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Case Report

Ultrasonic Evaluation of the Thyrohyoid Approximation Percentage as Support for Clinical Swallowing Assessment in Decannulation of a Tracheostomized Patient: A Case Report

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ABSTRACT

Decannulation is crucial in the rehabilitation of tracheostomized patients, and its success depends on an interdisciplinary and rigorous assessment of airway patency, respiratory parameters, and secretion swallowing safety. However, clinical evaluation of swallowing, while essential, remains a subjective procedure that is highly dependent on the clinician's experience. This case report explores the usefulness of ultrasound as a complementary tool that can enhance the objectivity of clinical evaluation. We present the case of a man with a tracheostomy and prolonged mechanical ventilation. After meeting the respiratory criteria for decannulation, the clinical evaluation of swallowing suggested a possible restriction in hyolaryngeal mobility. To objectively quantify this disturbance, ultrasound was employed, and the findings were later confirmed through an endoscopic swallowing evaluation. The results revealed that ultrasound enabled the objective measurement of hyolaryngeal excursion, identifying an impairment in its movement. This was quantified by calculating the percentage of change in the approximation between the thyroid cartilage and the hyoid bone compared to their resting positions. In conclusion, ultrasound appears to be a promising tool to complement the clinical evaluation of swallowing in individuals with a tracheostomy, allowing for objective measurement of hyolaryngeal function, particularly when conventional instrumental evaluations (videofluoroscopy or endoscopy) are not feasible. Clinicians are encouraged to share their experiences with the use of ultrasound to enhance knowledge in this and other clinical contexts.

Keywords:
Ultrasound; Hyolaryngeal Excursion; Tracheostomy; Decannulation; Deglutition; Clinical Assessment

Evaluación ecográfica del porcentaje de aproximación tirohioidea como apoyo a la evaluación clínica de la deglución en la decanulación de una persona con traqueostomía: Un reporte de caso

RESUMEN

La decanulación es crucial en la rehabilitación de personas con traqueostomía, y su éxito depende de una evaluación interdisciplinaria y rigurosa de la permeabilidad de la vía aérea, los parámetros respiratorios y la seguridad en la deglución de secreciones. No obstante, la evaluación clínica de la deglución, aunque esencial, sigue siendo un procedimiento subjetivo, altamente dependiente de la experiencia del clínico. Este reporte explora la utilidad del ultrasonido como herramienta complementaria a la evaluación clínica, incrementando su objetividad. Se presenta el caso de un hombre con traqueostomía y ventilación mecánica prolongada. Tras cumplir con los criterios respiratorios para proceder con la decanulación, la evaluación clínica de la deglución sugirió una posible restricción en la movilidad hiolaríngea. Para cuantificar objetivamente esta alteración, se utilizó ultrasonido, confirmando posteriormente los hallazgos mediante una evaluación endoscópica de la deglución. Los resultados mostraron que el ultrasonido permitió medir objetivamente la excursión hiolaríngea, identificando una alteración en su movimiento. Esta se cuantificó calculando el porcentaje de cambio en la aproximación entre el cartílago tiroides y el hueso hioides en comparación con sus posiciones en reposo. En conclusión, el ultrasonido surge como una herramienta prometedora para complementar la evaluación clínica de la deglución en personas con traqueostomía, permitiendo la objetivación de la función hiolaríngea, especialmente cuando las evaluaciones instrumentales convencionales (videofluoroscopía o endoscopía) no son factibles. Se anima a los clínicos a compartir sus experiencias con el uso del ultrasonido para enriquecer el conocimiento en este y otros contextos clínicos.

Palabras clave:
Ultrasonido; Excursión Hiolaríngea; Traqueostomía; Decanulación; Deglución; Evaluación Clínica

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INTRODUCTION

Tracheostomy is a crucial procedure for people requiring prolonged respiratory support, as it offers several benefits that enhance clinical progress, functionality, and rehabilitation (Hebert et al., 2017). However, despite its advantages, this procedure is not free from complications and drawbacks, which may affect swallowing functionality (Bice et al., 2015). One of the most significant complications of tracheostomy is an increase in the frequency of secretion aspiration, with an incidence rate as high as 60% (Ding & Logemann, 2005). This is primarily due to the presence of an inflated cuff, which interferes with protective responses such as coughing, throat clearing, and closure of the laryngeal vestibule, due to a lack of subglottic pressure. In addition, an inflated cuff affects the sensitivity and reactivity of the upper airway due to the loss of airflow (Amathieu et al., 2012; Tobar-Fredes et al., 2020; Wallace & McGrath, 2021). These factors impact swallowing functionality, delaying oropharyngeal motor responses, restricting hyolaryngeal movement, and causing vocal fold hypofunction (Ding & Logemann, 2005; Park & Lee, 2018; Seo et al., 2017). This situation may persist, showing no functional improvement even after occluding or removing the tracheostomy tube, particularly in individuals with dysphagia caused by underlying conditions that require respiratory support and tracheostomy.

