Review Article

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A Review on Nursing Care of Severe Head Injury Patients Who Undergo Late Versus Early Tracheostomy

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ABSTRACT

Introduction: A severe head injury is an illness that causes temporary or permanent neuronal damage. Tracheostomy is one treatment option for critically ill patients, especially severe head injury patients, who require long-term mechanical ventilation. Outcomes for mechanically ventilated patients with severe brain injury have improved, but tracheostomy practices for patients with severe brain injury are still being debated in Malaysia. **Aim:** This review highlights the pros and cons of early versus late tracheostomy among patients suffering from severe head injuries. **Methods:** The Medical Subject Heading (MeSH) terms were used to search the previous articles related to the early and late tracheostomy. The database was searched for articles published after 2000. **Results:** Early tracheostomy brings more beneficial aspects to severe head injury patients. A good prognosis was shown in previous articles. **Conclusion:** This study seeks to explore whether it is true that early tracheostomy among severe head injury patients will reduce the duration of the Intensive Care Unit (ICU) stay, wean patients off the use of ventilators faster, help in resource utilization, bring down the death rate, and reduce the likelihood of ICU readmission. Additionally, improved functional outcomes, aggregate quality of life, and rehabilitation compliance are all expected benefits of performing an early tracheostomy.

Keywords: Nursing Care; Severe Head Injury; Tracheostomy; Outcome

INTRODUCTION

A severe head injury is an illness that causes temporary or permanent physical, cognitive, or psychosocial deficits as a result of direct or indirect neuronal damage. Road traffic accidents, violence, and falls are the most common causes of severe head injuries. A precise early assessment can help predict patient outcomes in the future. Therefore, it can guide healthcare providers to deliver further management (Putri & Widasmara, 2019). The fast response time could influence preventing further disability in head injury patients (Sutiyo *et al.*, 2021). Tracheostomy is one treatment option for critically ill patients, such as those with severe head injuries, who require long-term mechanical ventilation (de Franca *et al.*, 2020). The tracheostomy tube aids pulmonary toileting and oral hygiene, as well as lowering the risk of ventilator-associated pneumonia (Manisha, George & Nadiya, 2021). A tracheostomy tube is also less unpleasant for patients awakening from a coma, and sedation can be tapered off more readily (Banfi & Robert, 2013; Khammas & Dawood, 2018). In addition, tracheostomy reduces the physiological dead space of ventilation and hence decreases the work of breathing dramatically (Adly *et al.*, 2018; Quiñones-Ossa *et al.*, 2020). Among severe head injury patients, this is significantly more beneficial, especially for those who have difficulty breathing or suffer from worsening respiratory function (de Franca *et al.*, 2020).

Review of Literature

Early tracheostomies have been demonstrated to have advantages that would lead to a shorter hospital stay. However, in order to reap the benefits of early tracheostomy without having to execute unnecessary tracheostomies, relevant patients must be identified early on during the admission process (Sriram & Chintamani, 2005). The necessity for a tracheostomy can be predicted by early oxygenation and ventilatory problems. Patients with a head injury, on the

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other hand, require airway protection rather than ventilatory support for pulmonary failure due to a failed neuromuscular system originating from the brain (Marra *et al.*, 2021).

Late tracheostomy is defined as tracheostomy in patients with prolonged intubation that exceeds seven days (Meng *et al.*, 2016). There are many adverse effects if a late tracheostomy is done, such as hospital-acquired pneumonia, an increase in mortality rate, a rise in the staying duration in the intensive care unit (ICU), and a prolonged duration of artificial ventilation (de Franca *et al.*, 2020). This is similar to the findings of a study carried out by Patel *et al.,* (2015), where prolonged intubation has been found to be linked with multiple complications, which include subglottic stenosis and glottic obstruction, serious pneumonia that requires a ventilator, and the requirement for high sedation.

Late tracheostomy and prolonged intubation also affect the nurses in several ways. Patients with prolonged intubation are unable to communicate with their caregivers as they are under sedation (Bice *et al.*, 2015). Pressure ulcers around the upper airway devices are considered painful and take a longer time to heal (Touman & Stratakos, 2018). Oral care of the patients that needs to be carried out by nurses is also a difficult task to perform for late tracheostomy patients (Rello *et al.*, 2007). Another problem is the weaning rate of mechanical ventilation, which is slower compared to early tracheostomy patients (Lin *et al.*, 2015).

