Early tracheostomy: who decides?

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SUMMARY

- This review paper describes the advantages and limitations of early tracheostomy.
- In the context of tarcheostomy tube insertion, it discusses the use of evidenced-based protocols, tracheostomy timing, prolonged mechanical ventilation, ventilator-associated pneumonia, and optimal outcomes.
- It is concluded that, whilst the research evidence is limited, the benefits of early tracheostomy tube insertion outweigh the disadvantages.

INTRODUCTION

First performed around 100 BC, tracheostomy, which is documented as the oldest surgical procedure, has had a long and controversial history (Rajesh & Meher, 2006). While Hippocrates condemned tracheostomies due to a fear of causing damage to the carotid artery, Antyllus, in second century AD, refined the technique dividing the third and fourth tracheal ring to avoid cartilage damage, and used it selectively on patients. In 1546, Antonio Musa Brasavola, an Italian physician, performed the first documented case of a successful tracheotomy in a patient, however Rajesh and Meher (2006) also outlined that overall the infection and mortality rates of these early procedures were high. However, in Copenhagen in 1952, after patients with poliomyelitis were treated with tracheostomy and mortality was virtually halved, tracheostomy came into more common usage (Intensive Care Society, 2006).

Implementing evidence based practices can both improve the health outcome for patients and the economic outcome for healthcare providers. Smith et al. (2005 cited Hatler et al., 2006) stated that escalating healthcare costs spark the desire not only by the hospital but the consumer to embrace practices that are based on evidence. Critically ill patients requiring the services of an intensive care unit (ICU), where multiple technologies are used by specialised staff often on a one-to-one basis, are at high risk of death and disability and their care is extremely expensive (Randolph & Pronovost, 2002).

This paper reviews the current literature on the use of tracheostomies in the ICU and the benefits tracheostomy may offer when compared to endotracheal intubation. In particular, the review focuses on whether earlier placement of tracheostomy improves outcomes for those patients identified as requiring prolonged mechanical ventilation (MV) and whether the development and implementation of an evidenced-based protocol could improve both efficiency and health outcome for patients.

Tracheostomy versus oral/nasal endotracheal tube insertion

The insertion of an oral or nasal endotracheal tube (ETT) is an aggressive procedure which can annul the cough reflex, produce tracheal lesions, remove some of the natural defences and facilitate entry of microorganisms directly into the lung. Safdar et al. (2005) and Kollef (2004) state that ventilator-associated pneumonia (VAP) is closely related to the insertion of an ETT and further suggest that the disease should be renamed 'ETT associated pneumonia'.

Among patients in whom VAP developed Hatler et al. (2006) found that the length of stay in ICU increased by about 6 days and 30.5% of patients died, and Cason et al. (2007) state mortality can be as high as 70%. However, Ramirez et al. (2007) in a review paper, stated that although tracheostomy was found to reduce time on MV and length of stay (LOS) in ICU, findings were inconclusive regarding the reduction of VAP. A decrease in VAP by 80% was noted however when a VAP prevention protocol was used in conjunction with early tracheostomy (Clum & Rumbak, 2007). Vollbrecht and Hyzy (2006), while stating that the presence of a tracheostomy was found to be associated with a sixfold increase in nonsocomical pneumonia, which in part could be attributed to the patient having an infection on the day of the tracheostomy, further stated that delaying the tracheostomy has not been shown to decrease the nonsocomical pneumonia rate. While Hsu et al. (2005) agree with Clum and Rumbak (2007) that early tracheostomy may decrease the rate of infection, they question whether if a tracheostomy tube has not been inserted by day 21 it should be inserted at all. In their small retrospective study of 163 intubated patients, the longer the patient was intubated before tracheostomy the greater the chance of developing post-tracheostomy pneumonia, failure to wean and prolonged MV. This, they explained, could be attributed to higher white blood cell counts, lower platelet counts, and poor PaO2: FiO2 ratios and also that prolonged MV may break down natural defence barriers.