In addition to the effects of tracheostomy, endotracheal intubation—required for most patients in intensive care—can also lead to disturbances in swallowing function. This is attributed to factors such as oropharyngeal and/or laryngeal trauma associated with intubation, muscle weakness and atrophy due to disuse, decreased proprioception, reduced laryngeal sensitivity, and desynchronization between breathing and swallowing (Macht et al., 2013; Shinn et al., 2019; Wallace & McGrath, 2021). Cognitive function deterioration resulting from sedation and analgesia associated with intubation further exacerbates these conditions. These complications are worsened in individuals undergoing prolonged endotracheal intubation, increasing the risk of vascular and mucosal damage, as well as the development of ulcers and vocal fold paralysis (Wallace & McGrath, 2021).

In this clinical context, the rehabilitation team's objective is to promote functional recovery until successful decannulation is achieved (Enrichi et al., 2017; Park et al., 2021; Singh et al., 2017). Therefore, the decision to proceed with decannulation must be based on a multidisciplinary team's consensus, considering the key factors that ensure a safe and successful procedure. These factors include safe and efficient secretion swallowing, the structural integrity of the airway, stable respiratory values, and effective coughing (Tobar-Fredes et al., 2020; Wallace & McGrath, 2021).

Consequently, the clinical assessment of swallowing is of paramount importance, as it provides data on the individual's swallowing performance. This data is made available to the interdisciplinary team, contributing to a comprehensive assessment of the patient and subsequent decision-making regarding potential decannulation. Given the above, clinical evaluation requires high rigor to obtain the most reliable information on swallowing performance. One of the most commonly used techniques is digital palpation of the hyolaryngeal complex, which allows the clinician to subjectively estimate the range and reactivity of excursion movements during the oropharyngeal motor response, using Logemann's four-finger method (Logemann, 1998). This technique indirectly assesses hyoid and laryngeal movements during swallowing. Reduced excursion of the hyolaryngeal complex is associated with impaired laryngeal elevation, closure of the laryngeal vestibule, and relaxation of the cricopharyngeal sphincter, all of which are indicators of compromised swallowing safety (Brates et al., 2019; Ishida et al., 2002; McCullough et al., 2000; Sivarao & Goyal, 2000).

Despite its widespread use in everyday clinical practice, due to its simplicity and practicality, caution should be exercised when making decisions based on digital palpation, as concerns have been raised regarding its sensitivity, objectivity, and replicability (Brates et al., 2019; McCullough et al., 2000; Rangarathnam & McCullough, 2016; Smithard et al., 1998). In this context, there is a need to increase the objectivity of procedures performed by speech-language therapy teams, for which the use of objective evaluation techniques is recommended. Examples include videofluoroscopy, fiberoptic endoscopic evaluation of swallowing (FEES), and lingual pressure measurement, among others. However, both videofluoroscopy and FEES are invasive, expensive, and of limited availability in the country's healthcare services, particularly in units treating critically ill patients.

In this scenario, ultrasound is currently emerging as a promising tool to support clinical evaluation, due to its accessibility, non-invasiveness, low cost, and applicability, even in hospitalized patients (Allen et al., 2021; Kuhl et al., 2003). During an ultrasound, a transducer is placed in the anterior midline of the neck, allowing visualization of two hyperechoic plates with acoustic shadowing, corresponding to the ossification of the thyroid cartilage and the hyoid bone. Both structures are used as reference points to assess hyolaryngeal excursion by measuring the distance between them before and during swallowing (Huang

et al., 2009; Kuhl et al., 2003). This makes it possible to calculate the percentage change in the proximity between the thyroid cartilage and the hyoid bone, compared to their resting positions.

It has been established that the percentage change in hyolaryngeal approximation is the most clinically relevant value, surpassing the absolute value of approximation, which presents significant variability due to structural differences among individuals (Huang et al., 2009). Moreover, it has been proven that the percentage change in hyolaryngeal approximation is independent of the individual's gender and posture (Ahn et al., 2015). Finally, it has been determined that a reduced hyolaryngeal approximation (<40% of the resting distance) indicates the presence of dysphagia, with acceptable levels of sensitivity (75.0%) and specificity (77.1%). These results are similar to those obtained through videofluoroscopy, with an inter-evaluator correlation coefficient of 0.983, positioning this technique as a reliable quantitative tool for the mentioned measurements (Hsiao et al., 2021; Huang et al., 2009; Picelli et al., 2021).

