

Indications and Timing of Tracheostomy After Cervical Spine Injury: Implications for Hospital Stay and Recovery

Benjamin Childs, BS; Timothy Moore, MD; John Como, MD, MPH; Heather Vallier, MD; MetroHealth System, Cleveland, Ohio, USA

Purpose: The purpose of this study was to characterize the relationship between timing of tracheostomy after cervical spine injuries and patient outcomes. We hypothesized that without a formal protocol to determine timing of tracheostomy, patients who were more severely injured would have tracheostomy earlier. We further hypothesized that in spite of greater injury in such patients, early tracheostomy would not be associated with complications; rather, it would shorten mechanical ventilation time and hospital stay.

Methods: 446 patients treated at a Level I trauma center for fractures and/or ligamentous cervical spine injury over 77 months were identified. 44 had insufficient records. Information including age, gender, ISS, Glasgow Coma Scale (GCS), associated injuries, length of stay (LOS), and mortality was included for the remaining 402 patients.

Results: 62 patients (15.4%) underwent tracheostomy. They had higher ISS (19.3 vs 10.6, $P < 0.001$), ASIA (American Spinal Injury Association) score (1-5 = E-A: 3.6 ± 1.5 vs 1.5 ± 0.88 , $P < 0.001$), and lower GCS (11.6 vs 13.8, $P = 0.001$). Patients who received tracheostomy were more likely to have ligamentous injury (53.3% vs 34.6%, $P = 0.02$), spinal cord injury (SCI) (80.0% vs 49.3%, $P < 0.001$), and chest injury (AIS [Abbreviated Injury Scale] Chest: 0.97 vs 0.39, $P < 0.01$). Tracheostomy was associated with longer LOS (23.9 vs 6.85, $P < 0.001$), and these patients spent a mean 7 days intubated before tracheostomy (7.37 vs 1.2, $P < 0.001$). Survival rate was no different versus non-tracheostomy patients (89.1% vs 83.9%). Tracheostomy was performed within 7 days after injury in 27 patients (46.6%, defined as early). They had lower GCS (8.96 vs 13.5, $P < 0.001$), but were no different in age, ISS, ASIA, and severity of chest injury. Early versus late patients were no different in LOS (23.0 vs 25.7 days, $P = 0.43$), tracheostomy days (42.3 vs 49.2, $P = 0.427$), or survival (91% vs 88%). Analysis of the time from injury to tracheostomy revealed that in spite of increasing GCS scores ($R^2 = 0.991$), patients with late tracheostomy tended to have longer LOS ($R^2 = 0.84125$), but the sample was underpowered to show significance.

Conclusion: Protocols regarding indications and timing for tracheostomy have not been well developed. This population is especially likely to require long-term mechanical ventilation due to SCI and frequent chest injury. In spite of greater injury burden, tracheostomy patients had similar mortality rate as the general population. Our early tracheostomy patients had lower GCS. Linear regression shows correlation between delaying tracheostomy and increasing LOS, but further study of a larger group of patients is needed.