

Commentary

Percutaneous tracheostomy: comparison of Ciaglia and Griggs techniques

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Received: 13 April 2000
Accepted: 17 April 2000
Published: 15 May 2000

Crit Care 2000, **4**:143–146

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Abstract

Endoscopic percutaneous dilatational tracheostomy is at least as safe as standard open tracheostomy in the operating room (OR). Recently, a single dilator was introduced to accomplish dilatation of the tracheal aperture in one step, thus obviating the need for multiple graduated dilators. Experience with endoscopic percutaneous tracheostomy (PCT) using the single dilator in 40 patients to date supports the premise that the procedure is safe, rapid, and technically simple. In the study by Añon *et al*, two very different techniques, are compared: the Ciaglia percutaneous dilatational tracheostomy technique using multiple dilators and the Griggs percutaneous technique using guidewire-dilating forceps. Although relative complication rates for the two techniques are not significantly different, both procedures are performed in a 'blind' fashion, without the benefit of a bronchoscope. The reported incidence of serious complications in this study is high, and almost certainly avoidable with the addition of direct bronchoscopic visualization. Operative time is reported to be shorter with the Griggs technique, but this finding is unlikely to hold true for the single dilator technique, which reduces procedure time to less than 15 min. This author's experience with bedside endoscopic PCT using the single dilator indicates that it is a safe, rapid and cost-effective procedure with a low complication rate.

Keywords: Ciaglia, complications, endoscopic percutaneous dilatational tracheostomy, Griggs, single dilator

Introduction

Almost two-thirds of modern-day tracheostomies are performed on adult, intubated intensive care unit patients [1]. Moving these critically ill patients with all their monitors to the OR has inherent risks and increases demands on OR time, which is expensive and often in short supply [2]. PCT may be performed at the bedside and independently of OR schedules. My experience with over 150 endoscopically guided PCTs using the Cook Percutaneous Tracheostomy Introducer set (Cook Critical Care, Bloomington, IN, USA) with multiple graduated dilators has demonstrated that the procedure is at least as safe as

conventional tracheostomy in the OR. In a comparative study by Kost and Zeitouni (unpublished data), endoscopic PCT compared favorably with conventional tracheostomy in the OR, with complication rates of 16 and 30%, respectively. These findings have been substantiated in a number of other studies [3,4].

Percutaneous tracheostomy using a single dilator

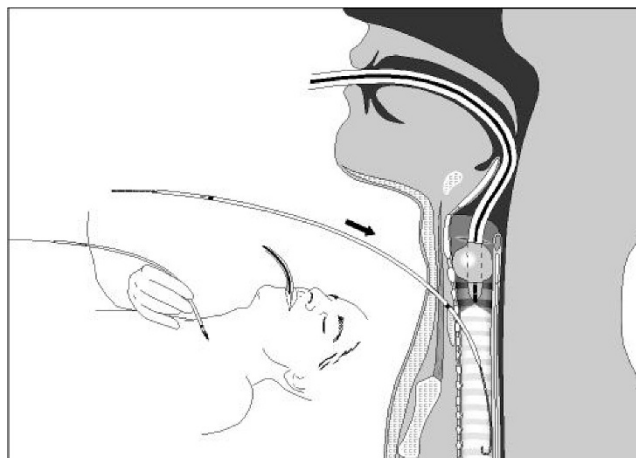
In an attempt to streamline the technique of PCT, a single dilator was recently introduced to replace the previously required multiple dilators, thus reducing the number of

steps required to complete the procedure. Dilatation of the tracheal aperture, which previously required multiple steps, can now be accomplished in a single step. This single dilator is sharply tapered and angled with a soft, hydrophilically coated tip. The procedure is suitable only in adult, intubated intensive care unit patients. It is contraindicated in the following situations: in emergencies; in the presence of an unprotected airway; in patients who require a positive end-expiratory pressure greater than 20 cmH₂O; and in children. It is also contraindicated in patients with a midline neck mass and in those with uncontrolled coagulopathies [5].