Studies of this technique have also shown a high correlation with clinical evaluation. A recent study showed that the percentage change in hyolaryngeal approximation correlates with the level achieved on the Functional Oral Intake Scale (FOIS) and their performance using the Gugging Swallow Screen (GUSS). These findings support the usefulness of this tool, even in hospitalized patients (Picelli et al., 2021). This has generated interest among researchers; however, there is still a need for adequate evaluation protocols and experience with incorporating them into clinical practice (Allen et al., 2021).

In recent years, the use of ultrasound in the evaluation of swallowing functions has seen significant progress, allowing visualization of both morphological (static) and biomechanical (dynamic) systems. Notable among these is the identification of areas and thickness of muscles essential for swallowing, such as the digastric, geniohyoid, and masseter muscles (Maeda et al., 2023; Potente et al., 2022).

Given the above, it is essential to generate empirical evidence supporting the potential benefits of incorporating ultrasound as a supplementary procedure in the clinical evaluation of swallowing, especially in health situations where gathering information for informed decision-making is more complex. In this context, the objectives of this document are: a) to report, based on a case study, the potential usefulness of ultrasound in the evaluation of hyolaryngeal function in the context of decannulation, and b) to introduce, based on the reported case, a proposal for general guidelines for including ultrasound in the clinical care workflows of people with tracheostomy.

CASE PRESENTATION

The case of a 61-year-old man with no known prior medical history is presented. He suffered a serious accident due to a boiler explosion followed by a four-meter-high fall. The injuries included second-degree steam burns affecting more than 50% of his body, including his face, as well as an inhalation injury. As a result, he was admitted to the intensive care unit in a state of severe hemodynamic instability. He presented with multiorgan failure, distributive shock, and several life-threatening complications. Due to these conditions, he required prolonged mechanical ventilation, and a tracheostomy was performed after eight days of endotracheal intubation. He was able to be weaned off the mechanical ventilator after 45 days. During this period, he received enteral nutrition, hydration, and medication through a nasojejunal tube, which could only be replaced by a gastrostomy after 131 days due to complications in his abdominal area caused by the accident.

While requiring mechanical ventilation, the patient remained uncooperative due to the effects of sedative-analgesic medication and hypoactive delirium. During this time, the speech-language therapy team carried out conservative interventions aimed at preventing oral infections, minimizing the risk of ventilator-associated pneumonia, and maintaining physiological support for orofacial functions.

As sedative medication was reduced and with the implementation of a tracheostomy tube (8 mm in diameter, with a cuff and subglottic aspiration duct), it was possible to carry out a more aggressive intervention aimed at recovering the swallowing functionality for secretions. This included the use of various techniques, such as chemo-thermo-tactile stimulation, swallowing exercises, air injection through the subglottic aspiration duct, and orofacial muscle management, among others. Twenty-five days after the tracheostomy, the patient's clinical condition showed positive changes, meeting the necessary respiratory criteria to progress toward decannulation. The speech-language therapy team conducted a new clinical evaluation to determine its feasibility.

Clinical Assessment

The clinical evaluation carried out by the speech-language therapy team included the following aspects and procedures: a) a

cognitive, communicative, and behavioral screening, b) assessment of tolerance to the use of a one-way valve and tracheostomy tube occlusion, c) determination of the need for subglottic duct suctioning, d) evaluation of cough efficacy, and e) assessment of non-nutritive swallowing (for secretions).

The non-nutritive swallowing assessment involved evaluating the oropharyngeal motor response, hyolaryngeal excursion, and the ability to achieve adequate oropharyngeal clearing. The oropharyngeal motor response evaluation measured the frequency of occurrence and the time elapsed between tongue propulsion and the onset of hyolaryngeal excursion, whose assessment was performed using the digital palpation technique (Logemann, 1998). In addition, a secretion staining test using vegetable dye was conducted to facilitate the detection of possible secretion aspiration and pharyngeal residues that could later enter the lower airway due to inadequate pharyngeal clearing.

