DETERMINING THE IMPACT OF EARLY AND LATE TRACHEOSTOMY AMONG SEVERE HEAD INJURY PATIENTS

BY

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ABSTRACT

Introduction: Severe head injury patients require a specific treatment plan and nursing care to achieve an optimal outcome. Mild head injury patients may need a few days of hospitalisation for close monitoring and conservative medical administration. However, in severe head injury cases, the patients may require a more extended period of hospitalisation for a series of complex neuro-medical and neurosurgical management. Tracheostomy may be performed on head injury patients with protracted breathing problems. Early tracheostomy, defined as the tracheostomy done less than seven days after initiation of endotracheal intubation, is believed to improve the patient's functional outcome, health-related quality of life and motivation toward rehabilitation. **Objective:** This study aims to determine the impact of early and late tracheostomy on the functional outcome, quality of life and rehabilitation motivation among severe head injury patients. **Method:** This is a retrospective cohort study involving 45 severe head injury patients with tracheostomy done from two hospitals in the Klang Valley. The participant's functional outcome, quality of life and motivation toward rehabilitation were evaluated using GOSE, QoLIBRI and MoT-Q instruments. In addition, the participant's clinical outcomes, including GCS upon discharge, length of stay in ICU and hospital, the incidence of VAP, duration of mechanical ventilation dependency, and decannulation rate, were recorded to identify the associations with the initiation of early and late tracheostomy. **Results:** There were 45 participants included in this study. Multivariate analyses showed that the association between these variables were significant for the length of stay in the hospital (p=0.035) and duration of mechanical ventilation used (p=0.005). The longitudinal analysis also showed that tracheostomy classification (early and late) had a significant association with the participant's functional outcomes (RR=1.189; 95% CI (1.10-1.28); p=<0.001) and motivation toward rehabilitation (RR=1.470; 95% CI (1.074-2.011); p=0.016). Nevertheless, the analysis did not show a significant association between tracheostomy classification and quality of life (RR=0.470; 95% CI (0.19-1.16); p=0.102). **Conclusions:** The initiation of early tracheostomy contributes to a favourable clinical outcome regarding mechanical ventilation duration and length of stay in the hospital for patients with severe head injury. Early tracheostomy also was significantly associated with functional outcomes and motivation toward rehabilitation, even though the association with health-related quality of life was found otherwise. Continuous follow-up assessment is proposed to reevaluate the impact of early tracheostomy on all variables. A comprehensive and details protocol for the initiation of early tracheostomy is recommended to be devised to maximize its benefit of it for patients with severe head injury.

Keywords: Early Tracheostomy, Late Tracheostomy, Severe Head Injury Patients.

ملخص البحث

مقدمة: يحتاج مرضى إصابات الرأس الشديدة إلى خطة علاجية ورعاية تمريضية خاصة لتحقيق أفضل النتائج. قد يحتاج مرضى إصابات الرأس الخفيفة إلى الإقامة في المستشفى لبضعة أيام تحت الإدارة الطبية المحافظة لمراقبة الحالة عن قرب. على كل حال، في حالات إصابات الرأس الشديدة، ربما يحتاج المرضى إلى فترة أطول من الاستشفاء لإجراء سلسلة معقدة من التدابير الطبية العصبية والجراحية العصبية. يمكن إجراء الفغر الرغامي (ثقب القصبة الهوائية) لمرضى إصابات الرأس الذين يعانون من مشاكل تنفس مديدة. يعتقد أن الفغر الرغامي المبكر، والذي يُعرَّف بأنه الفغر الرغامي الذي يتم إجراؤه خلال أقل من سبعة أيام من بدء التنبيب الرغامي، يحسن كلاً من: النتائج الوظيفية للمريض، ونوعية الحياة المتعلقة بالصحة والدافع نحو إعادة التأهيل. **الهدف:** تهدف هذه الدراسة إلى تحديد تأثير الفغر الرغامي المبكر والمتأخر على النتيجة الوظيفية، ونوعية الحياة، والدافع لإعادة التأهيل بين مرضى إصابات الرأس الشديدة. **المنهجية:** هذه دراسة حشديّة رجعيّة تشمل ٤٥ مريضاً مصاباً بإصابة شديدة في الرأس مع إجراء الفغر الرغامي، من مستشفيين في وادي كلانغ. تم تقييم النتيجة الوظيفية للمشارك، ونوعية الحياة، والدافع نحو إعادة التأهيل باستخدام مقاييس: GOSE وQoLIBRI و MoT-Q أيضا، تم تسجيل النتائج السريرية للمشاركين بما في ذلك: مقياس غلاسكو (GCS)عند الخروج من المشفى، ومدة الإقامة في المشفى و مدة الإقامة في وحدة العناية المركزة، وحدوث الالتهاب

