Efficacy of Ligamentotaxis for Thoracic and Lumbar Traumatic Fractures and Factors Influence Outcome.

Thesis

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By

Ahmed Refaat Elsayed

M.B, B.CH, Faculty of medicine, Zagazig University

Supervised by

Prof. Dr. Mohamed Ashraf Ghobashy

Professor of Neurosurgery

Faculty of Medicine, Ain Shams University

Prof. Dr. Ahmed Mahmoud Hamad

Professor of Neurosurgery

Faculty of Medicine, Ain Shams University

Dr. Sameh Mohamed Hefni

Lecturer of Neurosurgery

Faculty of Medicine, Ain Shams University

Ain Shams University
Faculty of medicine
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Table of contents

Contents Page

Abbreviations ……..….. I

List of figures ……..….. II

List of tables ……..… III

1. Introduction …… 2

2. Aim of the work ……. 5

3. Review

3.1 chapter 1 : Anatomy and biomechanics ……..……. 6

3.2 chapter 2 : traumatic fractures of spine ……... …...33

3.3 chapter 3 : posterior instrumentation using ligamentotaxis …… 65

4. Materials and methods ……... 83

5. Results ……...108

6. Discussion ……122

7. Conclusion and summary ……..134

8. References ……138

ABBREVIATIONS

ALL : Anterior longitudinal ligament .

ASIA : American spine injury association .

CSF : Cerebrospinal fluid .

CT : computed tomography .

IAR : Instantaneous axis of rotation .

MRI : Magnetic resonance image .

ODI : Oswestry disability index .

PLC : Posterior ligamentous complex .

PLL : Posterior longitudinal ligament .

SCI : Spine cord injury .

NASCIS : North American spine cord injury study .

TLISS : Thoraco lumbar injury severity score .

VAS : Visual analogue score .

List of figures

Figure Page

1. The foramen ……. 7
2. The intervertebral disc ……. 11
3. The ligaments of the spine …… 19
4. The sinuvertebral nerve ……. 26
5. Systemic injuries with spine fractures …….. 37
6. X ray of spine fracture ……40
7. CT of spine fracture …… .. 41
8. Burst fracture ……. 43
9. Conservative care for spine fracture ……..51
10. X ray pre and post operative ……57
11. Entry point for transpedicular fixation ……..74
12. Distraction during ligamentotaxis ……76
13. Axial view of burst fracture ……78
14. Visual analogue scale ……85
15. Interpedicular distance in XR ……87
16. Vertebral height loss …….. 88
17. Cobb angle ……. 88
18. Canal dimension …… 90
19. MRI of cord hemorrhage …….. 91
20. MRI of cord edema ……... 92
21. MRI of PLL rupture ……. 92
22. MRI of PLL buckling …… 93
23. Positioning ……. 95
24. Muscle separation ……. 96
25. Entry point ……. 97
26. Pedicle screws trajectory angles …… 98
27. Distraction force …… 99
28. Efficacy of distraction ……99
29. The C arm X ray machine ……. 100
30. C arm intraoperative …….. 101
31. X ray film by C arm …….. 101

32. MRI of PLL rupture postoperative …… 103
33. Angles of pedicular screws …… 105
34. Degrees of violation …… 106
35. XR pre and postoperative …… 106
36. Misplaced screws …… 107

List of tables

Table Page

1. Distribution of patients according to age and sex ……. 108
2. Distribution of patients according to cause of injury …. 109
3. Distribution of patients according to operative measures 111
4. Distribution of patients according to laminectomy ……. 111
5. Level of screw insertion …….. 112
6. Entry point repositioning ……. 112
7. Violation of screws ……. 113
8. Angles of right screws ……. 114
9. Angles of left screws ……. 114
10. VAS pre and postoperative ……. 117
11. ODI pre and postoperative ……. 117
12. Distribution of complication …… 118
13.Relation between outcome and sex ……. 119
14. Relation between outcome and age ……. 119
15. Relation between outcome and cause of injury ……119
16. Relation between outcome and type of fracture ……...120
17. Relation between outcome and level of fracture ……..120
18.Relation between type of fracture and efficacy ……. 121

Abstract

Background: Traumatic thoracic and lumbar fractures are very common specially in the thoracolumbar junction and the most common causes are road traffic accidents and falling from height.

