

Debunk the Myth: Percutaneous Tracheostomy in Cervical Spine Injury

Deepak Govil¹, Anant Vikram Pachisia²

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A tracheostomy is a technique to create an artificial airway and insert a tracheostomy tube to keep it open. It can be performed surgically or by percutaneous dilatational technique (PDT). The PDT using Seldinger's technique was popularized by Ciaglia in 1985, since then many modifications and new techniques of PDT have evolved. PDT has over time become a standard of care in intensive care units (ICUs) across the world. However, the ideal time for PDT in ICU still remains a debated topic. Young et al. in their randomized control trial (RCT) found that early tracheostomy (within 4 days) was not associated with an improvement in 30-day mortality.¹ Current guidelines also are inconclusive with regard to the timing of PDT in ICU.²⁻⁴

Bronchoscopy and ultrasonography (USG) are two important adjuncts for performing PDT:

- **Bronchoscopy:** It provides certain advantages like real-time needle insertion confirmation into the tracheal lumen, tracheostomy tube placement, prevention of tracheal posterior wall puncture, and position of endotracheal placement below vocal cords during the PDT. Some studies have found bronchoscope use during PDT may be associated with increased complication rates like increases in intracranial pressure and alveolar de-recruitment associated with a fall in oxygen saturation.^{3,5} Guidelines suggest its use were available but with the caveat that it may not reduce the complication rates.^{2,3}
- **Ultrasonography:** It is increasingly being used during PDT for a variety of benefits such as it is being non-invasive, accurately predicting needle insertion site, and helping in the pre-procedure examination for any aberrant vessel. We have previously already highlighted the safety of using real-time USG during PDT in coagulopathic patients in our study.⁶ Guidelines recommend using USG, preferably in real-time wherever expertise is available.^{2,3}

Patients with cervical spinal cord injury have prolonged mechanical ventilatory requirement in view of respiratory muscle paralysis leading to worsening of vital capacity, inability to clear trachea-bronchial secretions, and increased tendency to develop hospital-acquired pneumonia or atelectasis. All patients with complete traumatic cervical spine injury (CSI) C5 and above require a definitive airway and tracheostomy. A 79% of those with injury at C6 and below require a definitive airway, with 50% of them requiring tracheostomy.⁷ Tracheostomy in CSI has been a topic of debate for a long. Almost 20 years back, O'Keefe et al. published data on the safety of tracheostomy (71% of patients underwent

¹Department of Critical Care and Anaesthesia, Medanta – The Medicity, Gurugram, Haryana, India

²Department of Critical Care Medicine, Medanta – The Medicity, Gurugram, Haryana, India

Corresponding Author: Deepak Govil, Department of Critical Care and Anaesthesia, Medanta – The Medicity, Gurugram, Haryana, India, Phone: +91 11-26692531, e-mail: drdeepak_govil@yahoo.co.in

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PDT) done 6–10 days after anterior spine fixation in patients with CSI.⁸ Wang et al. in their retrospective study on patients requiring tracheostomy after acute cervical cord injury found that the late group, that is, where tracheostomy was done above or equal to 10 days after initial intubation needed significantly longer ICU stay, duration of mechanical ventilation and suffered higher pneumonia, higher ICU mortality after tracheostomy than the early (tracheostomy less than or equal to 4 days after initial intubation) and medium (tracheostomy 5–9 days after initial intubation) groups. One of the inclusion criteria was patients who underwent anterior cervical spine fusion surgery. However, they performed both PDT and conventional (surgical) tracheostomy in their patient population.⁹ Anterior cervical stabilization is required for unstable spinal column injuries that may result in anterior spinal cord compression. The primary concern is the proximity of the required incision for spinal stabilization to that of a midline tracheostomy incision or PDT insertion site. The potential for wound infection and dehiscence of the incision is particularly worrisome with secretions from the tracheostomy site contaminating the incision site. The probable complication of esophageal injury during anterior spinal procedures has implications for deep infection impacting the tracheal tissues as well. Also, there is still no consensus on the optimal timing of tracheostomy after acute traumatic CSI. French recommendation on the management of patients with CSI by Roquilly et al. recommend performing tracheostomy after 7 days in patients with anterior cervical spine fixation while early (<7 days) can be performed in those patients where posterior cervical spine fixation has been performed.¹⁰ In a meta-analysis by Foran et al., which included data from only critically ill patients with cervical

and high thoracic SCI, found that early tracheostomy does not improve short-term mortality but did decrease the duration of mechanical ventilation, length of ICU, and hospital stay. Contrary to French recommendations, they found that early tracheostomy after anterior cervical spine fixation surgery did not result in increased tracheostomy-related complications including wound infection.¹¹ American College of Surgeons (ACS) also recommend that early tracheostomy can be performed after anterior cervical spine fixation. They also propose that early tracheostomy leads to decreased morbidity and mortality however timeline for early tracheostomy is not defined, which ranges from 1 to 2 days post-injury to less than 7 days. Also, the ACS considers both open tracheostomy and PDT as safe alternatives for performing the procedure in CSI patients.¹² Galeiras et al. and Lozano et al. have instantiated no increased risk of infection with early tracheostomy in patients with anterior spinal fixation.^{13,14} Kaczmarek et al. in their retrospective analysis done at a level one trauma center found that PDT performed within a median of 5 days did not increase the risk of surgical site infection in patients who had undergone anterior cervical spine fixation surgery.¹⁵

In this edition, Paul et al. have eloquently elucidated the utility of very early (done on an average at 2.8 days from anterior spinal fixation) PDT with the use of a fiberoptic bronchoscope as an adjunct. In their retrospective study, PDT was performed without hyperextension of the neck. The patient population they evaluated had significant injuries with 40.4% of patients having injuries above C5. Also, 86.9% of patients had American Spinal Injury Association (ASIA) scale A injury. They were able to illustrate that PDT can be performed within 3 days after anterior cervical spine fixation without any significant complication.¹⁶

The safety and utility of PDT in ICU patients have now been proven without a doubt. There is also now a multitude of data in favor of PDT in CSI patients after cervical spine fixation, albeit most of it is contributed by retrospective analysis. This area of research requires randomized control trials to substantiate and consolidate the findings of the present literature.

ORCID

Deepak Govil  <https://orcid.org/0000-0002-4624-1614>

Anant Vikram Pachisia  <https://orcid.org/0000-0003-1292-1141>

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