Management of Acetabular Fractures Associated with Pelvic Ring Disruption

Thesis
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Abstract:

Title of the thesis: Management of acetabular fractures associated with pelvic ring disruption.

Summary:

Our study is one of first studies targeting at analysis of associated acetabular fractures with pelvic ring disruption injuries in details. In our thesis we discussed anatomy, biomechanics, classification, clinical picture, radiographic diagnosis and different treatment methods as well as complications during the literature review. The practical part of our study was conducted to assess management and functional outcome of twenty four patients treated with operative fixation for one or both components of these combined injuries.

Keywords: Acetabular – Pelvic- fractures- Associated – Management- Fixation.

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Mahmoud Abdel Karim

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CHAPTER I

ANATOMY

Anatomy of the acetabulum

The column concept of the acetabulum

One must be adapt at three-dimensional vision to master the complex anatomy of the acetabulum. From its lateral aspect , it is better to regard the acetabulum as being contained within the open arms of an inverted Y.

(**Fig 1-1)(Letournel, 1993)**

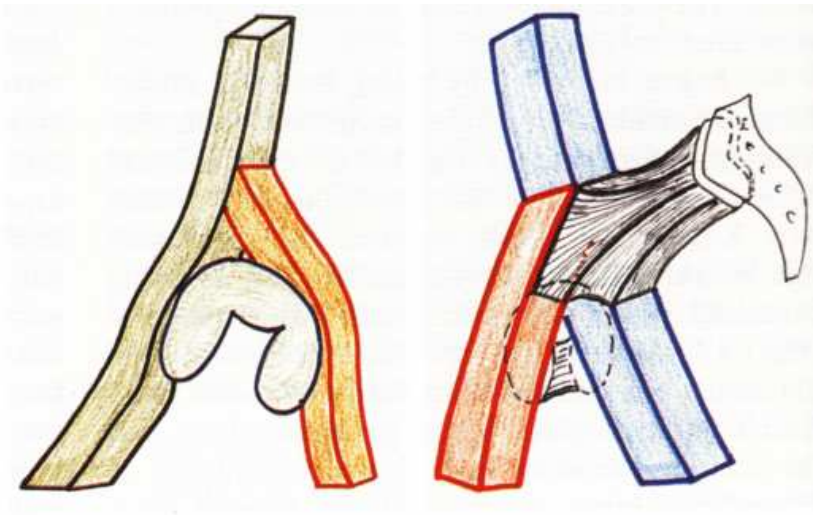


Fig1-1 The inverted Y containing the acetabulum (**Letournel, 1993**)

It is formed by a posterior column, the ilio-ischial component, and an anterior column, the iliopubic component, which is much longer and extends from the anterior end of the iliac crest to the pubic symphysis.The upper end of the posterior column is attached to the posterior aspect of the anterior column, a little above its mid-level.**(Fig 1-2) (Tile,1996)**

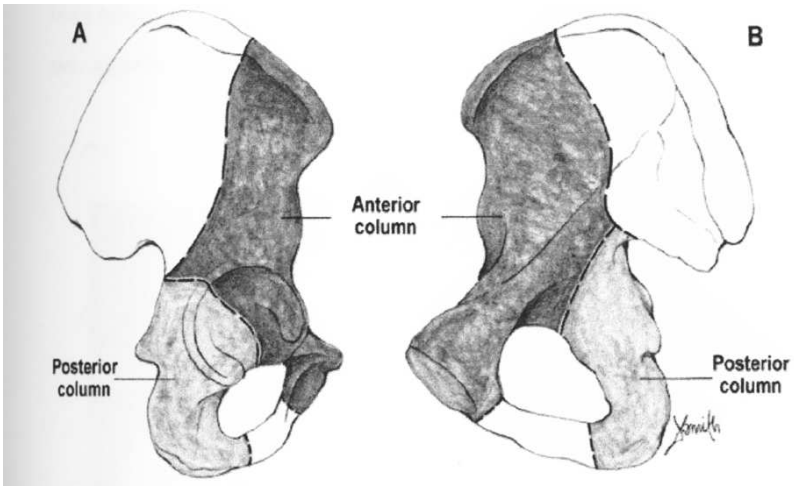


Fig 1-2: The column concept as devised by Judet in this extrapelvic and intrapelvic schematic views of the pelvic bone**. (Callaghan,1997)**

The Posterior column

This is called the ilio-ischial column .It is thick ,strong , and offers solid material for internal fixation .It is triangular in section .**(Letournel, 1993)**