Aim of the Work: to evaluate efficacy of ligamentotaxis in thoracic and lumbar compressed and burst spine fractures using intact posterior longitudinal ligament and factors affect its outcome without anterior vertebral decompression through repositioning retropulsed segments, restoring vertebral height.

Patients and Methods: This study was conducted on 20 patients (with Non-propability convenience sample) with traumatic thoracic and lumbar spine fractures with intact posterior longitudinal ligament in El-maadi military hospital, Ain Shams university hospital during the period of 2017-2018.

Results: The most common postoperative complication was infection in 5 % of patients and CSF leakage infection in 5 % of patients.

Conclusion: The outcome in the study were successful in 95% of patients as reduction of retropulsed part occurred by the intact posterior longitudinal ligament.

Key words: ligamentotaxis, thoracic, lumbar traumatic fractures factors influence Outcome.

Introduction

Spinal fractures are frequently located at the thoracolumbar junction due to biomechanical aspects**,** dorsolumbar trauma is more severe. It is the most common cause of paraparesis or paraplegia. Fall from height is the most common cause of dorsolumbar fracture. Majority of these cases belong to younger age group **(N Basheer MS et al.,2010).**

Dorsolumbar fractures often cause a neurologic deficit and present a significant economic burden to the family and society. Accepted methods of treatment of dorsolumbar burst fractures include conservative therapy, posterior reduction and instrumentation, and anterior decompression and instrumentation (**Gertzbein SD et al.,1992)**

Thoraco-lumbar fractures classification:

1- Compression fractures are characterized by an isolated failure of the anterior column. Therefore, the posterior vertebral wall and the spinal canal are intact

2- Burst fractures are the result of compression mechanisms or as part of a hyperflexion-extension or rotation injury .The anterior and middle column are disrupted secondary to axial loading. Loss of the posterior vertebral height with retropulsion of the posterior vertebral body margin into the canal.

3- In flexion-distraction fractures all three columns are affected. Distraction means separation of two parts, the middle and posterior column, with the anterior column acting as a pivot. This mechanism is associated with a high incidence of intra-abdominal injuries.

4- Fracture-dislocation injuries are usually the result of multidirectional forces, including compression and/or distraction in combination with some degree of shear or rotation (Bernstein **MP et al., 2006).**

Prevention and limitation of neurological injury and restoration of spinal stability is a primary goal of management of spinal cord injuries. Correction of deformities, minimizing the loss of motion, and facilitating rapid rehabilitation are the secondary goals. **(Fredrickson BE et al., 1992).**

It includes:

1. Anterior direct decompression through a corpectomy followed by anterior vertebral body replacement with cage or graft.

2. The posterior approach to the spine and ligamentotaxis using the tension of the posterior longitudinal ligament to push back the retropulsed fragment and restore the size of the canal.

In patients with complete or incomplete neurological deficit, in the presence of canal compromise decompression techniques can be used. Ligamentotaxis is indirect reduction technique in which intact but buckled

posterior longitudinal ligament (PLL) is used to guide the repositioning of retropulsed fracture fragments by the application of distraction forces.**(Zdeblick TA et al.,2003).**

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Aim of the Work

It is a prospective study to evaluate efficacy of ligamentotaxis in thoracic and lumbar compressed and burst spine fractures using intact posterior longitudinal ligament and factors affect its outcome without anterior vertebral support and its rule in decompression through repositioning retropulsed segments, restoring vertebral height.

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Chapter I: Anatomy and

Biomechanics of the Spine

In this chapter, we review the clinically relevant anatomy and biomechanics of the spine.

A- Vertebral column:

The structures that form the spinal column must be rigid enough to support the trunk and the extremities, strong enough to protect the spinal cord and cauda equina and anchor the erector spinae and other muscles, and yet sufficiently flexible to allow for movement of the head and trunk in multiple directions. The anatomic organization of the spinal column and related structures allows for all of this, but at a price, because the combined properties of rigidity and mobility can lead to many problems, particularly at the level of the cervical and lumbar spine(**Devereaux, 2007**).

