ANAESTHETIC CONSIDERATIONS IN ACUTE CERVICAL SPINE INJURIES

Essay

Submitted for partial fulfillment of the
Master Degree in Anaesthesia and Intensive Care

By

Shereen Kamal Kodaira

M.B.,B.Ch.

Supervisors

Prof. Dr. Yehia Abdel Reheem Hemaimy

Prof. and Head of Anaesthesia Dept. and Intensive Care Unit
Faculty of Medicine
Ain Shams University

Prof. Dr. Medhat Mohamed Younis

Prof. of Anaesthesia and Intensive Care Unit
Faculty of Medicine
Ain Shams University

Dr. Nermine Sadek Nasr

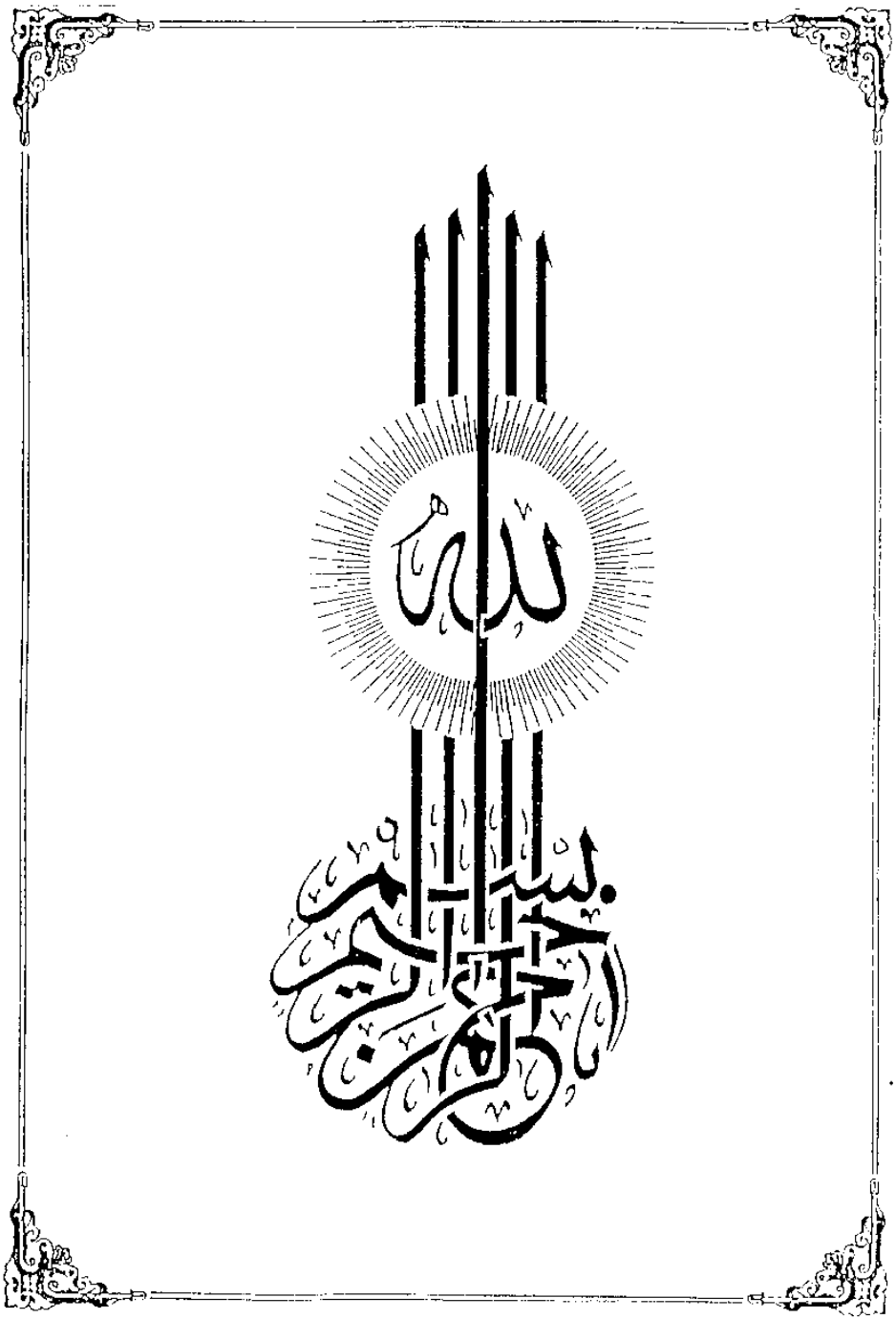
Lecturer of Anaesthesia and Intensive Care
Faculty of Medicine
Ain Shams University