Beginning at the dense bone of the greater sciatic notch , it extends distally through the centre of the acetabulum ,obturator foramen ,and inferior pubic ramus and includes the posterior wall of the acetabulum and the ischial tuberosity. Its inner surface forms the posterior aspect of the quadrilateral area, its posterior surface the non-articular area of the posterior wall of the acetabulum , its anterior surface the posterior articular surface of the acetabulum. Its posterior border formed by the greater and lesser sciatic notches**.(Fig1-3)(Tile,1995)**

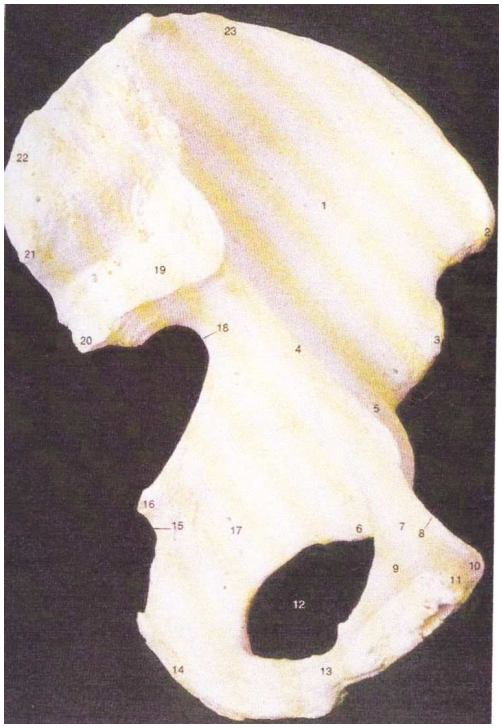
Fig1-3: The posterior column from the back as seen in an iliac oblique view on x-ray **(Tile, 1995**)

The anterior column

The iliopubic column, extends from the iliac crest to the symphysis pubis and includes the anterior wall of the acetabulum.In general it is concave both anteriorly and medially ; its arc being bridged by the inguinal ligament . It is divided into three segments;iliac , acetabular, and pubic, capped by the iliac crest .

Iliac segment

It forms the anterior part of the iliac wing and presents an internal (**Fig1-4**)and an external surface.**(Fig 1-5)**



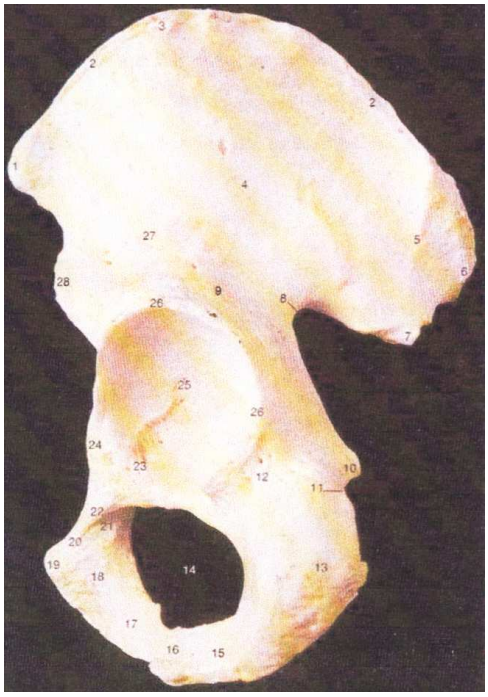


Fig 1-4: Medial surface of left hip bone

Fig 1-5: Lateral surface of left hip bone

(Mc Minn, 1988)

(a)The pelvic surface or the iliac fossa, the internal concavity of the ilium, is continuous below, with a wide shallow groove, which is bounded laterally by the anterior inferior iliac spine and medially by the iliopubic eminence.**(Fig 1-6)(Williams , 1980)**

(b)The external surface is markedly roughened and forms a large anterior part of the gluteal surface of the ilium including the anterior pillar , which extends upwards to the gluteus medius tubercle**.(Williams,1980)**