The procedure, using the single dilator, is performed with the head extended on the chest, using a standard preparation and drape. The patient is ventilated on 100% oxygen and vital signs are continuously monitored. Local anesthesia augmented by intravenous sedation is required. A 1.5 cm incision is placed one to two fingerbreadths above the cricoid cartilage, and the subcutaneous fat is separated using a curved hemostat. At this point, a flexible bronchoscope is inserted and aligned with the tip of the endotracheal tube (ETT). The bronchoscope and ETT are slowly withdrawn until the incision is maximally trans-illuminated, allowing continuous visualization of the entire procedure. A 14-gauge Teflon catheter introducer needle is inserted between the first and second, or second and third tracheal rings. A J-wire threaded through the intracath allows placement of an introducer dilator. This initial enlargement of the tracheal aperture facilitates positioning of the guiding catheter over the J-wire (Fig. 1). It is this J-wire/guiding catheter unit that forms the backbone over which the single dilator is inserted in an arc-like manner, accomplishing sufficient dilatation in one step (Fig. 2). In contrast, when using the multiple dilator kit, the tracheal aperture is sequentially enlarged using a series of graduated dilators. The final step in both techniques involves inserting a preloaded tracheostomy tube over the J-wire/guiding catheter unit (Fig. 3).

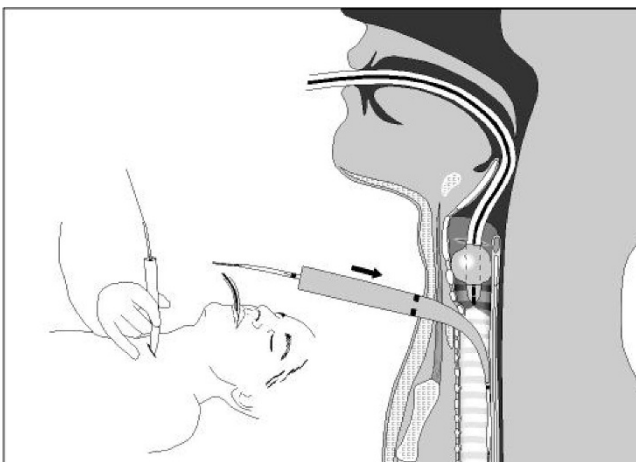
This procedure, using the single dilator, is currently being prospectively evaluated, with data available in 40 patients. All cases were performed or supervised by the same surgeon under continuous bronchoscopic guidance. There were 21 males and 19 females studied, who ranged in age from 20 to 84 years. Shiley tracheostomy tubes (Mallinckrodt Medical TPI Inc, Irvine, CA, USA) were placed in all patients with the size chosen according to the patient's needs. Thirty-one patients received Shiley no.8 tubes, whereas the remainder were fitted with Shiley no.6 tubes. Procedure time was 5–10 min. The overall complication rate was 10%. In one patient, arterial oxygen saturation briefly decreased to 84% for 20 s as a result of intratracheal bleeding. Postoperative oozing occurred in one patient, requiring only local measures for control. Two patients, each with significant coagulopathies, had more

Figure 1



The guiding catheter is placed over the guidewire, forming the unit over which the single dilator is introduced. Note the bronchoscope within the ETT, trans-illuminating the incision and allowing direct visualization of the procedure.

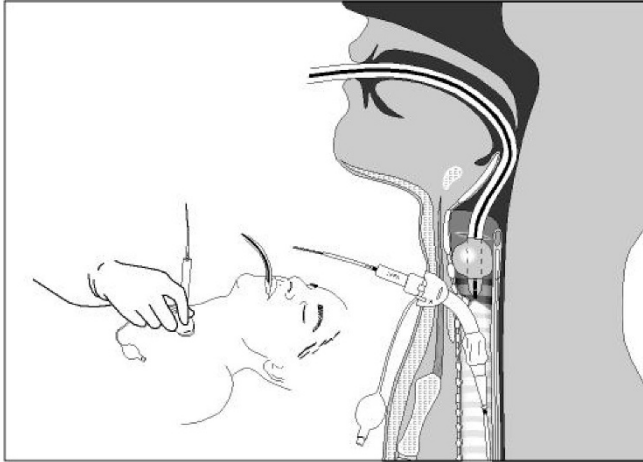
Figure 2



The single dilator is introduced in an arc-like motion over the guidewire/guiding catheter unit. Note the expected mild compression of the anterior tracheal wall. The integrity of the posterior wall is verified through the bronchoscope.

significant postoperative bleeding of approximately 250 cm³. Both of these patients responded to local measures and correction of the underlying coagulopathy. On follow up, six patients died with their tracheostomies *in situ*, 28 are alive with their tracheostomies *in situ*, and six have been successfully decannulated.