1994

بسم الله الرحمن الرحيم

﴿قَالُوا سُبْحَانَكَ لَا عِلْمَ لَنَا إِلَّا مَا عَلَّمْتَنَا إِنَّكَ أَنْتَ الْعَلِيمُ الْحَكِيمُ﴾

«صدق الله العظيم»
سورة البقرة آيه رقم (٣٢)



Dedictated TO...

MY FATHER

I'm presenting this work if it is satisfactory to my dear father, wishing he had been here to be proud of me, if I deserve!!

Shereen

ACKNOWLEDGEMENT

I'd like to express my absolute gratitude to Prof. Dr. Yehia Hemaimy, the Head of Anaesthesia Department, and Intensive Care Unit, whose presence is the main convincing reason which urged me to go on with this effortful work and study.

I'm very thankful to his tremendous efforts, precious instructions, patience and desirable criticism.

I'm very appreciable to Prof. Dr. Medhat Younis, Prof. of Anaesthesia and Intensive Care Unit, for his cooperation, valuable advices and the facilities he offered throughout this work.

Many thanks to Dr. Nermine Sadek, Lecturer of Anaesthesia and Intensive Care, for her generosity in not keeping from me any documents I needed.

CONTENTS

INTRODUCTION

INTRODUCTION

Spinal cord injury (S.C.I) occurs at a rate of over 11.000 new cases per year. Approximately one-half of these are at the cervical level. Traffic accidents are the leading cause, accounting for 30-50 percent of all injuries. Other mechanisms include diving accidents, gunshot wounds, sports and falls. Spinal cord injuries typically occur to men in their mid twenties. Because of associated injuries, the mortality after spinal cord trauma is nearly 50% *(Cucchiara and Mickenfelder, 1990).*

Cervical spine is particularly vulnerable to injury largely because of its extreme mobility. The great range of rotation, flexion, and extension all lead to poor mechanical stability. The direction of impact, position of the head relative to the thorax, and mechanism of injury determine the site and nature of damage to the spinal cord. Associated skeletal and soft tissue changes are often present with cervical trauma. Facial and skull lacerations and fractures aim at localizing the site of injury and the mechanisms of forces involved. *(Chehrazi et al., 1981).* The radiological appearance of an injured spine does not always correlate with the neurologic deficits found on examination, severe deficits may be present without bony displacement and

yet only minimal deficits can occur with some major bony dislocations. The fact that the spinal canal is relatively larger than the cord itself explains some of these observations *(Tator and Edmonds, 1979).*

Paediatric patients who account for 5% of all SCI, are resistant to minor trauma because of their immature mobile vertebral column and when injured their prognosis is good owing to the plasticity of their spinal cords. Following major trauma, patients younger than nine years of age are more likely to have cervical spine injury (especially Cl and C2) and a poorer prognosis always results, owing to the large size of the head relative to the rest of the body. Bony abnormalities may be absent on the x-ray. Flexion injury is the most common injury to the cervical spine. It occurs when the head is bent forward at the time of impact such as diving injury.

