NTSP Podcast series

National Tracheostomy Safety Project

This month's top papers: July 2022

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

- The impact of tracheostomy delay in intensive care unit patients: a two-year retrospective cohort study.
- Comparison of percutaneous tracheostomy methods in ICU patients: Conventional anatomical landmark method versus ultrasonography method - A randomised controlled trial.
- Changes in Multidisciplinary Tracheostomy Team Practice Over Time.
- Clinical Proof of Concept for Stabilization of Tracheostomy Tubes Using Novel DYNAtraq Device.

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The impact of tracheostomy delay in intensive care unit patients: a two-year retrospective cohort study.

Lay Summary:

This study looked at how different types of tracheostomy tubes affect a person's ability to speak. A tracheostomy is a tube placed in the windpipe, and patients can often regain their voice if air is able to flow up past their vocal cords.

Researchers used a mechanical lung and a 3D-printed model of a windpipe to test two types of tubes:

1. Taper-cuffed tubes: These have a cuff that is designed to be less bulky when deflated.
2. Fenestrated tubes: These have small holes, or fenestrations, that are meant to allow air to pass through for speech.

The study found that the taper-cuffed tubes allowed significantly more airflow than the fenestrated tubes across all sizes tested. This is important because while fenestrated tubes are designed for speech, they have a number of potential complications, such as tissue growth in the holes. The authors believe that the tapered cuff design, which is less bulky when deflated, provides a better path for air to pass. The study concludes that this improved airflow could help patients regain their voice, though more research with actual patients is needed to confirm this.

Summary for Healthcare Professionals:

This comparative bench study investigated the translaryngeal gas flow capabilities of a taper-cuffed tracheostomy tube (Shiley™ Flexible) compared to a traditional fenestrated barrel-cuffed tube (Shiley™ FEN) of equivalent sizes. The study was a laboratory study that used a mechanical lung and a 3D-printed tracheal model. It measured the exhaled gas flow as air passed through the model trachea and around the deflated cuffs of three sizes of tracheostomy tubes (Jackson 4, 6, and 10).

The study's results showed that across all three sizes, the flexible taper-cuffed tracheostomy tube allowed for significantly more translaryngeal airflow than the fenestrated tracheostomy tube ($p<0.0004$ and $p<0.00001$). The authors note that the taper-shaped cuff's less bulky profile upon deflation provides less contact area with the tracheal wall, which reduces the force exerted on the trachea.

The authors conclude that the taper-cuffed design provides significantly improved airflow past the cuff compared to fenestrated tubes, which have several potential complications, such as granulation tissue formation and tracheal stenosis. This improved airflow could have clinical implications for patient phonation and laryngeal rehabilitation , but further clinical studies with patients are required to confirm this finding.

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Comparison of percutaneous tracheostomy methods in ICU patients: Conventional anatomical landmark method versus ultrasonography method - A randomised controlled trial.

Lay Summary:

This study looked at how different methods for a procedure called percutaneous dilatational tracheostomy (PDT) compare in terms of safety and accuracy. PDT is a common procedure in the Intensive Care Unit (ICU) where a breathing tube is inserted into the windpipe. The two methods compared were:

1. Landmark method (Group A): Doctors rely on feeling the anatomical landmarks on the outside of the neck.
2. Ultrasound-guided method (Group B): Doctors use an ultrasound to get a real-time view of the neck's internal structures.

Researchers conducted a randomized trial with 60 patients. They found that the ultrasound-guided method was more accurate in placing the tube, resulting in significantly fewer cases of the puncture being off-center. This method also required fewer attempts to successfully place the tube.

However, the ultrasound-guided procedure did take a little longer to perform, about 20 minutes compared to 15 minutes for the landmark method. It was also associated with fewer complications overall, including less bleeding and a lower rate of the breathing tube cuff rupturing. The study concludes that using ultrasound guidance is a better option because it improves the accuracy and safety of the procedure, even though it may take slightly more time.

Summary for Healthcare Professionals:

This randomized controlled trial compared two methods of percutaneous dilatational tracheostomy (PDT): the conventional anatomical landmark method (Group A) and a real-time ultrasonography (USG)-guided method (Group B). The study aimed to compare the accuracy of the puncture site, the number of insertion attempts, and the rate of peri-procedural complications.