Risks

While tracheostomy is generally a well tolerated procedure, as with all interventions, there is an element of risk. Both Blot and Melot (2005) and Clum and Rumback (2007), while acknowledging the potential complications, suggest that benefit outweighs risk. Vollbrecht and Hyzy (2006) concur, however they also state that there is no data to suggest that tracheostomy has more risks than ETT ventilation. Although most studies in this review mention risk, they also mention benefits to be gained from further research. However, in a letter to a medical journal an ear, nose and throat specialist expressed alarm at the potential ramifications of performing early tracheostomies on patients who are already systemically unwell, suggesting that inpatient stay could be lengthened due to rehabilitation with a tracheostomy tube in-situ or complications such as tracheal stenosis (Philpott, 2005). Griffith et al. (2005) in a reply to the Philpott et al.'s letter outlined that an improvement in mortality for some patients may come at the expense of an unnecessary tracheostomy for others. Philpott et al.'s concerns are also expressed by others. Cox et al. (2007) and MacIntyre et al. (2005) point out that although

tracheostomies may reduce ICU LOS and reduce ICU costs, the savings made in ICU may be offset by the costs of long term care elsewhere.

When to insert a tracheostomy tube?

The point in a patient's illness, when the advantages of inserting a tracheostomy tube outweigh the risks involved, continues to be a source of debate in the ICU setting, where tracheostomy is a common procedure. Around the world however; there is a limited evidence base to support its use (Intensive Care Society, 2006). In 1989, during the American College of Chest Physicians Consensus Conference on Artificial Airways in Patients Receiving Mechanic Ventilation tracheostomy tube placement was recommended between day 10 and 21 or earlier if long term ventilation was identified (Plummer & Gracey, 1989). However, although there still appears to be a general compliance with this broad recommendation only two scientifically rigorous tests have been undertaken in the fifteen years since (Griffiths et al., 2005).

Today, there is still much controversy and no standardised guidelines for the use of tracheostomy, however, many studies are being undertaken into the effectiveness and health outcome for patients. As yet, no randomised controlled trials comparing the use of ETTs with tracheostomy tubes appear to have been undertaken. This reflects the difficulty such a comparison would entail. Any trial or study would need to use one or the other and then compare the outcomes, and this is neither a practical or feasible solution (TracMan Protocol, 2006).

Recent studies have compared the timing of tracheostomy to evaluate outcomes for patients, however as Cox et al. (2007) point out, not only is there controversy surrounding the procedure, there are no uniform definitions from which to interpret literature or evaluate outcomes. Another significant concerning variable is the patient population being studied. This ranges from both acute and long term medical and surgical ICU patients to patients with burns, head injury and trauma (Clum & Rumbak, 2007). It is seems clear that in order to develop and implement evidenced based protocols there needs to be more definitive criteria (Randolph & Pronovost, 2002).

Early tracheostomy?

Current literature suggests that the main advantages early tracheostomy tube insertion has over ETT insertion is that less time is spent on MV, less sedation is required, and lower ICU and in-hospital mortality rates result (Flaatten et al., 2006; Combes et al., 2007). Vollbrecht and Hyzy (2006) concur, and add that not only does tracheostomy offer immediate patient comfort but that sedation use can be drastically reduced with no increase in agitation.

Sedation is an essential requirement for nearly all patients intubated with an ETT. Used effectively it can control pain and anxiety and reduce time spent on MV. However, adverse drug side effects and lack of pain protocols can lead to prolonged recovery, poor outcome for the patient and increased healthcare costs whereas early tracheostomy tube insertion could help to minimise risks and improve outcome. Decreased use of sedation associated with tracheostomy tube use may also allow for improvements in speech, oral intake and mobility enhancing nursing care, particularly mouth care and suctioning which in turn can lead to a decrease in infection (Intensive Care Society, 2006; Clum & Rumbak, 2007; Morris & Herridge, 2007). Morris and Herridge (2007) report that an added benefit of early tracheostomy is early mobilisation, which may improve muscle, nerve and brain dysfunction that often occurs with a critical illness and MV. However, the need for further research was suggested, as current attitudes and practices in ICU along with problems of implementation are unknown.

