Management of Thoracolumbar Spinal Injury

Essay

Submitted in Partial Fulfillment of
the Master Degree in General Surgery

By

MOHAMMEDREFAATHAMMOUDA

(M.B.B.Ch)

Supervised by

Prof. Dr. Ali Khodir Ali Khodir

Professor of Neurosurgery

Al_Azhar faculty of Medicine

Prof.Dr. Ibrahim GamilEwais

Assistant Professor of Neurosurgery

Al_Azhar faculty of Medicine

Prof.Dr. Mohammed Esmat Abd_Elghany

Assistant Professor of Onchosurgery

Al_Azhar faculty of Medicine

Dr. Mohamed Hasan Mansour

Lecturer of Neurosurgery

Al_Azhar faculty of Medicine

Al_Azhar University

Faculty of Medicine

2013

علاج إصابات الفقرات الصدرية والقطنية

رسالـــــة
توطئة للحصول على درجة الماجستير
فى الجراحه العامه

مقدمة من

الطبيب / محمد رفعت حمودة
بكالوريوس الطب والجراحة

تحت إشراف

الأستاذ الدكتور / علي خضير علي خضير
أستاذ جراحة المخ والأعصاب
كلية الطب- جامعة الأزهر

الأستاذ الدكتور / إبراهيم جميل عويس
أستاذ مساعد جراحة المخ والأعصاب
كلية الطب- جامعة الأزهر

الأستاذ الدكتور / محمد عصمت عبد الغنى
أستاذ مساعد جراحة الأورام
كلية الطب- جامعة الأزهر

الدكتور / محمد حسن منصور
مدرس جراحة المخ والأعصاب
كلية الطب- جامعة الأزهر

كلية الطب
جامعة الأزهر
٢٠١٣

بِسْمِ اللّهِ الرّحمَنِ الرّحيمِ

[...رَبِّ أَوزِعنِي أَنْ أَشكُرَ نِعمَتَكَ الّتِي

أَنْعَمْتَ عَلَيَّ و عَلى والِدَيَّ

و أَنْ أَعْمَلَ صَالِحاً تَرْضَاهُ و أَدْخِلْنِي

بِرَحْمَتِكَ فِي عِبَادِكَ الصَّالِحِينَ]

صدق الله العظيم

النمل.. اية رقم ١٩

Acknowledgment

First and foremost, I feel always indebted to **Allah**, the Most Merciful, Who gives me power to accomplish this work.

I would like to express my deepest appreciation and sincere gratitude to **Prof. Dr. Ali Khodir Ali Khodir,** Professor of Neurosurgery, Faculty of Medicine – Al-Azhar University -, for his sincere help, constant encouragement, constructive criticism, and valuable guidance, I was truly honoured to work under his supervision.

I wish also to express my great gratitude and utmost appreciation to **Prof.Dr. Ibrahim Gamil Ewais** assistant Professor of Neurosurgery, Faculty of Medicine – Al-AzharUniversity, for his valuable suggestions and instructions during the progress of this work.

I feel deeply indebted to **Dr. Mohamed Hasan Mansour,** lecturer of Neurosurgery, Faculty of Medicine – Al-AzharUniversity, for his active cooperation, deep concern, enthusiastic encouragement, the effort and time he has devoted to the fulfillment of this work.

I would like also to thank **Prof.Dr. Mohammed Esmat Abd_Elghany,** Assistant Professor of Onchosurgery, Faculty of Medicine – Al-AzharUniversity, for his great efforts and support during this work.

I would like also, to acknowledge the support and cooperation offered to me continuously by senior staff and colleagues at the department of Neurosurgery, Al-AzharUniversity.

I owe special thanks to **my Family** for their care, patience and continuous encouragement.

Finally I'm deeply indebted to **my beautiful fiancée** who gave me much supportive gentle encouragement.

