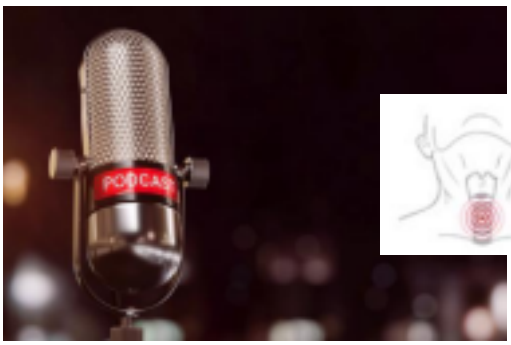
NTSP Podcast series



National Tracheostomy Safety Project

This month's top papers: January 2023

Welcome to the latest blog in the literature podcast from the NTSP. We try to bring you a quick roundup of what is hot in the world of tracheostomy and laryngectomy publications by scouring internationally recognised journals and media and bringing you the highlights.

The papers we will discuss this month are detailed below, along with an automated transcript of the podcast. Please note that the transcript is generated by AI and so may not be totally accurate.

You can find the links to the podcast on www.tracheostomy.org.uk and by searching for NTSP on your favourite podcast platform. Some of the podcasts are also uploaded to YouTube if you prefer to get your news that way. Check out the NTSP YouTube channel at https://www.youtube.com/c/NationalTracheostomySafetyProject. Please follow us and/or subscribe to keep up to date! https://x.com/NTSP_UK

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This month's top papers

- Predicting tracheostomy in multiple injured patients with severe thoracic injury (AIS ≥ 3) with the new T(3)P-Score: a multivariable regression prediction analysis.
- Severe secretion retention: a predictor of decannulation outcome in severe brain injury patients with tracheostomy.
- Multidisciplinary management of laryngeal pathology identified in patients with COVID-19 following trans-laryngeal intubation and tracheostomy.

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Predicting tracheostomy in multiple injured patients with severe thoracic injury (AIS ≥ 3) with the new T(3)P-Score: a multivariable regression prediction analysis.

Lay Summary:

This study focused on improving the prediction of which severely injured patients with major chest trauma will require a tracheostomy (a breathing tube in the neck) during their stay in the Intensive Care Unit (ICU). While general risk factors for tracheostomy are known in the overall critical care population, they had not been specifically confirmed for patients with multiple injuries that include severe thoracic trauma. Researchers retrospectively analyzed data from 1,019 adult patients who were admitted to six major trauma centers with severe chest trauma, meaning their chest injury severity was rated at AISThorax≥3 (Abbreviated Injury Scale score for the chest of 3 or higher). Out of this large group, 165 patients eventually needed a tracheostomy.

Using advanced statistical analysis, the team successfully identified several factors that strongly predicted the need for this life-saving procedure. These factors were then combined to create a new predictive tool called the Tracheostomy in Thoracic Trauma Prediction Score (T3P-Score). The significant predictors included prehospital endotracheal intubation (meaning the patient was already intubated before reaching the hospital), the overall extent of severe injuries across the body, the severity of the chest injury itself, and certain blood markers related to blood clotting. This new T3P-Score provides trauma teams with a vital, rapid assessment tool to quickly identify which patients are at the highest risk for needing a tracheostomy. This early prediction is crucial for optimizing resources and planning the patient's airway management in the critical early stages after severe trauma.

Summary for Healthcare Professionals:

This retrospective cohort study aimed to identify and validate specific predictor variables for tracheostomy requirement in multiple injured patients (age ≥18) with severe thoracic trauma, defined as AISThorax≥3 (Abbreviated Injury Scale score for the thorax of 3 or higher). The study analyzed data from 1,019 adult patients admitted to six academic Level I trauma centers, with 165 (16.2%) patients ultimately undergoing tracheostomy during their ICU stay.

A multivariable binary regression analysis was utilized to successfully develop the Tracheostomy in Thoracic Trauma Prediction Score (T3P-Score). The analysis identified several significant independent predictor variables for tracheostomy requirement:

- Prehospital endotracheal intubation (Adjusted Odds Ratio [AOR]: 2.494, 95% CI [1.412; 4.405]).
- High Injury Severity Score (ISS), indicating severe overall multi-trauma.
- Increased severity of the thoracic injury (AISThorax).
- Specific coagulation/inflammatory markers (e.g., elevated initial International Normalized Ratio [INR] and reduced initial hemoglobin).