Due to the lack of articles being discussed on the tracheostomy among head injury patients, especially in the Malaysian setting, this review paper will discuss the effects of early and late tracheostomy on severe head injury patients and their implication in Malaysia.

METHODOLOGY

This review focused on early and late tracheostomy among severe head injury patients. Thus, this article was aimed to analyse, summarise, and synthesise the previous articles related to early and late tracheostomy among severe head injury patients. The knowledge gaps were highlighted, and suggestions for future research were made.

The search strategies were based on the Medical Subject Heading (MeSH) terms to identify the related literature that referred to the two key components of the review topic:

1. People with severe head injuries (the MeSH terms were severe traumatic brain injury/ severe brain injury/ severe head injury).

2. The phenomenon of interest (the MeSH terms were used, early tracheostomy/ late tracheostomy).

The phrase searching and the Boolean operator technique (using "OR" and "AND") were employed to link all key components during the searching process in all databases. The articles published after 2000 were included in this review.

Ethical Consideration

The author disclosed receipt of the research grant from the Ministry of Higher Education of Malaysia (MOHE) (FRGS/1/2021/SKK06/UIAM/02/6) on 7th September 2021.

DISCUSSION

1. Relationship between Tracheostomy and Severe Head Injury

Historically, the outcome for patients requiring mechanical ventilation for acute brain injury has not been encouraging. It is reported that a high percentage are either fully dependent after six months of admissions or end up dead (Krishnamoorthy *et al.*, 2019). The field of neurocritical care has worked hard to combat a predisposition toward therapeutic nihilism caused by such data as well as an early removal of life support decision-making inclination (Hemphill & White, 2009). The outcomes of patients with severe acute brain injuries who are mechanically ventilated have improved; however, a recent analysis of tracheostomy procedures in Malaysian patients with severe acute brain injuries suggests that two distinct contexts for treatment may have developed (Krishnamoorthy *et al.*, 2019). Tracheostomy is a treatment marker for patients with severe acute brain injury; it denotes a continuing commitment to care and is avoided when supportive treatments are intended to be discontinued. On the other hand, in patients with

serious brain injuries, tracheostomy is frequently, but not always, necessary until their airway protective reflexes, pharyngeal tone, levels of activation, and cognition have improved sufficiently to at least clear secretions and maintain a patent upper airway (Schönenberger *et al.*, 2016).

Meanwhile, the tracheostomy plays a significant role in the neuro-ICU, which is clear and undisputed. Tracheostomies were performed on 20.5% of the 1,545 patients in the point prevalence cross-sectional, prospective observational, non-interventional study in neurocritical care, making it the second most prevalent procedure in these units (Pak and Yi, 2013). Meanwhile, current research has found that more than 10,000 tracheostomies were performed each year in the USA for severe acute brain injury between the years 2002 and 2011 (Seder, 2019).

Survivors of cranectomy frequently experience respiratory complications as a result of a compromised central drive, weak ventilatory muscles, retained secretions, or a higher risk of aspirating gastrointestinal contents (Aggarwal & Dua, 2019). In order to control their airways and maintain good pulmonary hygiene, these patients need prolonged intubation with the use of mechanical ventilators in the ICU. Eventually, some of these patients will require tracheostomies. It has not been well studied if tracheostomy is required following decompressive craniectomy (DC) for traumatic brain injury (TBI). Premature extubation, which causes rapid respiratory failure and necessitates reintubation as an emergency treatment, can be avoided by having the ability to recognise people who will require a permanent airway (Choi, Lemmink & Humanez, 2023). Furthermore, more information is needed to determine when tracheostomies are performed in this population. 24% of craniectomized survivors after TBI needed a tracheostomy. In survivors of craniectomies, age and the Glasgow Coma Scale (GCS) at the time of admission are independent predictors of the requirement for a tracheostomy. If tracheostomy is required, an earlier procedure might help with patient care (Huang *et al.*, 2013).

