Respiratory Complications Related to Neurological Diseases in Intensive Care Unit

An Essay

Submitted for fulfillment of Master degree
in Intensive Care

Presented by

Mohamed Nashaat Abd El Sataar
"M.B.B.CH"
Zagazig University

Supervised by

Prof.Dr/Magdy Mohamed Husein Nafie
Professor of Intensive Care, Anesthesia and Pain Management
Faculty of Medicine – Ain Shams University

Dr/Mohamed Mohamed Abd El Fattah Ghoneim
Lecturer of Intensive Care, Anesthesia and Pain Management
Faculty of Medicine – Ain Shams University

Dr/Tamer Nabil Toaima
Lecturer of Intensive Care, Anesthesia and Pain Management
Faculty of Medicine – Ain Shams University

Ain Shams University
Faculty of Medicine
2017

Abstract

Introduction: Pulmonary complications are very prevalent in the critically-ill neurological population. Respiratory failure, pneumonia, acute lung injury and the acute respiratory distress syndrome (A.R.D.S) represent the most common complications. Unfortunately, the development of these complications extends the patient's need for care in the intensive care unit.

Neurogenic pulmonary edema (NPE) is a relatively rare form of pulmonary edema caused by an increase in pulmonary interstitial and alveolar fluid. Neurogenic pulmonary edema develops within a few hours after a neurologic insult and diagnosis requires exclusion of other causes of pulmonary edema e.g. high-altitude pulmonary edema.

Aims: Is to focus the light on how to try to reduce the rate of respiratory complications in neurological diseases in Intensive care unit and overcome this problem for the hope of reduction of both comorbidity and mortality and improving their outcome if possible.

Summary: Respiration in mammals is the primal homeostatic process regulating levels of oxygen and carbon dioxide in the body that is critical for life.

Improvement in understanding of the mechanism(s) of respiratory failure, better diagnostic tests and provision of earlier ventilation, including home ventilation, has helped to prolong survival of patients with neuromuscular disorders which previously led to early morbidity and mortality.

Keywords: Respiratory Complications Related, Neurological Diseases, Intensive Care Unit

سورة البقرة الآية: ٣٢

Acknowledgments

First and forever, thanks to ***Allah****, Almighty for giving me the strength and faith to complete my thesis and for everything else.*

I would like to express my sincere gratitude to ***Prof.Dr/Magdy Mohamed Husein Nafie,*** *Professor of Intensive Care, Anesthesia and Pain Management, Faculty of Medicine – Ain Shams University, under his supervision, I had the honor to complete this work, I am deeply grateful to him for his professional advice, guidance and support.*

My deep gratitude goes to ***Dr/Mohamed Abd El Fattah Ghoneim,*** *Lecturer of Intensive Care, Anesthesia and Pain Management, Faculty of Medicine – Ain Shams University, for his invaluable efforts and tireless guidance and meticulous supervision throughout this work.*

I can't forget to thank ***Dr/Tamer Nabil Toaima,*** *Lecturer of Intensive Care, Anesthesia and Pain Management, Faculty of Medicine – Ain Shams University, for the efforts and time he has devoted to accomplish this work.*

Last but not least, I like to thank all my ***Family****, especially my* ***Parents,*** *for their kind care, help and encouragement.*

