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Tracheostomy in the Intensive Care Unit: An Italian Snapshot

Optimisation of percutaneous and surgical tracheostomy techniques is one of the challenges of modern intensive care unit (ICU) management. Different percutaneous tracheostomies (PTs) have been developed worldwide over the years. Ciaglia, in North America, described the multiple-step dilational tracheostomy; Griggs, in Australia, defined the guidewire dilating forceps (GWDF) technique; while, in Italy, Fantoni and Frova described the translaryngeal method and the rotational dilating technique, respectively. Different techniques may produce different results. For this reason, the current literature on tracheostomy shows a huge heterogeneity in procedures, outcomes and complication of the techniques currently performed in ICUs. Tracheostomy heterogeneity is also responsible for the different approaches developed in Europe. In Italy, a recent national survey (Vargas et al. 2012) tried to take a snapshot of the current practice concerning PT in critically ill patients. The aim of our work is to analyse the results of the Italian experience, matching them with the European context.

Current practice of Percutaneous Tracheostomy in Italy

Tracheostomy has many potential advantages over endotracheal intubation and is now used in ICUs worldwide (De Leyn et al. 2007). In the past years, many percutaneous dilational tracheostomies (PDT) have been proposed for critically ill patients (Kluge et al. 2008). Italy holds great and antique tradition regarding the tracheostomy procedure. In 1546, Antonio Brasavola, an Italian physician of Ferrara, performed the first successful tracheostomy in a patient with a peritonsillar abscess; at the same time, at the University of Padua, two surgeons and anatomists described a detailed tracheostomy technique using a different cannula and different equipment (Rajesh et al. 2006). In Italy, PDT techniques are indifferently performed. A national report Promoting Patient Safety and Quality Improvement in Critical Care (PROSAFE)—assessed the amount of interventional procedures performed in ICUs, and reported a case series of 5,555 tracheostomies performed in 167 ICUs. According to this report, the PDT more frequently performed was Ciaglia single step dilator (29.7%), followed by surgical tracheostomy (ST) (26.7%), PercuTwist® (13.6%), Griggs (11.6%), Ciaglia multiple dilator (8.1%) and the translaryngeal technique (TLT) (6%). Unfortunately, this report did not provide any information about clinical attitudes and management of PDTs performed in national ICUs. In order to obtain this information, we conducted an Italian mail survey to investigate the clinical practice of PDTs performed in Italian ICUs.

A National Survey

Our aim through conducting this survey in Italy was to describe the current situation regarding different techniques, indications, main procedural features, early and late complications, as well as timing of tracheostomy in ICUs (Vargas et al. 2012). This survey, approved by the Italian Society of Anesthesia, Analgesia and Intensive Care (SIAARTI), referred to the tracheostomies performed in 2011. We received questionnaires from 131 ICUs; this number covers about 30% of Italian ICUs, according to a recent statistical report (Italian Department of Health 2012). We collected data on 5,960 tracheostomies, which were mainly performed in medical-surgical ICUs. According to our data, the estimated total number of tracheostomies performed in Italy in 2011 was approximately 17,880.

Tracheostomy Techniques

Our survey allows deeper analysis of the national approach to the tracheostomy procedure, as compared with the approach to the procedure on a European scale. According to previous surveys carried out in Germany (Kluge et al. 2008) and the UK (Veenith et al. 2008), Ciaglia Blue-Rhino® (CBR) is the most common technique (32.8%) performed by Italian intensivists in the ICU, demonstrating the presence of a common European trend. The surgical approach seems to show a constant decline, except in France (Blot et al. 2005); in Italy, its use represents about 11% of tracheostomies in the ICU, with higher use indicated in large ICUs which have more than eight beds (Vargas et al. 2012). Large ICUs were also shown to be more likely to choose GWDF techniques rather than other percutaneous techniques in the same study. These facts could be explained in terms of the further time and resources needed by both surgical and GWDF tracheostomy procedures, as compared to other percutaneous commercial kits (Ambesh et al. 2002; Anon et al. 2004). Since their introduction, PDTs generated an intense debate in the scientific community. Even large meta-analyses show contrasting results in the comparison between surgical and non-surgical tracheostomy techniques, with some authors finding better outcomes and safety profiles in the former (Dulguerov et al. 1999), and others in the latter (Freeman et al. 2000). Despite these contrasts, for its simplicity and low incidence of serious complications, PT seems nowadays to be the choice of most ICU physicians worldwide.

The Translaryngeal Technique

The translaryngeal tracheostomy (TLT) technique plays a particular role in Italy. Antonio Fantoni developed TLT in the 1990s, with the aim of reducing potential posterior tracheal wall damage (Fantoni et al. 1997). TLT is universally recognised to require longer training. Our survey showed that TLT was the technique performed in a case series of 905 patients (15.2%) in Italy, in line with Germany (13%) (Kluge et al. 2008) and France (20%) (Blot et al. 2005), but significantly higher than that shown in the UK survey (Veenith et al. 2008), where TLT is included among "other techniques", accounting for less than 5% of total PT.

It is quite difficult to compare the impact of TLT methods on complications and outcome, since most of the studies worldwide use CBR or GWDF as a reference for percutaneous techniques.

An Italian randomised trial, with a oneyear double-blind follow-up, tried to compare complications and outcomes of Fantoni's TLT with those of ST (Antonelli et al. 2005). The results showed a reduction of time consumption and major bleeding in TLT, whilst no difference was shown in development of severe infections or survival (Antonelli et al. 2005).