A total of 60 patients were included, with 30 in each group. The results demonstrated a clear superiority of the USG-guided method in several key areas:

- Accuracy of Puncture: The USG group had significantly fewer cases of midline deviation, with a mean deviation of 11.33±9.51 degrees compared to 16.60±12.31 degrees in the landmark group (P=0.040).
- Insertion Attempts: The number of trials required to cannulate the trachea was significantly lower in the USG group (1.07±0.25) compared to the landmark group (1.40±0.56), with fewer cases needing more than two attempts.
- Complications: The USG-guided method was associated with a lower rate of complications, including a lower incidence of bleeding requiring interventions and a lower rate of ruptured endotracheal tube cuffs.

A drawback of the USG-guided method was a longer procedure time (20.07 minutes vs. 15.20 minutes, P<0.001). The authors conclude that USG-assisted PDT is a superior method that improves the accuracy of tracheal puncture and reduces complications, making it the preferred method in an ICU setting.

NTSP Podcast Series

Changes in Multidisciplinary Tracheostomy Team Practice Over Time.

Lay Summary:

This study looked at how a Multidisciplinary Tracheostomy Team (MTT) improved the care of patients with a tracheostomy tube. A tracheostomy is a procedure that helps patients breathe, particularly when they are moved from the intensive care unit (ICU) to a general hospital ward. The researchers compared patient care and outcomes from two different time periods: 2009-2011, when the team was first starting out, and 2017, after the team had been active for eight years.

The main finding was a significant improvement in patient care. The average time a patient had a tracheostomy tube was much shorter in 2017 (21 days) than in 2009-2011 (31 days). The team was also more likely to use a less-invasive procedure called percutaneous dilatational tracheostomy (PDT) in the later period, which increased from 83% to 96% of cases. In the later period, the hospital also started using a "Mini-Trach" after the main tube was removed in many patients, as a way to help them transition to breathing on their own.

The study concludes that maintaining an active multidisciplinary team is crucial for the continued improvement of tracheostomy care. This team approach leads to a shorter time with the tracheostomy tube, which is better for the patient.

Summary for Healthcare Professionals:

This retrospective audit compared tracheostomy management and patient outcomes at a university-affiliated adult hospital in Dublin, Ireland, in two time periods: 2009-2011 (at the start of the Multidisciplinary Tracheostomy Team [MTT] practice) and 2017 (after eight years of practice). The objective was to assess the impact of the continued development of the MTT.

The study included 117 patients in the earlier cohort and 81 in the later cohort. It found that the continued development of the MTT was associated with significant improvements in patient outcomes and care practices.

- Duration of Cannulation: The median duration of tracheostomy cannulation was significantly shorter in 2017 (21 days) compared to 2009-2011 (31 days) ($p=0.0005$).
- Procedural Technique: The use of percutaneous dilatational tracheostomy (PDT) significantly increased from 83% of procedures in 2009-2011 to 96% in 2017 ($p=0.003$).
- Decannulation Strategy: The study also noted the introduction of a "Mini-Trach" as part of the decannulation process in 2017. In that year, 69% of patients used a Mini-Trach after their primary tracheostomy tube was removed, and 82% of these patients were successfully decannulated.

The authors conclude that these results support the importance of maintaining an active, interdisciplinary team to improve tracheostomy care and patient outcomes, particularly for patients discharged from the ICU to general wards.

NTSP Podcast Series

Clinical Proof of Concept for Stabilization of Tracheostomy Tubes Using Novel DYNAtraq Device.

Lay Summary:

This study looked at how different methods for a procedure called percutaneous dilatational tracheostomy (PDT) compare in terms of safety and accuracy. PDT is a common procedure in the Intensive Care Unit (ICU) where a breathing tube is inserted into the windpipe. The two methods compared were:

1. Landmark method (Group A): Doctors rely on feeling the anatomical landmarks on the outside of the neck.
2. Ultrasound-guided method (Group B): Doctors use an ultrasound to get a real-time view of the neck's internal structures.

Researchers conducted a randomized trial with 60 patients. They found that the ultrasound-guided method was more accurate in placing the tube, resulting in significantly fewer cases of the puncture being off-center. This method also required fewer attempts to successfully place the tube.