2. Pros and Cons of Tracheostomy Timing

Patients with altered consciousness may need ventilatory assistance to manage pulmonary complications, intracranial hypertension, and mechanical ventilation during the early stages of TBI. Extubation is frequently delayed until after the acute period and until the proper weaning parameters have been established due to the patients' diminished level of awareness and inability to defend their airways after the acute phase has ended (Pak & Yi, 2013). Due to their decreased ability to expel secretions, these patients may benefit from prolonged intubation to prevent aspiration; however, research has indicated that prolonged intubation of patients with TBI is associated with a high risk of pneumonia (Li *et al.*, 2020). Early tracheostomy following trauma decreases the length of time spent in the ICU, the number of days spent on the ventilator, and the frequency of ventilator-associated pneumonia (Hui *et al.*, 2013). According to study results, patients who received an early elective tracheostomy stayed in the ICU for less time than those who first sought extubation (McCredie *et al.*, 2017). It has also been reported that individuals with brain injuries who underwent an early tracheostomy benefited from a decreased risk of pneumonia (Li *et al.*, 2020).

Tracheostomy offers a variety of advantages over endotracheal intubation, such as a smaller dead space, decreased airway resistance, less tube movement inside the trachea, increased patient comfort, and more efficient suction (Durbin, 2010). Despite the indication given by recent studies that tracheostomy surgery in intensive care units can be safe, there have also been cases where serious consequences from tracheostomy have arisen, including tracheal stenosis, increased bacterial colonisation, and haemorrhage (Wallace & McGrath, 2021).

A neurological assessment using the Glasgow Coma Scale (GCS) should always be included in a weaning procedure for head-injured patients, according to research. A score higher than eight on the GCS was most reliable for predicting successful extubation without the need for reintubation and preventing pneumonia and tracheostomy. In some situations, such as in patients with infratentorial lesions, the implementation of a tracheostomy by day eight is justified by the low likelihood of a subsequent extubation and increased in-hospital mortality. Due to damage to the key neuronal respiratory centres in the brain that aid in controlling respiration, patients with infratentorial lesions to the cerebellum and brainstem may be candidates for an early tracheostomy (El-Anwar *et al.*, 2017).

It is unfortunate that tracheostomy placement has been linked to a sixfold increase in the chance of developing ventilator-associated pneumonia because tracheostomy placement does not guarantee a reduction in nosocomial

pneumonia incidents. (Ibrahim *et al.*, 2001; Saad *et al.*, 2023). Similarly, patients with tracheostomies tend to have a longer duration of stay in the ICU and hospitals, and although ICU mortality is found to be reduced, more crucially, no reduction in hospital mortality has been recorded among tracheostomy patients (Fernando *et al.*, 2019).

A patient's declining capacity to maintain airway protection and eliminate secretions is one of many reasons that might lead to extubation failure. According to research, individuals undergoing neurosurgery have a higher risk of extubation failure if their GCS score is less than eight (Otaguro *et al.*, 2021). In contrast, (Godet *et al.*, 2017) found that extubation failure and GCS score do not correlate. In prospective observational cohort research conducted, they discovered that extubation was tolerated by 39 out of 49 patients with a GCS score of eight or less and by 10 out of 11 patients with a GCS score of four or less (Godet *et al.*, 2017). Additionally, the study also demonstrated that brain-injured patients who were extubated later experienced more pneumonias, were in the hospital for longer periods of time, and spent more in terms of hospital fees compared to patients who were extubated right away after fulfilling the requirements for conventional weaning.

To date, no significant randomised trials have conclusively demonstrated that tracheostomy intervention will improve the outcome of treatment. For patients with brain injuries, the need for a tracheostomy and the timing for its performance remain a common clinical issue (Robba *et al.*, 2020).

3. The Indication of Suitable Timing of Tracheostomy

Indications for tracheostomy can be classified as emergent or elective. Patients with acute respiratory failure who are unable to be removed from mechanical ventilation in the ICU will subsequently be sent for an elective tracheostomy (El-Anwar *et al.*, 2017). Somehow, the decision to perform a tracheostomy and when to perform it apparently rests with the patient's attending physician (Nseir *et al.*, 2007).

Due to a lack of firm criteria, the time to perform a tracheostomy depends on the clinical situation, the physician's discretion, and the outcome of discussion with the family members (Robba *et al.*, 2020). According to the study, the possibility that a patient will be extubated is based on his or her prognosis. Other clinical factors such as the patient's level of awareness, oxygenation, haemodynamic state, and capacity to maintain their airway can all affect the assessment made by the attending physician.