Although less used than before, TLT still animates discussions in literature. Also of interest are the results of controlled trials. TLT was compared to forceps dilational PT in a French study (Cantais et al. 2002), and to CBR in an Italian trial (Divisi et al. 2009), which each showed that TLT had a lower safety profile. It is of interest how both studies concluded that most of the complications with TLT are due to its complexity. This suggests that they might be reduced by appropriate training, since the learning curve for Fantoni's TLT is known to be slower than that for other PTs. Despite this, many centres still elect TLT as their choice for PT due to the very low incidence of bleeding and tracheal sequelae when it is performed by trained physicians, as exposed in large case studies, e.g. in Germany (Konopke et al. 2006) and Canada (Sharpe et al. 2003). On the basis of this inhomogeneity and unanimous concern about the fact that TLT complexity might mask its advantages over other PT techniques, a Greek team (Katsaragakis et al. 2007) proposed a modified translaryngeal method that combines the retrograde TLT with a blind needle puncture of the trachea. Further studies are necessary to validate such method.

Indications and Timing

Our Italian survey confirmed prolonged mechanical ventilation or difficult weaning as the leading indication for tracheostomy (74.3%), as in the French survey (Blot et al. 2005). Germany and the UK's surveys did not explicitly investigate PT or ST indications. A recent Spanish prospective, observational cohort study investigated patients receiving ST or PT under this indication, and showed that a longer time-to-decannulation was associated with male gender, age >60 years and high suctioning frequency (Hernandez et al. 2012). On the other hand, the same study found that among patients whose tracheostomy indication was impaired level of consciousness or inability to manage secretions, the main factors predicting a long time-to-decannulation were Glasgow Coma Scale and high suctioning frequency.

Timing is a widely discussed parameter of tracheostomy. It is well known that tracheostomy ratio, defined as incidence of tracheostomy per ICU patient, shows a wide intra- and inter-country variability (Nathens et al. 2006). Many ICUs use guidelines that include a specific time window (Scales et al. 2008). To optimise patient care and outcome, different studies investigated whether a specific timing was effectively associated with an improvement in patient survival or complication rates. The two arguments most commonly used to support early tracheostomy are that it could reduce infectious complications and promote early weaning. A recent Italian multicentric prospective observational study randomised more than 400 intubated patients without pre-existing lung infection to early (<7 days) or late tracheostomy (Terragni et al. 2010), and showed slightly higher incidence of ventilator-associated pneumonia (VAP) in the latter group, though without reaching statistical significance (Terragni et al. 2010). Regarding the effects on weaning, retrospective studies showed an association between early tracheostomy and early weaning (Freeman et al. 2005) confirmed by randomised trials (Rumbak et al. 2004) that suggested a causal link between the two. A more recent, larger study that tried to reduce bias in patient selection concluded that no advantage on weaning time was presented by early tracheostomy (Blot et al. 2008). A two-way analysis of variance between groups (ANOVA) was conducted to analyse differences between timing in countries; no differences between countries were indicated ($P>0.9$). Analysed data conclude that among such countries there is a homogeneous preferential use of intermediate (7- 14 days) tracheostomy (mean 70.3%) compared to early (<7 days, mean 18.6%) or late (>14 days, mean 11.1%). Early tracheostomy was more likely to be performed in small or non-teaching hospitals' ICUs in both Italian and French surveys.

Procedural Features

Past studies suggest that the adoption of locally developed guidelines could decrease the incidence of PT associated complications (Cosgrove et al. 2006). In our survey, a protocol for sedation during tracheostomy was used by 83.2% of participating ICUs, while only 58.8% of ICUs used a protocol for mechanical ventilation during the procedure. Tracheostomy was performed mainly with the endotracheal tube already present in patients (83.2%). Furthermore, 62.6% of ICUs declared having a specialised tracheostomy team. There is an increasing interest in understanding mechanisms that can enhance the efficacy of tracheostomy procedures while consolidating collaborative teamwork between physicians and nurses (Mitchell et al. 2012).

Continuous bronchoscopic guidance was routinely used in 93.1% of ICUs in Italy (Vargas et al. 2012), 80% in the UK (Veenith et al. 2008), 98% in Germany (Kluge et al. 2008), 36% in the Netherlands (Fikkers et al. 2003) and 16% in Spain (Anon et al. 2004). Note that the comparison between those percentages might be biased due to differing years of publication, since it is known that fibroscope use in ICUs dramatically increased in the last decade.

Complications

Our Italian survey ranked "minor bleedings" as the most frequent early complication, whilst the French survey identified a more generic group of "tracheal complications", more notably underlining the risk perceived by the physician rather than the real incidence of complications. The complication rate is the most difficult parameter to be distinguished by a survey study, and prospective controlled trials are more suitable for such purpose. An already cited study, while investigating another endpoint, reported an overall incidence of early plus late complications of 39.0%, which lowers to 23.9% if non-suppurative stoma inflammation is excluded (Terragni et al. 2010).

Conclusions

Tracheostomy is nowadays a procedure frequently performed in ICUs. Tracheostomy techniques, procedural features as well as complications are markedly heterogeneous among European ICUs (Veenith et al. 2008). Our national analysis can be considered a snapshot of the Italian way of performing tracheostomy in the ICU. Our study found that:

- 1) CBR was the preferred technique among PT;
- 2) Prolonged mechanical ventilation and difficult weaning were the leading indications for PT or ST;
- 3) Tracheostomies were mainly performed within seven and 14 days of mechanical ventilation;
- 4) PTs and STs were mainly performed by a specialised team with the use of sedation and ventilation protocol;
- 5) Most of the PTs were performed under continuous bronchoscopic guidance; and
- 6) Minor bleeding was the most frequent early and late complication.

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