The patient was described as partially cooperative, requiring prompting, external regulation, and instruction repetition to participate in some tasks, which was exacerbated on certain days. Three months after the events described in this report, the patient was diagnosed with Wallerian axonal degeneration, a condition explaining his cognitive and behavioral fluctuations. Regarding swallowing function, he was able to tolerate the use of a one-way valve with adequate sustained expiratory pressure (Villarroel et al., 2012). The patient showed an oropharyngeal motor response, although it was characterized by moderate restriction in hyolaryngeal excursion upon digital palpation. Based on these results, a decision was made to proceed with occluding the tracheostomy tube, with no clinical signs suggesting poor secretion management, which was consistent with the results of the secretion staining test. These clinical findings made the patient a candidate for decannulation. However, due to his long history of fragility, his fluctuations in cognitive-behavioral performance, and the restriction detected in his hyolaryngeal excursion, the speech-language therapy team decided to supplement the evaluation—specifically the excursion of the hyolaryngeal complex—with an objective technique.

Since nasofibroscopy or videofluoroscopy equipment was not available at the time, the speech-language therapy team decided to use the ultrasound technique to indirectly determine whether the patient's swallowing performance was sufficient to ensure lower airway safety.

Exploration of the Hyolaryngeal Excursion Through Ultrasound

For the ultrasound measurement, the team used a SonoSite X-Porte ultrasound machine (FUJIFILM, Toronto, Canada) equipped with a 10-5 MHz linear transducer in B-mode, with a depth of nine centimeters. This equipment allows real-time observation of structures in two-dimensional images. A speech-language therapist with two years of experience in laryngeal ultrasound performed the procedure in the patient's room. The patient was placed in a supine position with a semi-Fowler incline and slight cervical extension. The transducer was positioned along the midline of his neck in a longitudinal axis, at the level of the hyoid bone and thyroid cartilage (see Figure 1). The method described by Ahn et al. (2015) was used to identify the hyoid bone and the superior edge of the thyroid cartilage.

Following the guidelines of Huang et al. (2009), the measurements consisted of recording the distance between both structures, first at rest, then establishing the shortest distance between them during the swallowing of secretions, and subsequently calculating the percentage change in hyoid-laryngeal approximation. In all cases, the 64-bit ImageJ software (National Institutes of Health, USA, https://imagej.nih.gov) was used to estimate the distance in pixels.

The images of the ultrasound revealed an incomplete oropharyngeal motor response, showing a series of partial activations of the hyoid-laryngeal complex instead. The images used to measure the thyrohyoid distance at rest and maximum approximation can be seen in Figure 2. The patient had a 24.2% change in hyoid-laryngeal approximation. The distances in pixels at rest and maximum approximation are detailed in Table 1.

Considering these results, the speech-language therapy team suggested delaying the decannulation procedure at that time. This recommendation was communicated to the rest of the interdisciplinary team, which scheduled a non-nutritive swallowing evaluation via endoscopy for the following day.

Table 1. Details of the Measurements Obtained Through Ultrasound

Image	Distance in Pixels	% Change in the Hyolaryngeal Approximation [(A-B / A) *100]
Resting Position (A)	178.6	24.2 %
Maximum Approximation (B)	135.3	

Figure 1. Reference image of the operator performing an ultrasound, positioning the transducer on the patient's neck, along the midline in the longitudinal axis at the level of the hyoid bone and thyroid cartilage.