Extension injuries occur during a fall or during a rear-end automotive collision in which the head is forced backward. It is more common in the elderly because of the narrowed cervical canal, and in those affected by cervical spondylosis. Spinal cord injuries are accompanied by other associated trauma in 25 to 65 per cent of cases *(Maiman et al., 1986).*

The most common associated injuries involve the head such as: intracranial haemorrhage, skull fractures, rhinorrhea, and/or otorrhea. Other associated trauma includes rib fractures, pneumo-or haemothorax, pelvic or retroperitoneal bleeding (especially with lumbar cord injury), and extremity fractures *(Sherk and Nicholson, l980).*

Anaesthesiologists are likely to treat cervical cord injuries in the following situation: to provide emergency airway management, to provide physiologic support during neurologic diagnostic procedures, to provide general anaesthesia for life saving operation for an associated injury unrelated to the spinal cord; and anaesthesia, for stabilization or decompression laminectomy.

Cervical spinal cord injury accompanied with familial, personal and socioeconomic tragedy and the solution lies in the methods of its prevention which include better informed and safety educated individuals and designing vehicles with energy absorbing passive and active restraining systems, industrial safety measures and above all legal and social restriction to the combination of alcohol and driving *(Shoemaker et al., l979).*

Also the patient with cervical cord trauma should be initially identified and carefully transferred to a designated spinal cord injury (SCI) treatment center to be admitted to ICU or to the operating theatre *(Schneider et al., 1973)*.

ANATOMY OF CERVICAL SPINE

ANATOMY OF CERVICAL SPINE

The spinal cord is a cylinder somewhat flattened from front to back, whose lower end tapers into a cone. Ventrally it possesses a deep midline groove, the anterior median sulcus, and dorsally, it shows a shallow sulcus, from which a posterior median septum of neuroglia extends into its substance. The posterior median septum within the spinal cord is attached to the incomplete posterior median septum of arachnoid in the subarachnoid space *(Sances et al., 1984).*

The spinal cord possesses two symmetrical enlargements which occupy the segments of the limb plexuses as the cervical enlargement of brachial plexus and lumbosacral enlargement for the lumbar and sacral plexuses. C5 to Tl for the cervical enlargement and L2 to S3 for the lumbosacral enlargement, but their levels measured by vertebrae are quite different. Thus the cervical enlargement lies roughly corresponding to the vertebrae C3 to Tl, but the lumbosacral extends only from T9 to L1. Both enlargements lie roughly corresponding to the vertebrae C3 to T1, but the lumbosacral extends only from T9 to L1. Both enlargements are due to the greatly increased mass of

motor cells in the anterior columns of grey matter in these situations *(Bedbrook, 1979)*.

Spinal nerve roots

No spinal nerves lie inside the spinal theca, indeed no nerve lies, strictly speaking, within the vertebral canal. The anterior and posterior roots of the spinal nerves unite within the intervertebral foramina. Within the subarachnoid space the nerve roots are attached to the spinal cord each by a series of rootlets. Each anterior root is formed by three or four rootlets which emerge irregularly along the anterolateral surface of the spinal cord. Each posterior root is formed by several rootlets attached vertically to the posterolateral surface of the cord. A short distance from the cord the rootlets are combined into a single root. The anterior and posterior roots pass from the cord, to the appropriate intervertebral foramina. where each enters the duramater separately before uniting to form the mixed spinal nerve. The ganglion on the posterior nerve root lies in the intervertebral foramen, within the tubular evagination of dura and arachnoid immediately proximal to the point of union of anterior and posterior nerve roots *(Bucy, 1983)*.

The posterior root ganglia of the cervical nerves lie lateral to the intervertebral foramina, in contact with the vertebral artery. In confirmity with the shortness of the spinal cord, the lower nerve root the more steeper it slopes down to its intervertebral foramen. The upper cervical roots are horizontal the lumbar and sacral roots almostly vertical *(Botterell et al., l975).*

Internal structure

The spinal cord consists of a central mass of grey matter (cell bodies), in the form of a fluted column surrounding the central canal, enclosed in a cylindrical mass of white matter (fibres). It is almost divided into two halves by the anterior median fissure and the posterior median septum. The anterior fissure does not completely seperate the white matter, a narrow white commissure lies anterior to the grey matter. Both the grey and white matter of the right and left halves are divided into anterior, lateral and posterior columns of cells or fibres, in transverse section the grey matter of the columns is usually referred to as the anterior, lateral and posterior horns *(Webb et al., l978).*