Mohammed Nashaat

List of Contents

List of Abbreviation

A.R.D.S: acute respiratory distress syndrome

AChR : Acetyl Choline receptors

AHRF : acute hypercarpic respiratory failure

ALI : acute lung injury

ALS : amyotrophic lateral sclerosis

ATP : adenosine triphosphate

AVM : arterio-venous malformation

BBB : blood brain barrier

CNS : central nervous system

DM : diabetes mellitus

EAAT2 : excitatory amino acid transporter 2

ED : emergency department

EPAP : expiratory positive airway pressure

ETI : Endotracheal intubation

FRC : functional residual capacity

FVC : forced vital capacity

GABA : gamma-amino-butyric acid

GAD : Glutamic Acid Decarboxylase

GBS : Guillain-Barré syndrome

HAP : hospital-acquired pneumonia

HARF : Hypoxemic acute respiratory failure

HCAP :Healthcare-associated pneumonia

HLA : human leukocyte antigens

I.C.U **:** Intensive Care Unit

ICH : intra-cerebral hemorrhage

ICP : in intra cranial pressure

IL-1 : inter lukien-1

IL-6 : inter lukien-6

IL-8 : interleukin-8

IPAP : inspiratory positive airway pressure

IQs : intelligence quotients

IVIG : Intra venous immune globulin

LES : lower esophageal sphincter

LOC : level of consciousness

MDR : multidrug-resistant

MG : Myasthenia gravis

MIP : maximal inspiratory mouth pressure

MRSA : methicillin-resistant Staph.Aureus

MS : multiple sclerosis

NIV : Noninvasive ventilation

NMD : neuro-muscular disease

NMDA : N-methyl-D-aspartate

NPE : Neurogenic pulmonary edema

NPPV : noninvasive positive pressure ventilation

NTS : nucleus of the solitary tract

PA : Alveolar pressure

Pa : pulmonary arterial pressure

Paw : alveolar pressure

PBA : Pseudo-bulbar affect

PE : pulmonary embolism

Ppl : Pleural pressure

PS : Pressure Support

Ptp : trans-pulmonary pressure

Pv : pulmonary venous pressure

SAH : subarachnoid hemorrhage

SCI : Spinal cord injury

SMA : Spinal muscular atrophy

SMN : survival motor neuron

SNIP: sniff nasal inspiratory pressure

SSRIs : selective serotonin reductase inhibitors

TBI : Traumatic brain injury

TCAs : tricyclic antidepressants

TNF α : tumor necrotic factor α

VAP : Ventilator-associated pneumonia

VAP : Ventilator-associated pneumonia

VRC : ventral respiratory column

VTE : venous thromboembolism

List of Tables

List of Figures

Introduction

Pulmonary complications are very prevalent in the critically-ill neurological population. Respiratory failure, pneumonia, acute lung injury and the acute respiratory distress syndrome (A.R.D.S) represent the most common complications. Unfortunately, the development of these complications extends the patient's need for care in the intensive care unit ***(Pelosi et al., 2011).***

Neurological disorder is any disorder of the body nervous system. It may be structural, biochemical or electrical abnormalities in the brain, spinal cord or other nerves can result in a range of symptoms that include paralysis, muscle weakness, poor coordination, loss of sensation, confusion, pain and altered levels of consciousness ***(Butler, 2005).***

The goal in the ICU is to prevent, treat and optimize hypoxemia and maintain oxygen delivery to limit secondary neurological insults ***(Perrin et al., 2004).***

Pneumonia is one of the most common respiratory complications of acute stroke occurring in about 5 to 9 percent of patients. The incidence of stroke-related pneumonia appears to be higher in patients with acute

ischemic stroke admitted to intensive care unit and in those who require nasogastric tube feeding ***(Ingeman et al., 2011).***

Many different types of neurological disorders can affect respiratory functions such as some neuromuscular disorders which in particular have a tendency to affect respiratory function adversely and are characterized by either disease of a muscle itself or the nerve supplying that muscle. These neuromuscular disorders are typically characterized by progressive muscular impairment ***(Hutchinson and Whyt, 2008).***

Bulbar dysfunction resulting from cortico-bulbar pathway or brainstem neuron degeneration is one of the most important clinical problems encountered in motor neuron disease causing various respiratory complications which are major causes of morbidity and mortality. Abnormalities of the control and strength of the laryngeal and pharyngeal muscles can cause upper airway obstruction ***(Hadjikoutis and Wiles, 2001).***

Neurologic disorders affecting respiration can be categorized by different ways including either the anatomic site of the lesion such as the central or peripheral nervous system or the pathologic process such as ischemia and degeneration. Often several of these parameters are used to classify disorders of the central nervous system as non-degenerative or degenerative while, most of the peripheral

nervous system disorders that impact respiration are degenerative in nature ***(Bradley et al., 2004).***

Some pathologies which increase intra cranial tension as brain tumors may result in dysphagia depending on which brain region is involved. Pathologically, brain tumors may be benign or malignant. However, their space-occupying nature can result in significant neurologic dysfunction. Swallowing may be affected by infiltration of the tumor into brain regions responsible for deglutition causing aspiration ***(Kern et al., 2001).***

Aim of the Essay

Is to focus the light on how to try to reduce the rate of respiratory complications in neurological diseases in Intensive care unit and overcome this problem for the hope of reduction of both comorbidity and mortality and improving their outcome if possible.