

Recent Trends In Management Of Crescent Pelvic Fractures

Thesis

Submitted for fulfillment of doctorate degree in Orthopaedic surgery

Presented By

Hisham Mohamed Naguib Darweesh

(M.B, B.Ch, Cairo University)

(M.Sc.Ortho. Cairo University)

Under Supervision of

Prof. Dr. Ahmed Galal

Professor of Orthopedic Surgery

Faculty of Medicine, Cairo University

Prof. Dr. Sherif Khaled

Professor of Orthopedic Surgery

Faculty of Medicine, Cairo University

Dr. Ahmed Hazem Abdel Azeem

Lecturer of Orthopedic Surgery

Faculty of Medicine, Cairo University

Faculty of medicine

Cairo University

2016

Acknowledgement

Acknowledgement

First and foremost, praise and thanks are given to **Allah** who provided me in his unlimited generosity with the medical knowledge, and by his abundant aid this work has been done. It is a great honor to express my sincere gratitude and deep appreciation to **Prof. Dr. Ahmed Galal**, Professor of Orthopedic Surgery, Faculty of Medicine, Cairo University who gave me the honor of working under his remarkable supervision and fruitful guidance that makes me really fortunate and who was kind to offer me much of his valuable time.

I would also like to express my sincere gratitude and deep appreciation to **Prof. Dr. Sherif Khaled**, Professor of Orthopedic Surgery, Faculty of Medicine, Cairo University who gave me the honor of working under his supervision, for his careful and great support in this thesis and valuable and precious experience.

I would like also to express my deep obligation to **Dr. Ahmed Hazem Abdel Azeem**, Lecturer of Orthopedic Surgery, Faculty of Medicine, Cairo University for supervising the whole work, reading and criticizing the manuscript. I will

never forget his unlimited help, continuous support and kind encouragement.

*And also I would like to express my deep thanks to **all Orthopaedic department members** for their support and guidance.*

*I would like to extend my genial thanks to **my family** for helping me and for her patience throughout this work.*

Hisham Naguib

List of contents

• Aim of work.....	I
• Introduction	II
• Chapter 1 Review of the literature	1
• Chapter 2 Patients and Methods	63
• Chapter 3 Results	84
• Chapter 4 Case Presentation	105
• Chapter 5 Discussion	127
• Chapter 6 Summary	141
• Chapter 7 References	144
• Arabic Summary.....	154

Introduction

Pelvic fractures and fracture-dislocations of the pelvis are associated with significant morbidity and mortality. The pelvic injury pattern is dependent on the amount of force applied to the pelvis, as well as on the direction.¹

Lateral compression (LC) type of injuries account for >50% of all pelvic fractures. A particular subset of these fractures is the crescent fracture, a posterior fracture-dislocation of the sacroiliac joint. This injury is a combination of ligamentous disruption of the inferior portion of the sacroiliac joint (superior sacroiliac joint ligamentous structures remaining intact), and a vertical fracture of the posterior ilium extending from the middle of the sacroiliac joint and exiting the iliac crest.¹

The posterior superior iliac spine (PSIS) remains firmly attached to the sacrum via the superior portion of the posterior ligamentous complex. As a result of this injury, the involved hemipelvis is rotationally unstable. However, because the muscular pelvic floor and the sacrospinous and sacrotuberous ligaments remain intact, the hemipelvis is stable to vertical forces. Because these injuries involve the sacroiliac joint, a major weight-bearing articulation, the potential for posttraumatic arthritis, chronic instability, and malunion, if not appropriately treated, is considerable.¹

Open reduction and stable internal fixation is necessary to achieve a congruous articular surface as well as to reestablish rotational posterior pelvic stability. Open reduction and internal fixation of these injuries can be performed

via several different methods.¹

This work was initiated to assess the incidence, severity, and pattern of associated injuries (visceral, vascular, neurologic, and bony) and to assess the efficacy of a treatment protocol that used a posterior and anterior approaches to the sacroiliac joint.¹

Aim of Work

Aim of the work

The aim of our work is to discuss the use of the most recent trends for management of crescent pelvic fractures and evaluate the radiographic, clinical and functional outcome of the patients. We will compare our results to the published series in the literatures.

CHAPTER 1

Review of the literature

CHAPTER 1

1-Crescent pelvic fracture: Definition, Anatomy and Biomechanics

I-Definition:

Crescent fractures are defined as a vertical posterior iliac wing fracture leaving the posterior superior iliac spine and posterior sacroiliac ligaments attached to the sacrum, resulting in a rotationally unstable hemipelvis.²

II-Anatomy :

The pelvis is a ring structure made up of 3 bones: the sacrum and the 2 innominate bones. The innominate bone is formed of the fusion of 3 ossification centers: the ilium, the ischium, and the pubis.³

The Sacroiliac Joint:

It is made up of two parts. The inferior portion consists of the articular surface of the joint; the upper, more dorsal portion, between the posterior tuberosity of the ilium and the sacrum, contains the fibrous or ligamentous parts of the joint (interosseous ligaments). The anterior portion of this synovial joint is covered with articular cartilage on the sacral side and fibrocartilage on the iliac side. The joint itself has a small ridge on the sacral side that provides minimal stability. In the upright position, the weight of the body pushes the sacrum down between the iliac wings and causes approximately 5° dorsoventral rotation.⁴

The innominate bones move backward and downward as the pubic rami swing upward. Precise reduction and reestablishment of the morphology of the sacroiliac joint may not be as important as for an extremity joint because tight

contact between the articular surfaces never occurs in normal function .^{5,6} (FIG 1-1).

