

Commentary

Percutaneous dilatation tracheostomy: which technique is the best for the critically ill patient, and how can we gather further scientific evidence?

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Related to *Research* by Fikkers *et al.*, see page 395

Abstract

Percutaneous dilatation tracheostomy in the intensive care setting presents an increasingly important concept for establishing a large-bore tracheal airway with minimal surgical intervention. Over the last years, different technical solutions have been studied to assess their respective risks and benefits to determine whether one method is actually superior. A recent observational study comparing two such techniques prompted this commentary, which reviews the current literature, comments on study design and suggests interesting topics for future research in this field.

Keywords conic dilatation technique, fiberoptic bronchoscopy guidance, Griggs' guide wire dilating forceps (GWDF) technique, intensive care medicine, percutaneous dilatation tracheostomy, study design,

Numerous reports have been published in recent years regarding various methods of percutaneous tracheostomy (for review [1–3]). One of the general conclusions is that techniques that require the use of sharp instruments (e.g. Griggs' guidewire dilating forceps [GWDF] technique) apparently result in more complications. In addition, complications of percutaneous tracheostomy appear most likely to occur during the process of learning the technique – the 'learning curve'. Several large clinical trials reported a rather low incidence of complications with various percutaneous tracheostomy techniques [4–7], and those that directly compared different techniques for percutaneous tracheostomy [8–11] found them to be equally safe and efficacious when used by experienced physicians. Moreover, thus far there is no scientific evidence to support the current superiority of any single percutaneous tracheostomy technique in terms of safety and outcomes. All authors agreed that percutaneous tracheostomy is only suitable for elective procedures and definitely not in the emergency setting. Rather, conventional cricothyroidotomy should be

performed immediately in an emergency situation to safeguard the airway.

This issue of *Critical Care* reports work by Fikkers and coworkers [12]. The authors present data on 342 patients who underwent percutaneous tracheostomy during their course of intensive care treatment in a large teaching hospital. The data were collected in two consecutive periods, during which the care team performed percutaneous tracheostomy exclusively with the Griggs' GWDF technique (1997–2000) or with the conic dilatation technique (Ciaglia Blue Rhino™; Cook Critical Care, Bloomington, IN, USA; 2000–2003). Examining these data sets, the authors observed differences between the two techniques (or periods) in only four out of 33 possibly related complications (categories: perioperative; while cannulated; long-term). The numbers of difficult dilatations and of minor bleeding were higher with the conic dilatation technique (23 versus 0 [$P < 0.01$] and 24 versus 11 [$P = 0.02$], respectively). Voice problems and/or persistent hoarseness were also reported

more frequently after conic dilatation (22 patients versus 9 patients [$P < 0.01$]). Cosmetic problems were more common with the GWDF technique (10 versus 2 [$P = 0.03$]). In contrast, Fikkers and coworkers found no differences in time needed for the procedure, or in days spent in the intensive care unit. They concluded that both techniques are equally safe and effective.

This new work from Fikkers and coworkers in large part summarizes data (271 patients) from previous reports from the same group [13,14]. Their report in this issue includes 71 additional patients who all received percutaneous tracheostomy using the conic dilatation technique (Ciaglia Blue Rhino™), resulting in similar sample sizes for the study groups. The authors earlier reported on 100 of the patients who received conic dilatation tracheostomy [13], comparing data with a prior report on 171 patients cannulated using the GWDF technique [14]. In that report they have already concluded that these two techniques are comparably safe and easy to perform, similar to their findings presented in this issue.

Fikkers and coworkers indeed address a very important issue, because they analyze two different techniques for percutaneous tracheostomy with respect to practicability and the specific risks involved for patients in the intensive care setting. However, some drawbacks in their study design limit the ability to draw valuable evidence-based conclusions from this work regarding which of the two techniques may be more appropriate in clinical practice from the viewpoint of the intensivist. Because a sequential study design over a period of 6 years was used, the data might have been subject to differences in patient selection and/or medical staff between the two time periods, when one technique was applied exclusively. This could have influenced the results, partly accounting for the apparent contrast with current literature (e.g. fewer complications with the GWDF technique than with the Ciaglia Blue Rhino™ technique). Also, apparently, a rather large group of individuals performed the procedures described, and it remains unclear what kind of training they received before their participation in the study. This suggests that various effects of multiple learning curves and different degrees of experience might have confounded the results, and therefore possible benefits of one technique over the other could have been obscured. Finally, during the period of data collection the authors implemented a new step in the classical technique of conic dilatation tracheostomy (introduction of a Crile's forceps for blunt dissection of the pretracheal tissue), but it is unclear whether they controlled for the resulting effects in their data analysis and presentation.

Thus, Fikkers and coworkers' recent work exemplifies a critical dilemma in clinical research. The study presented may provide highly important information for the institution where it was conducted, because the data have probably already

been used for institutional quality management in intensive care medicine. However, the same information is not necessarily helpful for deciding between different methods for elective long-term airway management in critically ill patients in general. Only studies that are performed in a prospective, randomized and controlled manner will be able to gather further scientific evidence regarding the risks and benefits of different techniques for percutaneous dilatation tracheostomy. In addition, such studies should try to implement the most recent developments (e.g. [11]), enhancing their appreciation within the research community and fostering progress in the field.

The work by Fikkers and coworkers raises some interesting questions regarding percutaneous dilatation tracheostomy in the intensive care setting, and these indeed warrant future research. First, the preference of percutaneous tracheostomy over open tracheostomy is still intensely debated (for review [15,16]). Fikkers and coworkers, like other authors in the past, did not report findings in the patients who received surgical tracheostomy or were left intubated during the period while study patients were assigned to percutaneous tracheostomy. Provided that an appropriate study design is used, such parallel data may help to guide clinicians in their decision making in individual patients. Second, the value of fiberoptic endoscopy in guiding tracheal puncture and placement of the tracheal cannula during percutaneous tracheostomy is unquestioned [8–10]. Even though Fikkers and coworkers apparently provided fiberoptic bronchoscopy during parts of the procedure, they still observed a relatively high incidence of puncture of the posterior tracheal wall, puncture of the endotracheal tube, or subsequent oesophageal perforation or false route during placement of the tracheal cannula. It remains unclear whether this was related to the level of procedural experience in the individuals performing the procedures or due to other factors. These observations shed light on the benefits but also on the apparent limitations of fiberoptic guidance of percutaneous tracheostomy, and may provide a stimulus for efforts to clarify this issue.

In summary, Fikkers and coworkers, in two series (each over a 3-year period), studied the effects of two well established techniques of percutaneous tracheostomy (Griggs' GWDF technique and the conic dilatation technique [Ciaglia Blue Rhino™]) in a large number of patients. They found both methods to be equally safe and effective. However, because they recognise the limitations of a retrospective analysis, they plan to conduct a prospective, randomized study to compare GWDF and conic dilatational tracheostomies. The findings of that study will be very important because they may indeed determine the role for both techniques in critical care medicine.

Competing interests

The author declares that he has no competing interests.

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