

教-VIII Percutaneous Tracheostomy: State of the Art

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Tracheostomy is one of the most frequently performed surgical procedures in the critically ill patients. Open surgical tracheostomy (OT) has traditionally been performed by surgeons in the operating room. In the past half-century, several methods of percutaneous tracheostomy (PT) have been introduced. Some never got very far because of the high complication rates. The most popular PT technique worldwide today is the percutaneous dilatational tracheostomy described by Ciaglia, utilizing serial dilators or a single tapered dilator over a guidewire in a modified Seldinger technique. In some parts of the world, the PT technique described by Griggs (using a modified Howard Kelly forceps) and Fantoni (translaryngeal) remain popular. PT is most commonly performed at bedside in the intensive care unit (ICU) with or without bronchoscopic guidance.

The economic issue was one of the important aspects of PT that led to its early popularity. OT has traditionally been performed in the operating room. In many institutions, it remains so. When first introduced, bedside PT touted not only its ease of performance with comparable safety profile to OT, but also a significant decrease in hospital charges and a more efficient utilization of ICU resources. The latter reflects the absence of operating room charges and anesthesia fees associated predominantly with OT's that are performed in the operating room. In the past few years, reports of comparable safety in performing OT at bedside have been forthcoming. Bedside OT is performed with a standard reusable tracheostomy tray and electrocautery, without operating room charges and anesthesia fees. Although most studies have reported a shorter operative time with PT compared to OT, this is only an issue when the procedure is performed in the operating room, in which longer operating time entails higher charges. Since there is an additional cost and charge for the disposable kit for

PT, it is a little more costly than OT when both are performed at bedside. As the economic issue is no longer a distinct advantage of PT over OT when both are performed at bedside, the safety and technical aspects of PT are now the overriding issues in comparing the merits of PT and OT.

Most of the studies looking at the comparative safety and outcome profiles of PT and OT lack the rigorous design. Many of the OT's in the studies were performed in the operating room, not at bedside. There are two recent meta-analyses comparing PT and OT. The meta-analysis of Dulguerov and colleagues included observational and prospective studies, and several different PT techniques not limited to Ciaglia's technique. The study found that PT had a higher prevalence of perioperative complications compared to OT, in particular in perioperative deaths and cardiorespiratory arrests. The meta-analysis of Freeman and colleagues, on the other hand, used only prospective studies comparing PT (specifically Ciaglia's technique) to OT. The study found potential advantages in PT over OT in ease of performance, and in lower incidence of peristomal bleeding and postoperative infection. Both meta-analyses are limited by the substantial heterogeneity in the studies they cited.

In recent years, several studies involving different techniques of PT and the prospective

comparison between them have been published. Other studies have also looked at the safety and favorable outcome of PT in select patient population, including obese patients and those with limited neck extension. Virtually every case scenario that was previously reserved for OT has been successfully managed with PT by anecdotal experience, including cases of emergency tracheostomy, prior tracheostomy, short neck, coagulopathy and bleeding diathesis. In experienced

hands, even when performed by non-surgeons, the accumulating data seem to point towards an impressive safety profile for PT that is comparable to ST.

The long-term complication rates of tracheostomy itself, most notably tracheal and subglottic stenosis and tracheomalacia, remain unanswered. A confounding factor in assessing these long-term complications is the potential antecedent airway injury caused by translaryngeal intubation prior to the tracheostomy. Since tracheostomy is performed mostly in critically ill patients, many of the patients do not survive. No study has attempted to vigorously and prospectively define these complications in assessing the long-term survivors of patients with prior tracheostomy. The routine use of bronchoscopic guidance in PT may provide the benefit of visualizing and recording of the tracheal mucosal injury, tracheal wall abnormalities, and vocal cord and subglottic injury prior to tracheostomy, which may be useful in the prospective evaluation of long-term airway sequelae.

The trend towards minimally invasive surgery within the surgical specialties, and the development of interventional services within the non-surgical specialties have spurred considerable interest in bedside tracheostomy in the past decade. As new hospital designs of modern ICU's become more and more sophisticated, some critically ill patients who are at high risk for transport to the operating room are being managed surgically at bedside in the ICU. If the trend continues in bringing the operating room to the ICU, could we be witnessing the seeds of a new breed of future specialists, such as the interventional critical care intensivists?