The American College of Chest Physicians (ACCP) conducted a Consensus Conference in 1989 on Artificial Airways in Patients Receiving Mechanical Ventilation, however, the findings revealed that an accurate period of translaryngeal intubation could not be determined (Romero *et al.*, 2009). It was indicated that tracheostomy is preferred if the anticipated use of mechanical ventilation is expected to last more than 21 days. The physician had to make the final decision, and daily assessment was advised for mechanical ventilation predicted to last between 10 and 21 days. In more recent ACCP guidelines, it was advised that a tracheostomy should be performed if the patient has stabilised on the ventilator and will clearly need continuous ventilation (Romero *et al.*, 2009).

4. Communication between Nurses and Severe Head Injury Patients with Tracheostomy

One study focused on analysing the use of communication tools and their efficacy when it came to communicating with tracheostomy patients in the intensive care unit (Nakarada-Kordic *et al.*, 2018). Few studies have examined how tracheostomy patients communicate in the intensive care unit, while most recent studies concentrate on the experiences of endotracheal intubated patients (Flinterud & Andershed, 2015). Furthermore, no research has examined whether patients with nasotracheal intubation encounter similar communication challenges to those of tracheostomy patients receiving mechanical ventilation.

Due to the inflated cuff obstructing airflow to the vocal cords, mechanically ventilated patients in the ICU temporarily lose their voice. Communication with non-vocal patients is extremely difficult and could even be unpleasant for those involved. Patients may feel frustrated, restless, helpless, and incomplete, and the loss of speech may be interpreted by them as losing personhood, control, and independence (Happ *et al.*, 2011; Karlsson, Bergbom & Forsberg, 2012; Khalaila *et al.*, 2011; Dithole *et al.*, 2016). In the ICU, nurses are the primary caregivers in charge of establishing and maintaining communication (Nilsen *et al.*, 2014). Nurses may find it difficult and stressful to

determine the patient's needs, and if they are unsuccessful, they may feel inadequate and guilty for not being an ideal nurse" (Rodriguez *et al.*, 2022).

Using light sedation is gaining currency and has enabled a paradigm shift in the ICU. Denmark's national recommendations state to avoid using sedatives whenever possible or at least limit the dosage and duration time (Madsen *et al.*, 2015). It depicts that more patients are aware of their surroundings during their stay at the ICU, and therefore they will not experience any severe difficulty in terms of communication. Although the majority of the ICUs in the Nordic countries have imposed lighter sedation protocols (Egerod *et al.*, 2013). The study has revealed that providing nursing care to sedated patients differs from the care given to conscious patients; also, non-verbal patients require more time, close attention, and continuity from nurses (Karlsson, Bergbom & Forsberg, 2012). More research is required to explore communication between nurse and patient within the context of non-sedation, while findings from this research have provided knowledge and perspectives that were not previously known.

5. Disrupted Communication between Patients and Nurses Due to Use of Tracheostomy Tube and Ventilation

Caring for patients who are minimally conscious or in a chronic vegetative state can become a real clinical challenge since some of them may stay in such a state for several years without communicating with anyone (Gosseries *et al.*, 2012).

Nilsen *et al.*, (2014) highlighted that prolonged intubated patients have difficulties communicating, and this can prevent them from being able to express their needs, symptoms, and emotions, as well as from taking part in decisions about their own treatment. Patients often expect to be understood by the nurses, as if it is part of their professional competence (Tolotti *et al.*, 2018). Communication with patients who are unable to use their voice is difficult. The same study highlighted anger and frustration as feelings also experienced by nurses when they were not able to recognise what the patient needed or what they were trying to communicate. Other studies have found that despite the existence of several communication techniques to assist in the communications between mechanically ventilated patients and other health professionals, there is currently some difficulty in teaching them to communicate (Duarte *et al.*, 2021).