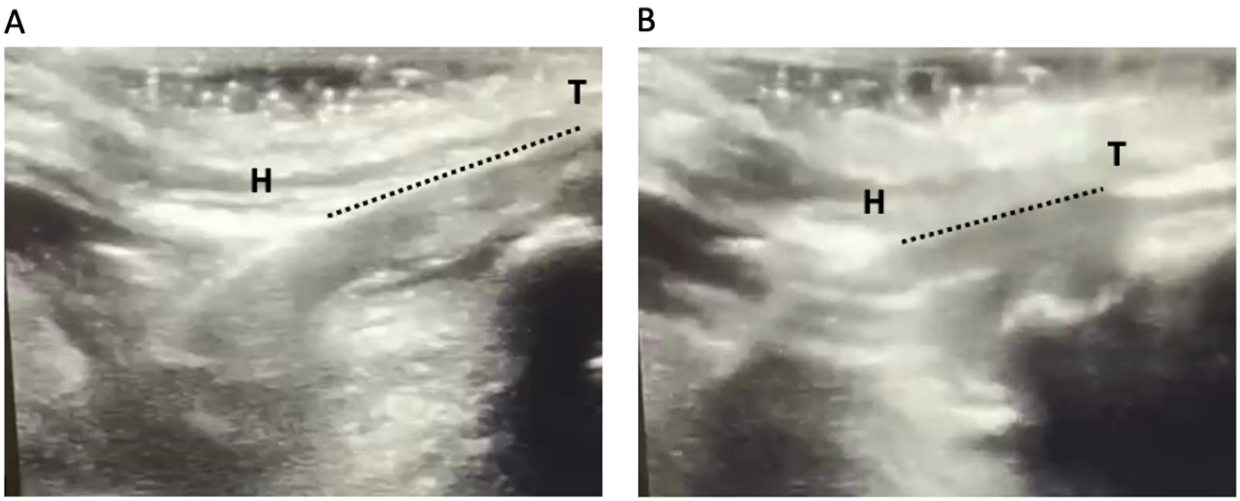

Figure 2. Images obtained through ultrasound in the longitudinal plane showing the structures of interest: hyoid bone (H) and thyroid cartilage (T). The distance between both structures is indicated by a dotted line for both positions. The image on the left (A) corresponds to the resting position, while the image on the right (B) represents the position of maximum thyrohyoid approximation during the swallowing of secretions.

Endoscopic Exploration of Non-Nutritive Swallowing

A fiberoptic endoscopic evaluation of swallowing (FEES) was performed using a portable device (Scope Basic, ATMOS, Lenzkirch, Germany). The Penetration Aspiration Scale (Rosenbek et al., 1996) was used to describe the level of safety for swallowing secretions. To assess swallowing efficiency, the Yale Pharyngeal Residue Severity Rating Scale (Neubauer et al., 2015) and the Secretion Severity Rating Scale (Murray et al., 1996) were employed. Similar to the ultrasound, the endoscopic evaluation was conducted in the patient's room, where the patient was positioned supine at 45º; a greater angle was not possible due to the patient's burns. The procedure was carried out by a speech-language therapist certified in FEES, with over five years of experience in performing the procedure. The guidelines described by Langmore (2006) were followed, which included staining the secretions with two drops of blue vegetable dye. Additionally, the

patient's swallowing performance was assessed with the ingestion of 3 mL of cold and colored purified water (5ºC), corresponding to level 0 of the International Dysphagia Diet Standardisation Initiative (Cichero et al., 2017).

The endoscopic evaluation (see Figure 3) revealed disturbances in safety and efficiency parameters in swallowing secretions. Regarding safety, it was observed that the stained secretions passed through the vocal folds without triggering a reflex response, which is equivalent to level 8 of the Penetration Aspiration Scale. Efficiency was also compromised, as secretions remained in the laryngeal vestibule without the patient being able to clear them through swallowing or coughing, corresponding to level III on the Secretion Severity Rating Scale. As for the Yale Pharyngeal Residue Severity Rating Scale, the patient's performance for managing secretions in the valleculae was comparable to level III, with accumulation that did not obstruct the visualization of the epiglottic ligament. A similar performance was observed for the piriform sinuses, with mild accumulation in 1/4 of the space, corresponding to level III of the scale. These findings were consistent with the observations of the oropharyngeal motor response, which showed severe impairment, evidenced by the absence of whiteout during the patient's spontaneous swallowing attempts.

To increase the sensory load, 3 mL of cold purified water was administered once, due to its safety over other options. This resulted in a slight improvement in the patient's bolus control, although insufficient to modify his swallowing safety and efficiency. The content that crossed the vocal folds was immediately suctioned via the subglottic aspiration duct and the tracheostomy tube, as well as through aspiration of the oropharyngeal cavity.