The spinal column is composed of 7 cervical, 12 thoracic, 5 lumbar, and 5 fused sacral vertebra, along with 5 coccygeal bones. The cervical, thoracic, and lumbar vertebrae are similar in structure except for the first (atlas) and second (axis) cervical vertebrae. Each ‘‘standard’’ vertebra is composed of a body, two pedicles, two lamina,

four articular facets, and a spinous process. The atlas is composed of a ring of bone without a body, whereas the axis has an odontoid process around which the atlas rotates. Between each pair of vertebrae are two openings, the foramina, through which pass a spinal nerve, radicular blood vessels, and the sinuvertebral nerves (recurrent meningeal nerves) (**Figure 1**)(**Cho, 2015**).

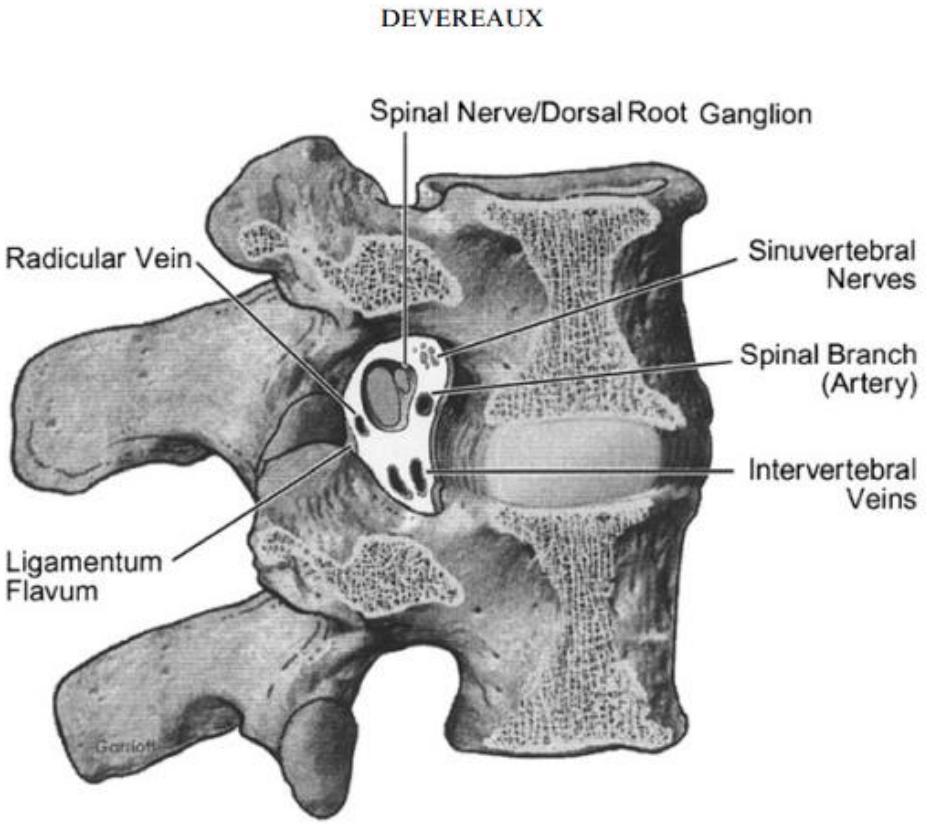

Figure 1: The foremen. (From Levin KH, Covington EC, Devereaux MW, et al. Neck and low back pain. Continuum (NY) 2001;7:9; with permission.)(**Devereaux, 2007**).

Each foramen is bordered superiorly and inferiorly by pedicles, anteriorly by the intervertebral disc and adjacent vertebral body surfaces, and posteriorly by the facet joint. The spinal canal itself is formed posterolaterally by the laminae and ligamentum flavum, anterolaterally by the pedicles, and anteriorly by the posterior surface of the vertebral bodies and intervertebral discs. The midsagittal (anterior-posterior) diameter of the cervical canal from C1 to C3 is usually approximately 21 mm (range 16–30 mm), and from C4 to C7 the diameter is approximately 18 mm (range 14–23 mm). The midsagittal diameter of the cervical spinal cord is 11 mm at C1, 10 mm from C2 to C6, and 7 to 9 mm below C6. The midsagittal diameter of the cervical cord normally occupies approximately 40% of the midsagittal diameter of the cervical canal in healthy individuals(**Chandar and Freeman, 2014**).

This cervical canal midsagittal diameter is decreased by 2 to 3 mm with extension of the neck, which is of clinical importance in the context of hyperextension injuries in an individual with a congenitally narrow spinal canal, especially in the presence of additional narrowing caused by cervical spondylosis. Under such circumstances an acute cervical