Acetabular segment

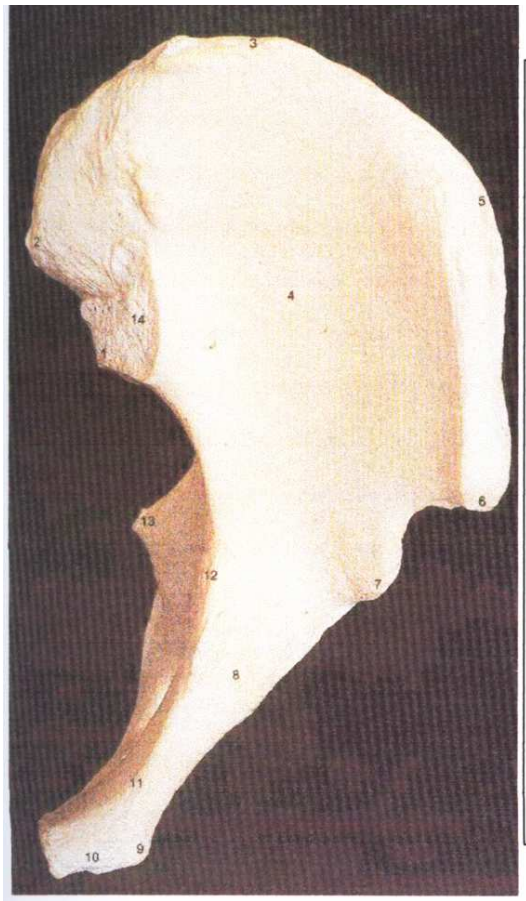
This is triangular and prismatic in shape and presents three surfaces : **(Fig 1-7)**

(a)The postero-lateral surface supports the anterior articular segment of the acetabulum and the front part of the cotyloid fossa . The anterior horn is located about 1 cm above the level of the upper border of the obturator foramen .

(b) The internal surface is generally concave and is formed by the anterior part of the quadrilateral surface. It extends as far forward as the obturator canal and is limited superiorly by the ilio-pectineal line.

c) The antero-superior surface presents from above downwards, the gutter of the ilio-psoas tendon and the ilio-pectineal eminence . At the level of the latter the bone of this surface forms the anterior lamella of the anterior wall of the acetabulum , and is

roughly parallel to the anterior acetabular articular surface; at that level the bone is 6-10mm thick . It is limited internally by the ilio-pectineal line, which is always interrupted in fractures of the anterior wall of the acetabulum . It may be useful to remember that the inferior limit of the ilio-pectineal eminence is situated at the same horizontal level as the anterior horn of the acetabulum , or a little higher . **(Letournel, 1993)**



1 Posterior inferior iliac spine
2 Posteiror supeior iliac spine
3 Iliac crest
4 Iliac fossa
5 Tubercle of iliac crest
6 Anterior superior iliac spine
7 Anterior inferior iliac spine
8 Iliopubic eminence
9 Pubic tubercle
10 Pubic crest
11 Pecten of pubis (pectineal line)
12 Arcuate line
13 Ischial spine
14 Auricular surface
The arcuate line and the pecten and crest of the pubis form part of the brim of the pelvis; the rest of the brim being formed by the promontary and upper surface of the lateral part of the sacrum
The pecten of the pubis is more commonly called the pectineal line
Fig 1.6: The left hip bone, from above as seen in an inlet view. Same view seen in an ilioinguinal approach
(McMinn, R.M.H. and Hutchings, R.T. *A Colour Atlas of Human Anatomy*, Barcelona: Wolfe Medical Publications Ltd, 1988.)

Pubic segment

This is the superior pubic ramus and constitutes the slenderest piece of the column as well as its most forward and medial part. The superior pubic ramus passes upwards,backwards and laterally from the body, superolateal to the obturator foramen to reach the acetabulum . Triangular in section , it has three surfaces and borders.**(Williams,1980)**

(a)The antero-superior surface is distinctly spiral in configuration and in order to apply a plate for internal fixation, it is always necessary to twist this to fit the shape of the segment.**(Tile,1995)**

(b)The internal surface, or pelvic surface, is smooth.

(c) The inferior surface forms the bony roof of the obturator groove, which is converted to a canal by the upper borders of the obturator membrane and obturator muscles, and transmits the obturator vessels and nerve from the pelvis to the thigh**.(Last ,1984)**

Both anterior and posterior columns unite a little above the level of the mid-point of the anterior column and form an angle of approximately 60 degrees .The summit of the angle is filled with a fillet of compact bone, which constitutes the roof of the acetabulum and forms the keystone of the arch. So, this anatomical roof corresponds to a segment of articular surface, which subtends to an angle of 45 to 60 degrees and is located between the anterior inferior iliac spine and the ilio-ischial notch of the acetabular margin (not always clearly visible) posteriorly. Medially, the anatomical roof does not reach the edge of the cotyloid fossa; on the contrary, it is joined by the superior border of the cotyloid fossa by a distinct and thinner plate of compact bone,which is often easily visible in a coronal section of the area and on the antero-posterior view**.(Letournel,1993)**

Joined together in the manner described, the two columns are linked with the auricular surface of the sacro-iliac joint by the sciatic buttress .**(Rouvière,1940)**