The use of light sedation, or even no sedation, is growing, especially in Europe, when the clinical conditions of mechanically ventilated patients are favourable (Karlsson, Bergbom & Forsberg, 2012). This reduces the time needed for patients to wean from mechanical ventilation and, as a result, also shortens their length of stay in the ICU, ensuring better health outcomes. Karlsson and Bergbom (2015) provided a description of the primary sources of difficulty and stress in patients with mechanically ventilated tracheostomy, which include no way to communicate. Multiple researchers have found in the experiences of the patients that difficulty in communication generates feelings of helplessness and vulnerability (Engström *et al.*, 2013; Lykkegaard & Delmar, 2015; Meriläinen, Kyngäs & Ala-Kokko, 2013), thus understandably becoming sources of frustration, anxiety, and fear (Grossbach, Chlan & Tracy, 2011).

6. Unclear Guidelines for Tracheostomy Care in Malaysia

In Malaysia, information about nursing care for severe head injury patients is very limited. In Neurosurgical Clinical Practice Guidelines in 2015, early management of head injuries in adults is discussed without going into detail about performing a tracheostomy as an alternative strategy.

Since the beginning of time, our respected clinicians and nurses have dealt with severe head injury patients undergoing tracheostomy. Nurses are the frontline workers that deal with severe head injury patients, ensuring that their treatment and well-being are taken care of. In order to really understand the impact of early or late tracheostomy among severe head injury patients, the knowledge, perception, challenges, and experiences of the nurses involved are of paramount importance and will have a huge impact on the narrative.

Because of the uncertainty surrounding the benefits and implications of nursing care for head injury patients, the timing and execution of tracheostomy vary from one healthcare facility to the next, and proper nursing care guidelines are not available. According to Tai *et al.*, (2019), a physician's decision and family hesitation to opt for a tracheostomy approach are the two main reasons for the occurrence of late tracheostomy and this may result in a significant loss to the patient's progress, the nurses, as well as the hospital's resources.

There is still a scarcity of evidence-based data and thorough information on the subject. The impact of early or late tracheostomy among severe head injury patients from the nurses' perspective must be thoroughly investigated. As a result, this study was carried out to see how nursing care affects patients with serious head injuries.

There are no published nursing-focused clinical guidelines for the non-acute management of patients with moderate-to-severe head injuries who are in the chronic phase of their condition. With no rules, nurses are unable to provide these patients with the treatment they need when other medical concerns arise later in life. Secondly, current acute care guidelines concentrate on providing technical and medical care for patients with acute conditions, but they do not cater to the implications of chronic or acute cognitive impairments for family education or patient care. The influence of cognitive deficits when caring for patients with chronic brain damage who are hospitalised for other health issues is also not well-defined by clinical recommendations on associated health disorders, such as an acquired brain injury brought on by a stroke (Paul, 2010).

7. Issues on Tracheostomy Care Among Severe Head Injury Patients

The National Confidential Enquiry into Patient Outcome and Death (NCEPOD) reported that 31% of ward patients and 24% of patients in ICU experienced complications related to tracheostomy (Wilkinson, Freeth & Kelly, 2015). An audit conducted every year in Peshawar at a tertiary care hospital revealed that 37.5% of complications occurred early, while 7.5% of complications were late complications (Zenk *et al.*, 2009).

The doctors, nurses, and other hospital staff play a major role in the post-operative care of such patients and managing life-threatening and acute complications, both in the ICU and on the ward. Unfortunately, the lack of standardised protocols for managing tracheostomies and inadequate staff training can make this simple procedure quite challenging (Khanum *et al.*, 2022).

Both in the ward and the ICU setup, the nursing staff and doctors play a critical role in bedside management. Therefore, it is essential that all healthcare professionals who are directly involved in giving these patients postoperative care are capable of doing so effectively.

CONCLUSION

This article showed that early tracheostomy gave a better outcome to severe head injury patients. Shorter duration of ICU stays, faster weaning off the ventilator, help in resource utilization, reduced death rate and ICU readmission, improved functional outcome, aggregate quality of life, and rehabilitation compliance are all expected benefits of early tracheostomy.

The healthcare provider believes that tracheostomy has a positive psychological impact on the severe head injury patients in terms of better comfort and communication compared to prolonged intubation. However, there are some challenges in the delivery of nursing care to severe head injury patients with tracheostomy. Every hospital in Malaysia are not yet to have clear guidelines of severe head injury patient with tracheostomy in term of nursing care. Thus, future research was recommended to explore the perception of nurses, especially in the ICU, to know their perception on tracheostomy care toward severe head injury patients.

Conflict of Interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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