The study addresses a gap in the literature by validating these predictors specifically in a high-risk severe thoracic trauma population, which is distinct from the general critical care cohort. The development of the T3P-Score provides a novel tool for trauma teams to accurately quantify the risk of a future tracheostomy at the time of initial assessment. This early risk stratification is clinically significant as it enables timely decision-making for optimal airway management planning and efficient resource allocation in the trauma bay and subsequent ICU care.

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Severe secretion retention: a predictor of decannulation outcome in severe brain injury patients with tracheostomy.

Lay Summary:

This study investigated why some patients with severe brain injuries (SBI) who have a tracheostomy tube placed in their neck struggle to have that tube successfully removed. Removing the tube, a process called decannulation, is a major step toward recovery, but it can fail if the patient cannot breathe or swallow safely on their own. Researchers looked back at the records of 127 SBI patients to understand what factors best predict success or failure in this process.

They found that two factors were highly effective at predicting failure. The first was a low Glasgow Coma Scale (GCS) score upon hospital admission, indicating a more severe neurological condition. The second, and most critical, factor was the severity of secretion retention, meaning the patient's inability to manage saliva and mucus. When patients had severe secretion retention, the success rate of removing the tracheostomy tube was very low, leading to a much higher chance of failure. Conversely, if a patient did not have this severe retention problem, they had a very high chance of success. Failure to successfully remove the tube was also linked to a longer stay in the Intensive Care Unit (ICU) and a higher incidence of complications like pneumonia. This study highlights how a simple, objective factor like severe secretion retention can be used by medical teams to make a confident, safe decision about decannulation, ultimately helping SBI patients recover more smoothly.

Summary for Healthcare Professionals:

This retrospective cohort study investigated specific clinical predictor variables for decannulation outcome in 127 consecutive severe brain injury (SBI) patients who underwent tracheostomy and a subsequent multidisciplinary decannulation trial. The study aimed to validate the utility of secretion management parameters in predicting decannulation failure (DF). The observed DF rate in this high-risk population was 13.4% (17 out of 127 patients).

Multivariate logistic regression analysis identified two independent risk factors for DF: a lower Glasgow Coma Scale (GCS) score upon admission and a secretion retention grade ≥3 (classified as severe). The predictive performance of secretion retention was particularly strong: a grade ≥3 resulted in a high positive predictive value (PPV) for DF (58.3%) and a robust negative predictive value (NPV) for decannulation success (DS) (96.5%). Patients who experienced DF also demonstrated a lower GCS score, a higher incidence of acute kidney injury (AKI) and stroke-associated pneumonia (SAP), and significantly prolonged Intensive Care Unit (ICU) and hospital length of stay (LOS). The authors conclude that severe secretion retention is a critical and objective parameter that should be explicitly integrated into multidisciplinary clinical decision-making protocols for tracheostomy decannulation in the SBI population.

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Multidisciplinary management of laryngeal pathology identified in patients with COVID-19 following trans-laryngeal intubation and tracheostomy.

Lay Summary:

This study investigated a common and serious problem found in patients who survived severe COVID-19 and required long-term breathing support: damage to the voice box (larynx). Patients with severe COVID-19 often need a tube placed through their mouth into the windpipe for mechanical ventilation, a process that can injure the larynx. This injury can be made worse by the virus itself.

Researchers looked back at the records of patients who were recovering and experiencing voice or swallowing issues at a UK hospital. They found that out of 42 patients assessed, one-third had vocal cord paresis (partial paralysis of the vocal cords), and almost one-fifth had severe laryngeal injuries like scarring or blockages. These findings show that damage to the voice box is a common complication in these survivors.

Crucially, this damage had a direct impact on recovery. For patients who had a tracheostomy (a permanent breathing tube in the neck), the presence of laryngeal pathology significantly delayed the process of taking them off the tube. Only 44% of patients with laryngeal damage were successfully weaned off their tracheostomy, compared to 74% of those without the damage. The authors conclude that early and specialized evaluation using a camera test called FEES is vital. A multidisciplinary team, including specialized therapists, is essential to manage these complex airway issues and speed up the recovery process.