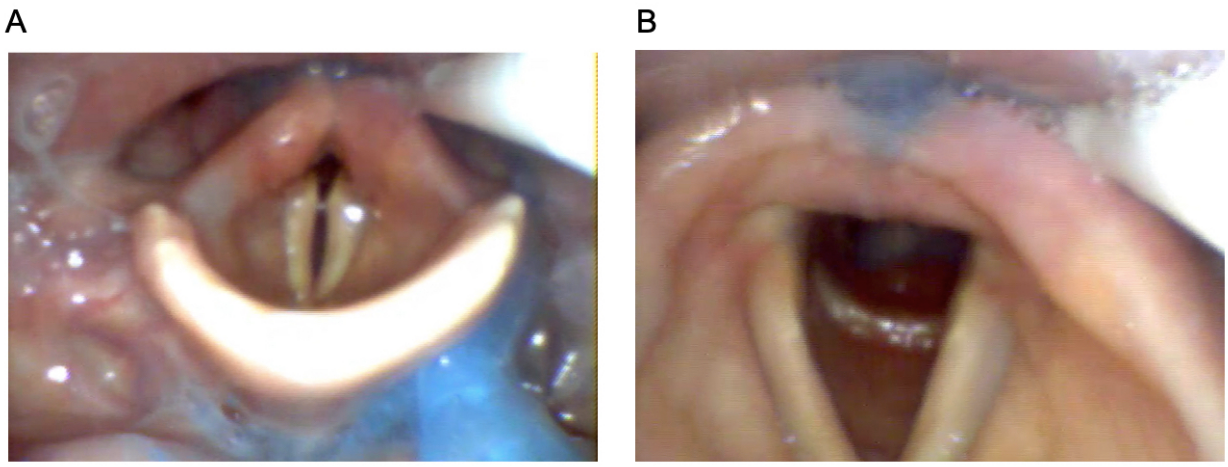

Figure 3. Images captured during the endoscopic swallowing study. In the image on the left (A), the accumulation of secretions in the valleculae is observed, which subsequently precipitate into the piriform sinuses. In the image on the right (B), the fall of secretions through the posterior commissure of the vocal cords is shown, settling on the tracheostomy tube.

Since the patient did not meet the established clinical criteria for decannulation, showing silent aspiration of saliva and a lack of spontaneous swallows with whiteout for two continuous minutes (Muhle et al., 2021), the speech-language therapy team suggested postponing the decannulation process. The interdisciplinary team agreed to maintain the tracheostomy until the patient demonstrated functional swallowing of secretions and an improvement in the airway's protective mechanisms.

Ethical Considerations

The patient provided verbal consent to use his medical records. Additionally, his legal guardian signed a document to authorize the use of medical records or examination results, following the guidelines established by the ethics committee of *Hospital del Trabajador*.

DISCUSSION

Tracheostomy is a beneficial procedure for patients requiring prolonged respiratory support, but it can affect swallowing function, particularly when needed for extended periods. This results in a high incidence of secretion aspiration due to the loss of sensitivity and reduced functionality of the airway protective mechanisms (Shinn et al., 2019; Wallace & McGrath, 2021). Decannulation is a desirable procedure, but its success requires the consensus of the interdisciplinary team, with each professional contributing to the decision-making process. In this context, speech-language therapists play a crucial role in ensuring that the patient shows sufficient swallowing performance and airway protective mechanisms for managing secretions (Tobar-Fredes et al., 2020; Wallace & McGrath, 2021).

Considering the conditions found in critical care units, the assessment of secretion management functionality is often conducted through clinical evaluation. However, this evaluation is subjective and depends on the clinician's skills (Brates et al., 2019; McCullough et al., 2000). Meanwhile, the use of traditional objective alternatives, such as videofluoroscopy and FEES, is often limited by disadvantages such as high costs, low availability, and invasiveness. In this context, laryngeal exploration using ultrasound emerges as a promising tool to support clinical evaluation. It stands out for being non-invasive and low-cost, with results that correlate with oral intake scales and allow for quantifying aspects of swallowing performance (Hsiao et al., 2021; Huang et al., 2009; Picelli et al., 2021).

Given the above, the objectives of this study were: a) to report, based on a case study, the effectiveness of ultrasound in assessing hyolaryngeal function in the context of decannulation, and b) to introduce, based on the reported case, a general guidelines proposal for including ultrasound in the clinical care workflows for people with tracheostomy.

The case reported here involves a person with long-term tracheostomy who, after meeting the criteria for possible decannulation according to other specialties, underwent a clinical swallowing assessment. This evaluation showed sufficient swallowing performance to consider decannulation, with the sole exception of the subjective detection of decreased hyolaryngeal excursion. Consequently, the speech-language therapy team decided to use ultrasound as an objective tool to assess the hyolaryngeal performance, a crucial piece of information for determining the functionality of swallowing as a protective mechanism for the lower airway.

The assessment of hyolaryngeal excursion was carried out using ultrasound, measuring the percentage of approximation between the thyroid cartilage and the hyoid bone compared to their resting positions. The results revealed this excursion to be disturbed. It should be mentioned that these results were confirmed the following day through an endoscopic evaluation. The objectification of this parameter proved relevant in the decannulation process of this case, where obtaining precise information was essential for making an appropriate decision.