Type of tracheostomy

Apart from timing of tracheostomy, another notable difference to consider is type of tracheostomy performed. Commonly, two approaches to tracheostomy are used: open surgical tracheostomy (ST) and percutaneous dilational tracheostomy (PDT). Flaatten et al. (2006), while concluding that early tracheostomy produced favourable outcomes in PMV, noted that the since the introduction of PDT, tracheostomy has become more common. The main benefit of PDT is that it facilitates easy rapid placement by the intensivist at the bedside, in contrast to ST where booked theatre time is required (Combes et al., 2007). In an Australian study it was noted that there was a low complication rate of PDT compared to ST and that with any technical procedure the level of experience of the person performing the procedure will influence the outcome and risk (Cosgrove et al., 2006). As with other studies in this review, note was made of the limited data that existed in regard to the procedure and mention was made of the current UK TracMan Trial and the clarification that this large multi-centred randomised trial should bring to understanding the effectiveness, timing and quality of tracheostomy tube insertion.

Prolonged mechanical ventilation

Patients requiring prolonged MV have different needs from other patients in ICU (Cox et al., 2007). The majority are elderly, have significant co-morbidities and a higher risk of post-discharge death, experience a notable decrease in functioning, require increased amounts of unpaid family assistance and are more resource intensive (Cox et al., 2007).

In 2004, at the National Association for Medical Direction of Respiratory Care (NAMDRC) conference, it was decided that since the prolonged MV definition currently in use depended upon which body defined it, there was a need to review existing practices. In view of the expected increase in prolonged MV, recommendations were made that high priority should be given to funding research aimed at predicting survival, functional outcomes and costs. It was also recommended that prolonged MV be defined as MV for greater than 21 days or for greater than six hours per day (MacIntyre et al., 2005). This was in line with the original recommendations of 1989 (Plummer & Gracey, 1989). Blot and Melot (2005) also reported that similar guidelines were presented at a French critical care conference, however it was also noted that since actual clinical benefits and risks are unknown the decision and timing of using a tracheostomy was generally still decided by physicians. One limitation of the French study (Blot & Melot, 2005) was that only one fifth of the ICUs that were contacted responded, which may show that only those with a strong interest in tracheostomy took part. However more than two years later, several studies still define prolonged MV within a wide range of between 24 hours to 29 days (Cox et al., 2007; Clum & Rumbak, 2007).

Tracheostomy is currently the standard intervention for patients requiring prolonged MV. Some studies are showing that if a tracheostomy tube is inserted earlier, patients may spend less time on MV, and experience improved ICU survival rates and shorter in-hospital LOS, and decreased healthcare costs. However, few studies have drawn conclusions on the optimal timing of this procedure (TracMan, Trial Protocol, 2006; Combes et al., 2007).

In prolonged MV with tracheostomy compared to prolonged MV without tracheostomy, whilst there are benefits of tracheostomy clinicians also face difficulties in entering patients into trials that may limit necessary placement of tracheostomy tubes. This adversely influences both the trial and patient outcomes (Intensive Care Society, 2006; Cox et al. 2007). As well as the influence of physicians, effective nursing care has been shown to have a positive influence on the length of time on MV and could also affect trial outcomes when comparing different hospitals (MacIntyre et al., 2005).

CONCLUSION

In conclusion, the literature reviewed illustrated the complexity of the subject and the difficulty found in researching where patient health may need to be risked to achieve findings that are more accurate. Although compliance with evidenced based protocols and guidelines are sought to achieve optimal outcomes other factors such as specialist staff available or compliance with protocols remain unpredictable. The fact that small studies when implemented well can achieve significant results, as demonstrated by Hatler et al., (2006), suggest that other improvements in the care of patients with ETT, may make early tracheostomy necessary and since ICU provides only part of the care needed to provide optimal outcomes for patients a more multidisciplinary approach may be needed. There is no doubt however, that early tracheostomy for prolonged MV provides many benefits and that further research may result in evidenced-based protocols that are needed to optimise outcomes for patients.

REFERENCES

Blot F, Melot C; Commission d'Epidémiologie et de Recherche Clinique (2005). Indications, timing, and techniques of tracheostomy in 152 French ICUs. Chest127 (4), 1347-1352.

Cason C, Tyner T, Saunders S, Broome L (2007). Nurses' implementation of guidelines for ventilator-associated pneumonia from the Centers for Disease Control and Infection. American Journal of Critical Care 16 (1), 11-39.

Clum R, Rumbak M (2007). Mobilizing the patient in the intensive care unit: the role of early tracheostomy. Critical Care Clinics 23 (1), 71-79.