Summary for Healthcare Professionals:

This retrospective observational cohort study was conducted at a UK tertiary hospital between March and December 2020 to characterize the nature and functional impact of laryngeal pathology in patients recovering from COVID-19 following prolonged trans-laryngeal intubation and/or tracheostomy. Patients presenting with voice or swallowing issues were assessed by the Speech and Language Therapy (SLT) team using Fibreoptic Endoscopic Evaluation of Swallowing (FEES).

The study found a high prevalence of laryngeal abnormalities: vocal cord paresis was the most common finding, identified in 33.3% of the 42 patients assessed. Furthermore, severe laryngeal injury, encompassing conditions such as stenosis and granulation, was present in 19.1% of patients.

The presence of laryngeal pathology significantly impacted clinical outcomes related to airway independence. Laryngeal pathology was observed to delay decannulation in 24% of tracheostomized patients. The successful decannulation rate for the subgroup with laryngeal pathology was significantly lower at 44%, compared to 74% for those without detected pathology.

The authors conclude that laryngeal pathology is a frequent morbidity in COVID-19 survivors after intubation and tracheostomy, and its presence is directly associated with delayed weaning. The findings strongly support the use of FEES as a critical tool for early and accurate diagnosis to guide multidisciplinary management strategies, which are essential for achieving safe and timely airway liberation.

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Scientific abstracts and references

Sci Rep. 2023 Feb 24;13(1):3260. doi: 10.1038/s41598-023-30461-x.

Predicting tracheostomy in multiple injured patients with severe thoracic injury (AIS ≥ 3) with the new T(3)P-Score: a multivariable regression prediction analysis.

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Multiple trauma patients with severe chest trauma are at increased risk for tracheostomy. While the risk factors associated with the need for tracheostomy are well established in the general critical care population, they have not yet been validated in a cohort of patients suffering severe thoracic trauma. This retrospective cohort study analysed data on patients aged 18 years or older who were admitted to one of the six participating academic level I trauma centres with multiple injuries, including severe thoracic trauma (AISThorax ≥ 3) between 2010 and 2014. A multivariable binary regression was used to identify predictor variables for tracheostomy and to develop the Tracheostomy in Thoracic Trauma Prediction Score (T3P-Score). The study included 1019 adult thoracic trauma patients, of whom 165 underwent tracheostomy during their intensive care unit (ICU) stay. Prehospital endotracheal intubation (adjusted OR [AOR]: 2.494, 95% CI [1.412; 4.405]), diagnosis of pneumonia during the ICU stay (AOR: 4.374, 95% CI [2.503; 7.642]), duration of mechanical ventilation (AOR: 1.008/hours of intubation, 95% CI [1.006; 1.009]), and an AISHead ≥ 3 (AOR 1.840, 95% CI [1.039; 3.261]) were independent risk factors for tracheostomy. Patients with sepsis had a lower risk of tracheostomy than patients without sepsis (AOR 0.486, 95% CI [0.253; 0.935]). The T3P-Score had high predictive validity for tracheostomy (ROCAUC = 0.938, 95% CI [0.920, 0.956]; Nagelkerke's R2 was 0.601). The T3P-Score's specificity was 0.68, and the sensitivity was 0.96. The severity of thoracic trauma did not predict the need for tracheostomy. Follow-up studies should validate the T3P-Score in external data sets and study the reasons for the reluctant use of tracheostomy in patients with severe thoracic trauma and subsequent sepsis.Trial registration: The study was applied for and registered a priori with the respective ethics committees.

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Conflict of interest statement: The authors declare no competing interests.

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Severe secretion retention: a predictor of decannulation outcome in severe brain injury patients with tracheostomy.