In line with previous research (Hsiao et al., 2021; Huang et al., 2009; Picelli et al., 2021), the case presented here shows the potential of ultrasound as a complementary resource in evaluating hyolaryngeal excursion, a critical aspect in determining whether an individual's swallowing function ensures airway safety or not (Brates et al., 2019; Ishida et al., 2002). Thus, ultrasound emerges as a promising tool to be incorporated during the clinical assessment of swallowing, reducing the risk of subjectivity and limited sensitivity inherent to digital palpation (Logemann, 1998). However, as these results are based on a single case, the efficacy of ultrasound in decision-making for successful decannulation is not conclusively established. Further research with a larger sample is necessary to fully support its effectiveness.

Therefore, ultrasound appears as a useful tool for hospital settings, particularly in critical care units where options for conducting instrumental evaluations, such as videofluoroscopy or FEES, are often restricted. The greater availability and portability of ultrasound equipment allow for its application in complex clinical situations where the limitations of clinical evaluation may influence recommendations and decisions made by speech-language therapists. Below, a proposal for including ultrasound in the decannulation protocols for individuals with tracheostomy is presented.

Proposal for Including Ultrasound in Decannulation Protocols for Tracheostomized People

The assessment of swallowing performance for secretions is a crucial component in the decannulation process for patients with tracheostomy who satisfactorily meet respiratory and cognitive criteria. To this end, most decannulation protocols include clinical evaluation of swallowing, with hyolaryngeal excursion being a key parameter. It is suggested to include ultrasound as a complementary tool to the clinical assessment.

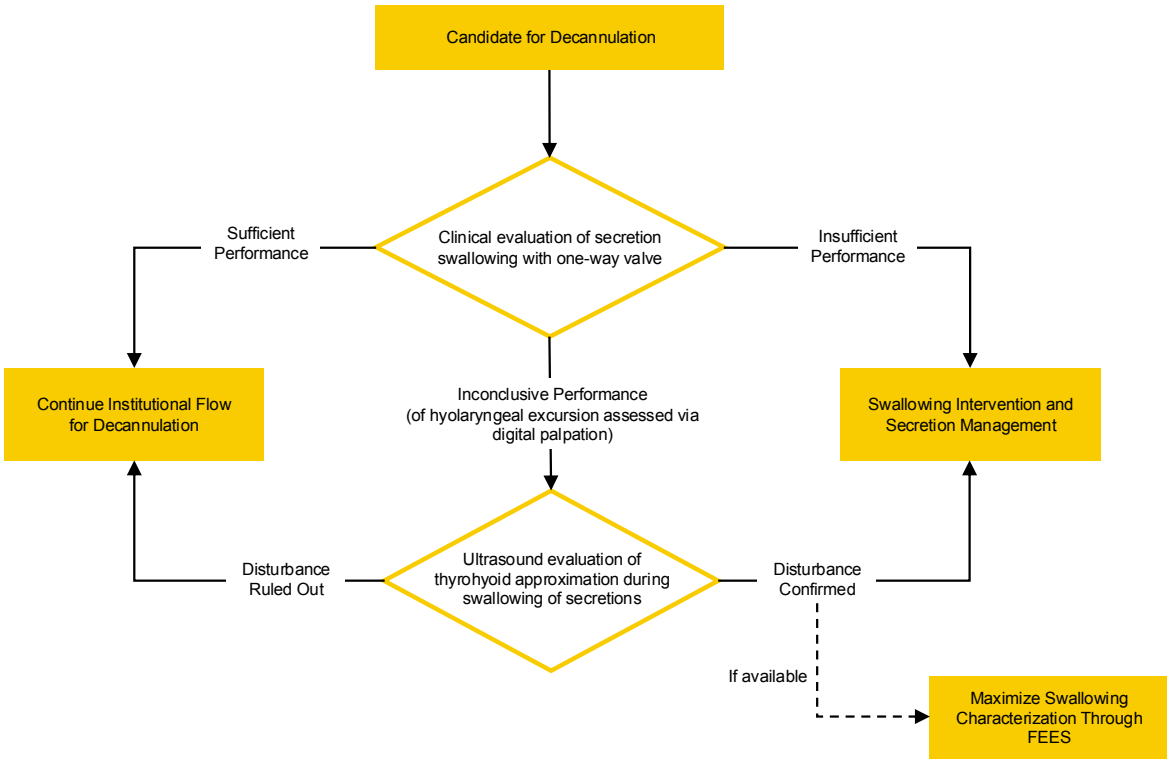

Figure 4. Proposal for the Inclusion of Hyolaryngeal Excursion Assessment via Ultrasound in the Evaluation Process of Tracheostomized Individuals Who are Candidates for Decannulation

Figure 4 presents a diagram that incorporates the use of ultrasound in the evaluation of tracheostomized individuals. This method provides objective information, especially necessary in cases where the results of the clinical assessment of secretion swallowing are inconclusive in deciding whether to proceed with the decannulation process. Through this procedure, it is feasible to access information quickly and easily, which not only enriches the diagnosis but also contributes to speech therapy planning and interdisciplinary management. This includes the understanding that there is still work to be done regarding the correlation of ultrasound with assessments using FEES or videofluoroscopy.