Combes A, Luyt CE, Nieszkowska A, Trouillet JL, Gibert C, Chastre J (2007). Is tracheostomy associated with better outcomes for patients requiring long-term mechanical ventilation? Critical Care Medicine 35 (3), 802-807.

Cosgrove JE, Sweenie A, Raftery G, Carey SM, Kilner AJ, Nesbitt ID, Cressey DM, Hirschauer N, Laws PG, Ryan DW (2006). Locally developed guidelines reduce immediate complications from percutaneous dilatational tracheostomy using the Ciaglo Blue Rhino technique: a report on 200 procedures. Anaesthesia and Intensive Care 34 (6), 782-787.

Cox CE, Carson SS, Lindquist JH, Olsen MK, Govert JA, Chelluri L; Quality of Life After Mechanical Ventilation in the Aged (QOL-MV) Investigators (2007). Differences in one year health outcomes and resource utilisation by definition of prolonged mechanical ventilation: a prospective cohort study. Critical Care 11 (1), R9.

Flaatten H, Gjerde S, Heimdal J, Aardal S (2006). The effect of tracheostomy on outcome in intensive care unit patients. Acta Anaesthesiologica Scandinavica 50 (1), 92-98.

Griffiths J, Barber VS, Morgan L, Young JD (2005). Systematic review and meta-analysis of studies of the timing of tracheostomy in adult patients undergoing artificial ventilation, British Medical Journal 330 (7502), 1243.

Hatler CW, Mast D, Corderella J, Mitchell G, Howard K, Aragon J, Bedker D (2006). Using evidence and process improvement strategies to enhance healthcare outcomes for the critically ill: a pilot project. American Journal of Critical Care 15 (6), 549-554.

Hsu CL, Chen KY, Chang CH, Jerng JS, Yu CJ, Yang PC (2005). Timing of tracheostomy as a determinant of weaning success in critically ill patients: a retrospective study. Critical Care 9 (1), R46-R52.

Intensive Care Society (2006). TracMan - Tracheostomy Management in Critical Care, version 9. London, Intensive Care Society. [Online]. Available at: http://www.tracman.org.uk (accessed 15 January 2008).

Kollef MH (2004). Prevention of hospital-associated pneumonia and ventilator-associated pneumonia. Critical Care Medicine 32 (6),1396-1405.

MacIntyre NR, Epstein SK, Carson S, Scheinhorn D, Christopher K, Muldoon S; National Association for Medical Direction of Respiratory Care (2005). Management of patients requiring prolonged mechanical ventilation: report of a NAMDRC consensus conference. Chest 128 (6), 3937-3954.

Morris P, Herridge M (2007. Early intensive care unit mobility: future directions. Critical Care Clinics 23 (1), 97-110.

Philpott C, Bennett A, Tassone P (2005). Timing of tracheostomy in adult patients: potential ramifications are alarming. BMJ 331 (7513), 404-405.

Plummer AL, Gracey DR (1989). Consensus conference on artificial airways in patients receiving mechanical ventilation. Chest 96 (1), 178-180.

Rajesh O, Meher R (2006). Historical review of tracheostomy. The Internet Journal of Otorhinolaryngology 4 (2) [Online]. Available at: http://www.ispub.com/ostia/index.php?xmlFilePath=journals/ijorl/vol4n2/tracheostomy.xml (accessed 15 January 2008).

Ramirez P, Ferrer M, Torres A (2007). Prevention measures for ventilator-associated pneumonia: a new focus on the endotracheal tube. Current Opinion in Infectious Diseases 20 (2), 190-197.

Randolph A, Pronovost P (2002). Reorganizing the delivery of intensive care could improve efficiency and save lives. Journal of Evaluation in Clinical Practice 8 (1), 1-8.

Safdar N, Crnich CJ, Maki DG (2005). Nosocomial infections in the intensive care unit associated with invasive medical devices. Current Infectious Disease Reports 3 (6), 487-495.

Smith C, Cowan C, Sensenig A, Catlin A; Health Accounts Team (2005). Health spending growth slows in 2003. Health Affairs 24 (1), 185-194.

Vollbrecht T, Hyzy R (2007). Overview of Tracheostomy. [Online]. Available at: http://www.utdol.com/utd/content/topic.do?topicKey=int-pulm/4602&view=text (accessed 23 March 2007).