standard tracheostomy has complications 2–3 times more frequently than PDT [8, 19] and a higher incidence of tracheal stenosis [5, 14, 21, 22]. In a study using tomography, an 18% incidence was observed [22]. Research with controls after death have also not shown tracheal stenosis in PDT [11]. Altogether, our study documented the absence of significant mucosal complications or other reactive laryngotracheal disorders after PDT. The low rate of complications and the absence of stenosis in our experience have convinced us of the validity of Ciaglia PDT in all cases in which a temporary tracheostomy is required.

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