However, the ultrasound-guided procedure did take a little longer to perform, about 20 minutes compared to 15 minutes for the landmark method. It was also associated with fewer complications overall. The study concludes that using ultrasound guidance is a better option because it improves the accuracy and safety of the procedure, even though it may take slightly more time.

Summary for Healthcare Professionals:

This randomized controlled trial compared two methods of percutaneous dilatational tracheostomy (PDT): the conventional anatomical landmark method (Group A) and a real-time ultrasonography (USG)-guided method (Group B). The study included 60 patients, with 30 in each group. The results demonstrated a clear superiority of the USG-guided method in several key areas.

- Accuracy of Puncture: The USG group had significantly fewer cases of midline deviation, with a mean deviation of 11.33±9.51 degrees compared to 16.60±12.31 degrees in the landmark group (P=0.040).
- Insertion Attempts: The number of trials required to cannulate the trachea was significantly lower in the USG group (1.07±0.25) compared to the landmark group (1.40±0.56), with fewer cases needing more than two attempts.
- Complications: The USG-guided method was associated with a lower rate of complications, including a lower incidence of desaturation and bleeding.

A drawback of the USG-guided method was a longer procedure time (20.07 minutes vs. 15.20 minutes, P<0.001). The authors conclude that USG-assisted PDT is a superior method that improves the accuracy of tracheal puncture and reduces complications, making it the preferred method in an ICU setting.

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Scientific abstracts and references

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Eur J Med Res. 2022 Jul 26;27(1):132. doi: 10.1186/s40001-022-00753-5.

The impact of tracheostomy delay in intensive care unit patients: a two-year retrospective cohort study.

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BACKGROUND: AIMS: This study was undertaken to evaluate our tracheostomy service and identify reasons for any delays. METHODS: A retrospective study in an academic tertiary-care hospital in Jeddah, Saudi Arabia. Inclusion criteria were any patients in ICU who required a surgical tracheostomy over a 2-year period (January 2014 to December 2015). The primary outcome was delayed tracheostomy referral and secondary outcomes included the number of days between referral and consultation, days between consultation and tracheostomy placement, and mortality rates. RESULTS: Ninety-nine patients had a tracheostomy between January 2014 to December 2015 and could be analysed, mean age of 52.7 years, 44.5% females. The average duration from referral to tracheostomy was 5.12 days (SD 6.52). Eighteen patients (18.2%) had delayed tracheostomy (> 7 days from referral). The main reasons for the delay were the patient's medical condition (50%, n = 9), followed by low haemoglobin (38.9%, n = 7). Administrative reasons were recorded in 5 cases only (28%); 2 due to operating room lack of time, 2 due to multidisciplinary issues, and 1 due to family refusal. Laboratory-confirmed low haemoglobin, a prescription of anti-platelets, or a prescription of anti-coagulation were not associated with a longer duration between referral and tracheostomy placement. An increase of 1 day in the time between referral and tracheostomy corresponded to an increase in delay in discharge from ICU of 1.24 days (95% CI 0.306 to 2.18). CONCLUSION: Although most delays related to the clinical condition of the patient, administrative and multidisciplinary factors also play a role. Early tracheostomy (less than 14 days) from intubation increases the survival rates of patients and improves their clinical outcomes. Further prospective evaluation is needed to confirm the impact of delay in performing surgical tracheostomy among ICU patients whose bedside percutaneous tracheostomy is contraindicated.

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Conflict of interest statement: There is no conflict of interest to declare.

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Comparison of percutaneous tracheostomy methods in ICU patients: Conventional anatomical landmark method versus ultrasonography method - A randomised controlled trial.