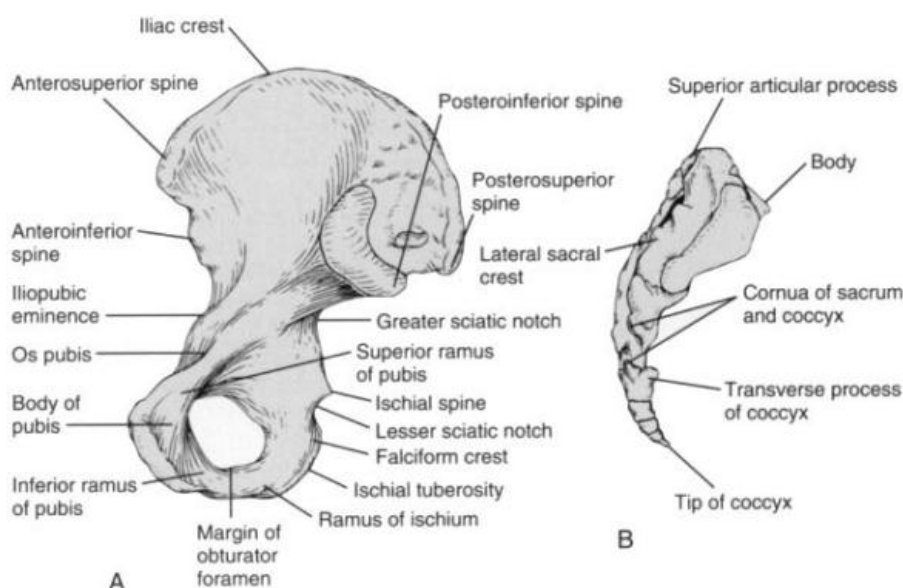


FIG 1-1 The sacroiliac joint. A, Iliac side of the sacroiliac joint, as well as the remainder of the innominate bone and the important bony landmarks. B, Sacral side. The two portions of the sacroiliac joint can best be appreciated on these views. The articular surface of the sacroiliac joint on the sacrum has a ridge and is covered by articular cartilage. The posterior portion is filled with ligamentous structures.⁶

The ligaments of the pelvis :

They are arranged into two groups:

A-Posterior group and

B-Anterior group

A-Posterior group:

1- Interosseous sacroiliac ligaments:

These ligaments, the strongest in the body, unite the tuberosities of the ilium and sacrum and are thought to be primary stabilizing ligaments of the sacroiliac joint.

Superficial to the interosseous ligaments are a series of connecting ligaments that join various portions of the pelvic ring, these include:

2- Posterior sacroiliac ligaments:

Two distinct bands are described:

1. The short posterior sacroiliac ligaments oriented nearly horizontally, pass from the tubercle or ridge of the sacrum to the posterior superior and posterior inferior spines of ilium.
2. The long posterior sacroiliac ligaments oriented longitudinally, run from the posterior superior iliac spine to the lateral portion of the sacrum.⁷

3- Anterior Sacroiliac Ligaments:

They are present more ventrally, representing the anterior part of the fibrous capsule of the sacroiliac joint.⁸

The ligaments are strong, flat bands, pass from the anterior surface of the sacrum to the anterior adjacent surface of the ilium.

Other connecting ligaments include:

4- Sacrotuberous Ligament:

This is an extremely strong, broadband originating from 3 locations:

- Dorsal surface of the lower 3 sacral vertebrae.
- Posterior portion of iliac crest in the region between, posterior superior and posterior inferior iliac spines and
- Long posterior sacroiliac ligaments.

From these 3 locations the fibers run laterally and inferiorly to the medial border of the ischial tuberosity. ³

5- Sacrospinous Ligament:

This is a strong triangular sheet arising from the lateral margin of the sacrum and the coccyx, deep to the sacrotuberous ligament and passing to the ischial spine. The anterior surface of the ligament blends with the coccygeus muscle and it has been said by to represent a degenerated posterior part of the muscle belly itself. ³

6- Iliolumbar Ligaments:

The pelvis is secured to the axial skeleton at the lumbosacral articulation. these particular ligaments are present on both sides. The iliolumbar ligament is the markedly thickened portion of the fascia covering the quadratus lumborum. It arises from the tip of the 5th lumbar transverse process to the inner surface of the ilium just anterior to the sacroiliac joint, blending with the anterior sacroiliac ligaments. Strain on this ligament often results in avulsion fractures of the 5th lumbar transverse processes. ⁸

7- Lateral lumbosacral Ligament:

Spreads downward from the fifth lumbar transverse process to the ala of the sacrum. ⁸

Posterior Tension Band

The prime stabilizing structures of the joint are the supporting ligaments. The posterior sacroiliac ligament complex confers most stability while the

anterior sacroiliac, sacrotuberous, sacrospinous and iliolumbar ligaments function as supplemental stabilizers. These posterior ligaments combine to form a strong posterior tension band to the joint.⁹ (**FIG 1-2**)

B- Anterior group:

Anteriorly, the pubic symphysis acts like a strut, preventing collapse of the pelvis. The opposed bony surfaces are covered by hyaline cartilage and are united by a fibrocartilaginous interpubic disc and fibrous tissue. Superiorly and anteriorly, dense ligamentous fibers add stability to the anterior pelvis. The symphysis is reinforced inferiorly by the inferior pubic or arcuate ligament.¹⁰