The 10% complication rate encountered with the single dilator compares favorably with the 16% complication rate using the multiple dilators. The single dilator also significantly shortens operative time by several minutes by eliminating multiple steps in the procedure. These early data

Figure 3

The tracheostomy tube, preloaded with the appropriate dilator, is inserted over the guidewire/guiding catheter unit. The guidewire, guiding catheter and dilator are removed and replaced with the tracheostomy tube inner cannula. The patient is now ventilated through the tracheostomy tube.

suggest that endoscopic PCT using the single dilator is a safe, rapid and technically simple procedure.

Ciaglia and Griggs techniques

There are several other PCT techniques described, many of which are fundamentally different from each other. Comparisons are important in resolving safety issues.

Two very different techniques were compared in the study by Añon *et al* [6], primarily in terms of complications and operative times. Although an interesting study, the report suffers from inherent weaknesses that raise questions about the validity of the conclusions reached.

First, the technical details provided are sparse, making it unclear exactly how the procedures were performed. Reviewing these details is important because they may have a direct bearing on the incidence of certain complications. In the Ciaglia technique, after the initial incision the subcutaneous fat is spread horizontally and no attempt is made to carry the dissection further, which could indeed result in bleeding from the thyroid gland. The authors mention 'repositioning' the ETT to just below the vocal cords. Without the use of a bronchoscope for trans-illumination through a previously made incision, how can this be done safely without a significant risk of accidental extubation? Both techniques were performed in a 'blind' manner, without the use of a bronchoscope. There is increasing evidence [7,8] that endoscopy, which allows direct step-by-step visualization of the procedure, significantly reduces the incidence of serious complications such as posterior tracheal tears, false passage, pneumothorax and subcutaneous emphysema. Indeed, in the article by Añon *et al* [6], a total of 15 complica-

tions occurred in 10 out of 63 patients. Six of these complications occurred in two patients, both of whom had tracheal tears; as a consequence of these tracheal tears, both patients also suffered a deterioration in oxygen saturation and developed subcutaneous emphysema. A false passage developed in another patient. It is likely that all seven aforementioned complications could have been avoided with bronchoscopy, which would have allowed visualization of the posterior tracheal wall and prevented the tears and creation of a false passage. This would have reduced the complication rate from 15 out of 63 (23%) to eight out of 15 (13%).

Whereas the Ciaglia technique involves blunt dilatation of an initial tracheal aperture by displacing adjacent tissue, in the Griggs technique dilatation of the tracheal aperture is achieved by passing a dilating forceps over the guidewire, into the trachea. Opening these forceps, which resemble a nasal speculum, forcibly dilates the tracheal aperture and any intervening tissue. Because the desirable tracheostomy site (between first and second or between second and third tracheal rings) often corresponds to the anatomical location of the thyroid isthmus, the latter may be torn on opening the dilating forceps, thus increasing the risk of bleeding. Three out of the four cases of hemorrhage occurred in the Griggs guidewire dilating forceps group. Indeed, the potential also exists for over-zealous insertion of the forceps through the posterior tracheal wall and even into the esophagus, particularly because the procedure is blind.

The second shortcoming of the study by Añon *et al* [6] is the lack of long-term follow up, and therefore the incidence of complications such as tracheal stenosis and tracheomalacia is unknown. Review of the literature suggests a low incidence of these complications in the endoscopic dilatational PCT technique.

Finally, reduced procedure time is often touted as an additional advantage of bedside PCT. Añon *et al* [6] noted a significantly lower procedure time in the Griggs guidewire dilating forceps technique compared with the Ciaglia technique employing multiple dilators. Although this may be so, it is unlikely that this difference would hold with the new Ciaglia single dilator kit. My experience indicates that the procedure can easily be performed in less than 15 min.

Conclusion

In conclusion, bedside endoscopic dilatational PCT is a safe, cost-effective alternative to standard open tracheostomy in the OR. Proper patient selection and attention to technical detail are essential elements in maintaining low complication rates. In particular, direct step-by-step visualization with bronchoscopy adds immeasurably to the margin of safety by largely preventing serious complications such as false passage, pneumothorax, posterior tracheal wall tears and subcutaneous emphysema.

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