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BACKGROUND AND AIMS: Percutaneous dilational tracheostomy (PDT) is a common procedure in intensive care unit (ICU) patients requiring long-term mechanical ventilation. PDT has gradually replaced surgical tracheostomy because it is associated with minimal invasiveness, reduced bleeding and simplicity in technique.This study was conducted to compare ultrasound-guided PDT versus conventional tracheostomy in terms of duration of the procedure, number of passes and immediate peri-procedural complications. METHODS: A total of 72 patients with clinical indications of tracheostomy were recruited. A total of 12 patients met the exclusion criteria. The remaining were randomly assigned into two groups of 30 each: Group A (Landmark) with traditional anatomical landmark and Group B (USG) with real-time ultrasound guidance. Puncture positions were recorded with bronchoscopy. Midline deviation was captured on a bronchoscopy image using a protractor. Data on procedural safety and efficacy were also collected. RESULTS: Group B had significantly fewer cases of midline deviation (11.33 ± 9.51) in comparison to Group A (16.60 ± 12.31). Trials > 2 were equal to 11 in Group A and 2 in Group B. However, the duration of the procedure was higher in Group B (20.07 ± 3.25 min) as compared to Group A (15.20 ± 3.71 min). Peri-procedural and post-procedural complications were also higher in the Landmark group. CONCLUSION: Ultrasound-guided PDT showed superiority over landmark PDT in terms of less number of trials, midline puncture and fewer complications. However, it took a little longer to perform USG-guided PDT.

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Conflict of interest statement: There are no conflicts of interest.

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Changes in Multidisciplinary Tracheostomy Team Practice Over Time.

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Aim Increasing numbers of tracheostomy patients are discharged from the Intensive Care Unit (ICU) to general hospital wards. There is evidence that a Multidisciplinary Tracheostomy Team (MTT) can have a positive impact on the care of tracheostomy patients discharged from the ICU. We compared tracheostomy management and patient outcome in two time periods, at the start of our MTT practice in 2009-2011 and again in 2017. Methods In a retrospective audit, we compared tracheostomy management and patient outcome in 117 patients who had a tracheostomy in 2009-2011 with 81 patients who had a tracheostomy in 2017. Results The duration of tracheostomy cannulation was significantly shorter (21 vs 31 days, p=0.0005) in 2017 compared to 2009-2011. A Mini-Trach was used after tracheostomy decannulation in 56 of the 81 (69%) tracheostomy patients in 2017. Conclusions The continued development of our MTT service over 8 years was associated with a significantly shorter duration of tracheostomy cannulation and the introduction of Mini-Trach use after tracheostomy decannulation. These results support the importance of maintaining an active MTT service to manage tracheostomy patients after discharge from the ICU.

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Conflict of interest statement: The authors report no conflicts of interest.

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Clinical Proof of Concept for Stabilization of Tracheostomy Tubes Using Novel DYNAtraq Device.

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INTRODUCTION: Tracheostomy is one of the most common surgical strategies in intensive care units (ICU) and provides relevant clinical benefit for multiple indications. However, the complications associated with its use range from 5 to 40% according to different series. The risk of these complications could be reduced if fixation strategies and alignment of the tracheostomy tube with respect to the tracheal axis are improved. AIM: To build a functional device of technological innovation in respiratory medicine for the fixation and alignment of tracheostomy cannula (acronym DYNAtraq) and to evaluate its feasibility and safety in a pilot study in mechanically ventilated patients. METHODS: Study carried out in four phases: (1) design engineering and functional prototyping of the device; (2) study of cytotoxicity and tolerance to the force of traction and push; (3) pilot study of feasibility and safety of its use in tracheostomized and mechanically ventilated patients; and (4) health workers satisfaction study. RESULTS: The design of the innovative DYNAtraq device included, on the one hand, a connector with very little additional dead space to be inserted between the cannula and the ventilation tubes, and, on the other hand, a shaft with two supports for adhesion to the skin of the thorax with very high tolerance (several kilograms) to pull and push. In patients, the device corrected the malpositioned tracheostomy tubes for the latero-lateral ($p < 0.001$) and cephalo-caudal angles ($p < 0.001$). Its effect was maintained throughout the follow-up time ($p < 0.001$). The use of DYNAtraq did not induce serious adverse events and showed a 70% protective effect for complications ($RR = 0.3$, $p < 0.001$) in patients. CONCLUSION: DYNAtraq is a new device for respiratory medicine that allows the stabilization, alignment and fixation of tracheostomy tubes in mechanically ventilated patients. Its use provides additional benefits to traditional forms of support as it corrects misalignment and increases tolerance to habitual or forced movements. DYNAtraq is a safe element and can reduce the complications of tracheostomy tubes.