Mohammed Refaat Hammouda

CONTENTS

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION

Fractures and dislocations of the spine are serious injuries that most commonly occur in young people **(Willis Cahoon Campbell et al, 2003).**

Vertebral fractures of the thoracic and lumbar spine are usually associated with major trauma and can cause spinal cord damage that result in neural deficits. Each vertebral region has unique anatomical and functional features that result in specific injuries. **(George Timothy Reiter, 2011).**

The incidence of spinal cord injury is approximately 40 cases per million populations per year. However, this estimate is based on older data from the 1990s as there has not been any new overall incidence studies completed **(National Spinal Cord Injury Statistical Center , 2011).**

The ideal classification for thoracolumbr fractures must be simple yet complete, and it must reflect an understanding of the mechanism of injury, correspond to anatomic pathology. It also should determine the treatment options, and be relevant to the prognosis. With the advent of the 3 columns classification of spinal anatomy, a more precise analysis of spinal stability was made possible. Knowing which columns are intact, can better enable the clinician to interpret the integrity of the spine as a load bearing column **(Patel et al, 2003).**

Proper management of thoracolumbar injuries is predicated on a through understanding of the involvement of the structural and neural tissues. An extensive physical examination should be performed and neurologic status should be documented upon initial presentation. Concomitant injuries should be assessed, and the patient's overall physical condition should be optimized promptly **(Singh R et al, 2009).**

The combination of plain radiographs, computed tomography (CT) scan, and magnetic resonance imaging (MRI) allows bony and ligamentous injuries to be defined. The analysis of the radiological studies should be based on biomechanical concepts. The information obtained from these studies allows for classification of the injuries and identification of unstable injuries, and it aids in selection of the proper instrumentation to adequately stabilize the bony elements **(Dosch JC et al, 2007).**

The aim of spinal injury treatment is the restoration of spinal physiology, with relief of pain and restoration of stability without neurological damage **(Maravilla et al, 1978).**

The goals of operative treatment are to decompress the spinal cord canal and to stabilize the disrupted vertebral column. Gaebler et al reported that early decompression and stabilization procedures within 8 hours of injury allowed for a higher rate of neurologic recovery **(Gaebler C et al, 1999).**

For many years, surgical measures were restricted to laminectomy, but experience in recent years has clearly shown that the best method of decompression of neural structures is rapid and perfect reduction of fracture or dislocation **(Maravilla et al, 1978).**

AIM OF THE WORK

The aim of the work is to discuss the management of the thoracolumbar spinal injury.

DEVELOPMENTAL SPINAL ANATOMY

The preembryonic period (weeks 0 To 3)

The preembryonic period. Which begins at fertilization and continues for approximately 3 weeks, is characterized by the development of the bilaminar germ disc (Fig. I. 1). The bilaminar germ disc is converted to the trilaminar germ disc during the next stage, the embryonic period. ***(Sadler T.W. 2000)***

The embryonic period (weeks 3 to 8)

The third week of gestation is characterized by the processes of gastrulation and neurulation. Gstrulation is the process of the formation of all three embryonic germ layers : ectoderm , mesoderm , and endoderm.

Neurulation, which is initiated in the latter half of the third week. Is a process of folding that converts the neural plate, a thickening of the ectoderm overlying the notochored, to the neural tube (Fig I. 2) ***(Larsen W.J. 2001)***

Notochord

From the primitive pit, a rod-like process of cells called the notochordal process moves cranially up to the prechordal plate by day 20. The notochordal process, which is the precursor of the skeletal axis, becomes canalized and caudally breaks through the ectodermal surface at the primitive node. The tube then opens ventrally starting at the level of the pit and proceeds cephalad. The yolk sac therefore transiently communicates with the amniotic cavity through the opening at the pit called the neurenteric canal (Fig. I. 3). After the tube opens, it is converted to a central ventral bar of mesoderm called the notochordal plate, which detaches from the endoderm by day 22 to 24 and becomes entirely contained within the mesoderm. It then forms a solid cylinder of cells to form the definitive notochord ***(Sadler T. W. 2000).***