الرئوي المرتبط بجهاز التنفس الصناعي (VAP)، ومدة الاعتماد على التهوية الآلية، ومعدل إزالة أنبوب فغر القصبة الهوائية، لتحديد ارتباطات هذه النتائج مع بدء الفغر الرغامي المبكر والمتأخر. **النتائج:** تضمنت هذه الدراسة ٤٥ مشاركاً، أظهرت التحليلات متعددة المتغيرات أن الارتباط بين هذه المتغيرات كان مهماً: لمدة الإقامة في المستشفى (p=0.035)، ومدة التهوية الألية المطبقة (p=0.005) .كما أظهر التحليل الطولي أن تصنيفات الفغر الرغامي (المبكر والمتأخر) كان لها ارتباطاً كبيرا: بالنتائج الوظيفية للمشارك (RR=1.189; 95% CI (1.10-1.28) ; p=<0.001) والدافع نحو إعادة التأهيل (RR=1.470; 95% CI (1.074-2.011)) ; p=0.016 ومع ذلك، لم يُظهر التحليل ارتباطًا مهمًا بين الفغر الرغامي ونوعية الحياة (RR=0.470; 95% CI (0.19-1.16) ; p=0.102) .**الاستنتاجات:** إجراء الفغر الرغامي في وقت مبكر يساهم في نتيجة إيجابية فيما يتعلق بمدة التهوية الألية ومدة الإقامة في المشفى عند المرضى المصابين بإصابة شديدة في الرأس، كما ارتبط الفغر الرغامي المبكر بشكل كبير بالنتائج الوظيفية للمرضى والدافع نحو إعادة التأهيل، على الرغم من أن الارتباط بجودة الحياة المتعلقة بالصحة وُجِدَ على خلاف ذلك. يُقترح متابعة التقييم المستمر لإعادة تقييم تأثير الفغر الرغامي المبكر على جميع المتغيرات، ويوصى بوضع بروتوكول شامل وتفصيلي لبدء الفغر لرغامي المبكر للحصول على الاستفادة القصوى منه للمرضى اللذين يعانون من إصابات شديدة في الرأس.

الكلمات المفتاحية: الفغر الرغامي (ثقب القصبة الهوائية) المبكر، الفغر الرغامي (ثقب القصبة الهوائية) المتأخر، مرضى إصابات الرأس الشديدة.

APPROVAL PAGE

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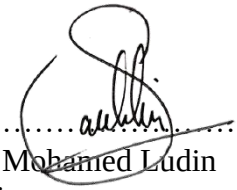

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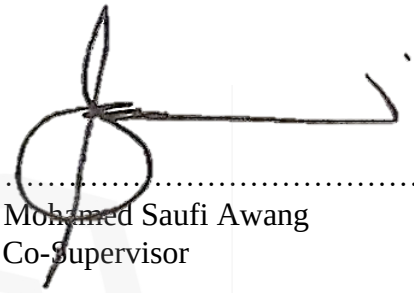

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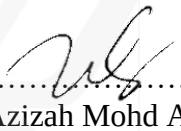

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DECLARATION

I hereby declare that this dissertation is the result of my own investigations, except where otherwise stated. I also declare that it has not been previously or concurrently submitted as a whole for any other degrees at IIUM or other institutions.

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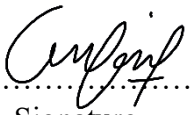

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This dissertation is dedicated to my beloved parents and siblings, my soulmate Nur Syazwina Mohd Yusof and our bundle of joy Maryam Safiyyah and Muhammad Zayd

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LIST OF ABBREVIATIONS

ADLs	Activity daily living
ARDS	Acute Respiratory Distress Syndrome
CAP	Community-acquired pneumonia
CNE	Continuous Nursing Education
CPG	Clinical Practice Guideline
CRBSI	Catheter related bloodstream infection
CT	Computed tomography
CVA	Cerebrovascular accident
CVC	Central venous catheter
DAI	Diffuse axonal injury
DVT	Deep vein thrombosis
ETT	Endotracheal tube
FRGS	Fundamental Research Grant Scheme
GCS	Glasgow Coma Scale
GEE	Generalized Estimating Equations
GOS	Glasgow Outcome Scale
GOSE	Glasgow Outcome Scale Extended
HAP	Hospital-acquired pneumonia
HDU	High Dependency Unit
HKL	Hospital Kuala Lumpur
ICF	Internal Classification of Functioning, Disability and Health
ICP	Intracranial pressure
ICU	Intensive Care Unit
IREC	International Islamic University Malaysia Research Committee
KNPGRC	Kulliyyah of the Nursing Postgraduate and Research Committee
LOC	Loss of consciousness
LOS	Length of stay
MCO	Movement Control Order
MDG	Millenium Development Goals
MOH	Ministry of Health