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BACKGROUND: Identifying accurate predictors of decannulation outcome is essential to ensure safe and timesaving decannulation. Studies indicated hypopharyngeal secretion retention is closely associated with compromised airway protection and patients with it are less likely to be decannulated. However, data verifying the link between secretion retention and decannulation outcome are lacking. AIM: The aim of this study was to identify the association between hypopharyngeal secretion-retention (indicated by Murray Secretion Scale [MSS]) and decannulation outcomes in a large cohort of severe acquired brain injury (sABI) patients with tracheotomy. To test the diagnostic performance of secretion retention in decision making of decannulation. DESIGN: Retrospective cross-sectional study. SETTING: The setting of the study is neurorehabilitation department in a tertiary teaching hospital. POPULATION: A total of 144 adult patients with sABI and tracheostomy were retrospectively selected from the database from September 1, 2019, to August 31, 2021. METHODS: The results of hypopharyngeal secretion-retention observed by fiberoptic endoscopy on the day that decision on decannulation was made were collected. The association between severity of secretion retention and decannulation outcomes was investigated through logistic regression, which was used to adjust covariates, including presence of food/liquid aspiration, decreased laryngeal sensation and conscious level. The optimal cut-off values of MSS for decannulation status prediction was determined by maximizing the Youden Index. RESULTS: One hundred twenty-one patients were included in the sample. The age was 55.6±15.2 years, 84 (69.4%) patients were male. Eighty-four (69.4%) of them were successfully decannulated during their hospital stay. Multivariable logistic regression analysis indicated severe secretion retention (MSS level3) was independently associated with prolonged tracheostomy (adjusted odds ratio 65.23, 95% CI 6.58-646.35, P<0.001). The sensitivity and specificity of MSS level3 to assess the probability of prolonged decannulation were 78.4% and 96.4%, respectively. The area under the curve was 0.894 (95% CI 0.819-0.969). CONCLUSIONS: Our results add to the evidence supporting screening of secretion retention severity in sABI population to identify patients at risk of prolonged tracheostomy. Whether decreasing secretion retention increases probability of successful decannulation deserves to be investigated by further study. CLINICAL REHABILITATION IMPACT: This study could provide evidence for establishing objective decannulation criteria based on fiberoptic endoscopy and be helpful for implementing targeted rehabilitation interventions to promote successful decannulation.

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Multidisciplinary management of laryngeal pathology identified in patients with COVID-19 following trans-laryngeal intubation and tracheostomy.

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BACKGROUND: COVID-19 disease often requires invasive ventilatory support. Trans-laryngeal intubation of the trachea may cause laryngeal injury, possibly compounded by coronavirus infection. Fibreoptic Endoscopic Evaluation of Swallowing (FEES) provides anatomical and functional assessment of the larynx, guiding multidisciplinary management. Our aims were to observe the nature of laryngeal abnormalities in patients with COVID-19 following prolonged trans-laryngeal intubation and tracheostomy, and to describe their impact on functional laryngeal outcomes, such as tracheostomy weaning. METHODS: A retrospective observational cohort analysis was undertaken between March and December 2020, at a UK tertiary hospital. The Speech and Language Therapy team assessed patients recovering from COVID-19 with voice/swallowing problems identified following trans-laryngeal intubation or tracheostomy using FEES. Laryngeal pathology, treatments, and outcomes relating to tracheostomy and oral feeding were noted. RESULTS: Twenty-five FEES performed on 16 patients identified a median of 3 (IQR 2-4) laryngeal abnormalities, with 63% considered clinically significant. Most common pathologies were: oedema (n = 12, 75%); abnormal movement (n = 12, 75%); atypical lesions (n = 11, 69%); and erythema (n = 6, 38%). FEES influenced management: identifying silent aspiration (88% of patients who aspirated (n = 8)), airway patency issues impacting tracheostomy weaning (n = 8, 50%), targeted dysphagia therapy (n = 7, 44%); ENT referral (n = 6, 38%) and reflux management (n = 5, 31%). CONCLUSIONS: FEES is beneficial in identifying occult pathologies and guiding management for laryngeal recovery. In our cohort, the incidence of laryngeal pathology was higher than a non-COVID-19 cohort with similar characteristics. We recommend multidisciplinary investigation and management of patients recovering from COVID-19 who required prolonged trans-laryngeal intubation and/or tracheostomy to optimise laryngeal recovery.

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