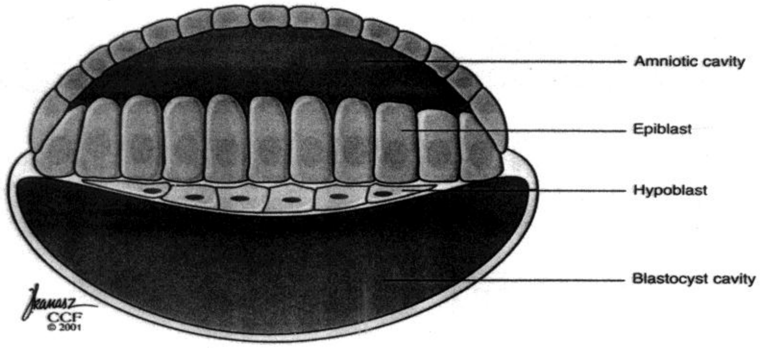

Figure (I-1): Formation of bilaminar germ disc from the embryoblast. The epiblast is adjacent to the amniotic cavity, and the hypoblast is adjacent to the blastocyst cavity. ***(Courtesy Cleveland Clinic, Division of Education, © 2001.)***

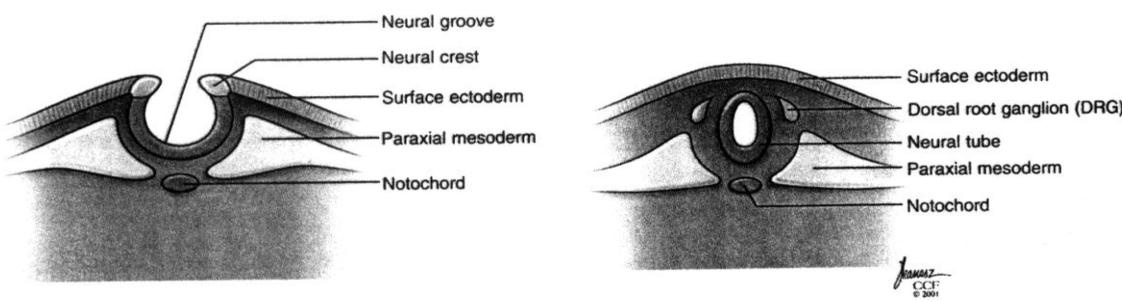

Figure (I.2): Formation of neural tube and dorsal root ganglion (axial view). A, Elevation of ectoderm creates neural folds that invaginate and ultimately fuse to form a neural tube. B, Neural crest cells form from lateral edges of these neuroectodermal cells, migrate toward the underlying mesoderm, and give rise to cranial nerve ganglia, spinal ganglia, and dorsal root ganglia (DRG). ***(Courtesy Cleveland Clinic, Division of Education, ©2001.)***

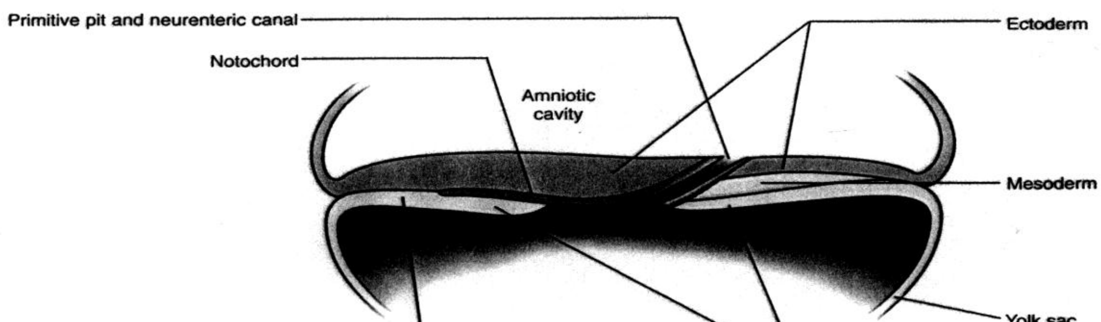

Figure (I-3): Sagittal representation showing initial stages of formation of notochord. The notochordal process becomes canalized and breaks through the caudal aspect of the ectoderm. This allows transient communication between the yolk sac and the amniotic cavity through the neurenteric canal. ***(Courtesy Cleveland Clinic, Division of Education, ©2001.)***