MOHE	Ministry of Higher Education
MoT-Q	Motivation for Traumatic Brain Injury Questionnaire
MREC	Medical Review & Ethics Committee
MRIC	Malaysian Registry of Intensive Care
MSEDGE	Neurology Section of the American Physical Therapy Association's Multiple Sclerosis taskforce
MVA	Motor vehicle accident
NMRR	National Medical Research Register
PD EDGE	Parkinson's Taskforce
PDPA	Personal Data Protective Act
PEEP	Positive end-expiratory pressure
PPE	Personal protective Equipments
QoLIBRI	Quality of Life After Brain Injury
RAPS	Risk Assessment Pressure Ulcer Scale
RASS	Richmond Agitation Sedation Scale
SAH	Sub-arachnoid hemorrhage
SAPS II	Simplified Acute Physiology Score
SDG	Sustainable Development Goals
SOFA	Sequential Organ Failure Assessment Score
SPSS	Statistical Package for Social Science
SSI	Surgical site infection
StrokEDGE	Spinal Cord Injury Taskforce
TBI	Traumatic Brain Injury
TBI EDGE	Traumatic Brain Injury Taskforce
UMMC	University Malaya Medical Centre
UTI	Urinary tract infection
VAP	Ventilator-associated pneumonia
VTE	Venous thromboembolism
WHO	World Health Organisation

CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND OF THE STUDY

Head injury is a medical condition described when the individual has suffered an injury or trauma to the scalp, skull, or brain (Haddad & Arabi, 2012). The injury could be blunt or penetrating trauma to the head accompanied by an episode of alteration in that person's level of consciousness (Maconochie & Ross, 2010). According to Ling et al. (2017), head injury is the most common diagnosis leading to Intensive Care Unit (ICU) admission in Malaysia after severe sepsis, with a percentage of 7.1% of the total population. Patients with a head injury will be assessed on the severity of the injury and will be classified as a mild, moderate, or severe head injury. The Glasgow Coma Score (GCS) assessment is widely used in patients with head injuries due to its high reliability and validity as a universal medical communication tool. According to Orman et al., (2011) and Liew et al., (2017), severe head injuries are classified for patients with GCS of less than 9. Moderate head injury with GCS of 9 to 12, while mild head injury will be classified to the patients with GCS of 13 to 15. Severe head injuries include haematoma, haemorrhage, concussion, cerebral oedema, skull fracture, and diffuse axonal injury (DAI).

In case of severe head injury, establishing an airway is deemed the most critical intervention to maintain adequate oxygenation for the patients (Liew et al., 2017). Patients who experience head injury are among the cases that usually need the support of mechanical ventilation to prevent the condition of hypoxemia or hypercapnia that may lead to secondary insult or further damage to the brain. According to the Malaysian Clinical Practice Guideline (CPG) (2015), a secured airway by tracheal intubation approach should be established among severe traumatic brain injury (TBI) patients with a GCS of less than nine (9) to maintain adequate oxygenation whereby the state of hypoxemia was unable to be corrected by the supplemental oxygen. The regular

breathing rate of the patients should be maintained, and hyperventilation should be avoided (Badjatia et al., 2008).

It is noticeable that the terms head injury and traumatic brain injury (TBI) have been used interchangeably when the researchers explained the cases related to the head injury (Fukuda & Warner, 2007; Liew et al., 2017). TBI usually referred to as an intracranial injury, is a brain injury brought on by an outside force (CDC Injury Centers, 2020). It can be divided into different categories according to the severity (from mild concussion) to severe TBI, its method (closed or penetrating head injury), or other characteristics (e.g., occurring in a specific location or over a widespread area). Meanwhile, the head injury is a more general term that can refer to harm to the skull and other body parts like the scalp (CDC Injury Centers, 2020). As the definition of these two terms is interrelated, thus these terms are used interchangeably in this study to refer to as head injury.

Regarding head injury, Asehnoune et al., (2018) mentioned that severe head injury, intracranial haemorrhage, or stroke are common causes of ICU admission with the initiation of mechanical ventilation therapy. Patients who had a severe TBI that sometimes underwent craniotomy or craniectomy indicated for mechanical ventilation support while they were being fully sedated for cerebral protection. It is an approach of neuroprotection or neuro-resuscitation, described as the therapy commenced before the onset of ischemia (Fukuda & Warner, 2007). For patients likely to have difficulty weaning off from mechanical ventilator support or require re-intubation, the issue arises whether these patients should be preserved with mechanical ventilation support via oral intubation of endotracheal tube (ETT) or proceed with early cannulation of tracheostomy instead.

In the case of patients with severe head injury, the leading physician or neurosurgeon in most healthcare facilities usually will judge for initiating the tracheostomy approach. Franco-Jimenez et al., (2020) mention that the decision to proceed with a tracheostomy should be individualised for each case considering mortality risk, expected duration of mechanical ventilator dependency, and neurological prognosis. The primary consultant or neurosurgical team attending the patient will decide the timing of the tracheostomy to be executed (Franco-Jimenez et al., 2020; Shibahashi et al., 2017; Siddiqui et al., 2015).

The term tracheostomy is subjected to the anterior opening into the trachea via the incision at the neck area to create an artificial surgical airway. This procedure creates