In addition to the aforementioned, current literature provides growing evidence of the value of ultrasound in observing glottic structures and functions. This allows for the detection of clinically relevant situations, such as glottic edema in cases of laryngeal stridor (Ding et al., 2006). Furthermore, it enables the assessment of the protective function of the vocal folds during swallowing and is useful for identifying lesions in extubated patients or those with tracheostomy (Ruan et al., 2018; Taenaka et al., 2017). Considering the above, it is suggested to explore incorporating ultrasound into the evaluation of tracheostomized patients who show signs of laryngeal stenosis or are unable to achieve stable expiratory pressure ranges during the implementation of a one-way valve.

Reflections on the Use of Ultrasound in Other Clinical Scenarios

Although there is still a long way to go before establishing ultrasound as a complementary objective method for swallowing assessment, this technique is increasingly being used. This is especially true in the case of diagnosing and monitoring patients in intensive care units (Guevarra & Greenstein, 2020). However, it is interesting to reflect on other potential uses for this tool. For instance, ultrasound could be used to support the clinical swallowing evaluation in people with respiratory diseases at high risk of contagion, such as COVID-19, due to the aerosolization associated with the use of other tools like FEES. In this sense, it is suggested to contemplate the incorporation of ultrasound into clinical management protocols for patients with COVID-19, as proposed by *Sociedad Latinoamericana de Disfagia* (Latin

American Society of Dysphagia) (Manzano-Aquiahuatl et al., 2022).

Furthermore, ultrasound can be a valuable tool for patients in palliative care and/or end-of-life care, as FEES and videofluoroscopy present certain limitations in this context such as invasiveness and the need for patient transfer, respectively. Being a non-invasive and easily applicable method, ultrasound allows clinicians to gather crucial information regarding the effectiveness of strategies aimed at reducing the risk of aspiration pneumonia and improving the quality of intake for comfort. According to Tobar-Fredes et al. (2021), in situations where instrumental procedures are not recommended, ultrasound plays a fundamental role in clinical decision-making.

CONCLUSIONS

This study describes the use and effectiveness of ultrasound in the assessment of hyolaryngeal function in tracheostomized individuals who are candidates for decannulation, based on the case report of a patient with polytrauma, burns, and prolonged tracheostomy. In this regard, the following points are presented as key conclusions:

- Decannulation is a critical step in the rehabilitation of tracheostomized patients, and ensuring safety in this process is vital. In this context, speech-language therapists play a fundamental role by providing the healthcare team with invaluable information regarding the patient's ability to protect their airway. A precise assessment of swallowing function and airway protection mechanisms is essential before considering a patient as a candidate for decannulation.
- Clinical swallowing assessment, particularly of hyolaryngeal excursion, is highly subjective and dependent on the clinician's skills, which can lead to less precise decisions and a risk of overlooking significant dysfunctions.
- Ultrasound is a non-invasive, low-cost, and easy-to-use tool that allows clinicians to objectively measure hyolaryngeal excursion, providing more accurate and reliable information for decision-making in tracheostomized patients.
- The characteristics of ultrasound make it especially useful in hospital settings, complex clinical situations, and when other instrumental evaluation techniques are not feasible.
- Ultrasound should not replace instrumental assessments such as videofluoroscopy or FEES; rather, it should be used as a supportive tool for clinical evaluation, providing additional objective data the professional must analyze to determine their impact on swallowing.
- Including ultrasound in decannulation protocols could contribute to informed decision-making, improving the safety and success of the decannulation process.

Considering the still limited availability of information regarding the use of ultrasound in swallowing studies, we believe it is relevant for other specialists to share their experiences. This will enrich the practical application of new knowledge across diverse contexts and clinical scenarios.

Finally, it is crucial to emphasize that both ultrasound and other instrumental tools, such as FEES or videofluoroscopy, are essential complements but do not replace the clinical judgment of properly trained professionals. The clinical assessment of swallowing, combined with an evaluation of personal factors, social environment, available resources, and support networks, remains vital for a comprehensive and personalized approach.

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