DIFFERENT IMAGING MODALITIES IN DIAGNOSIS OF SACRO-ILIAC JOINT DISEASES.

Essay

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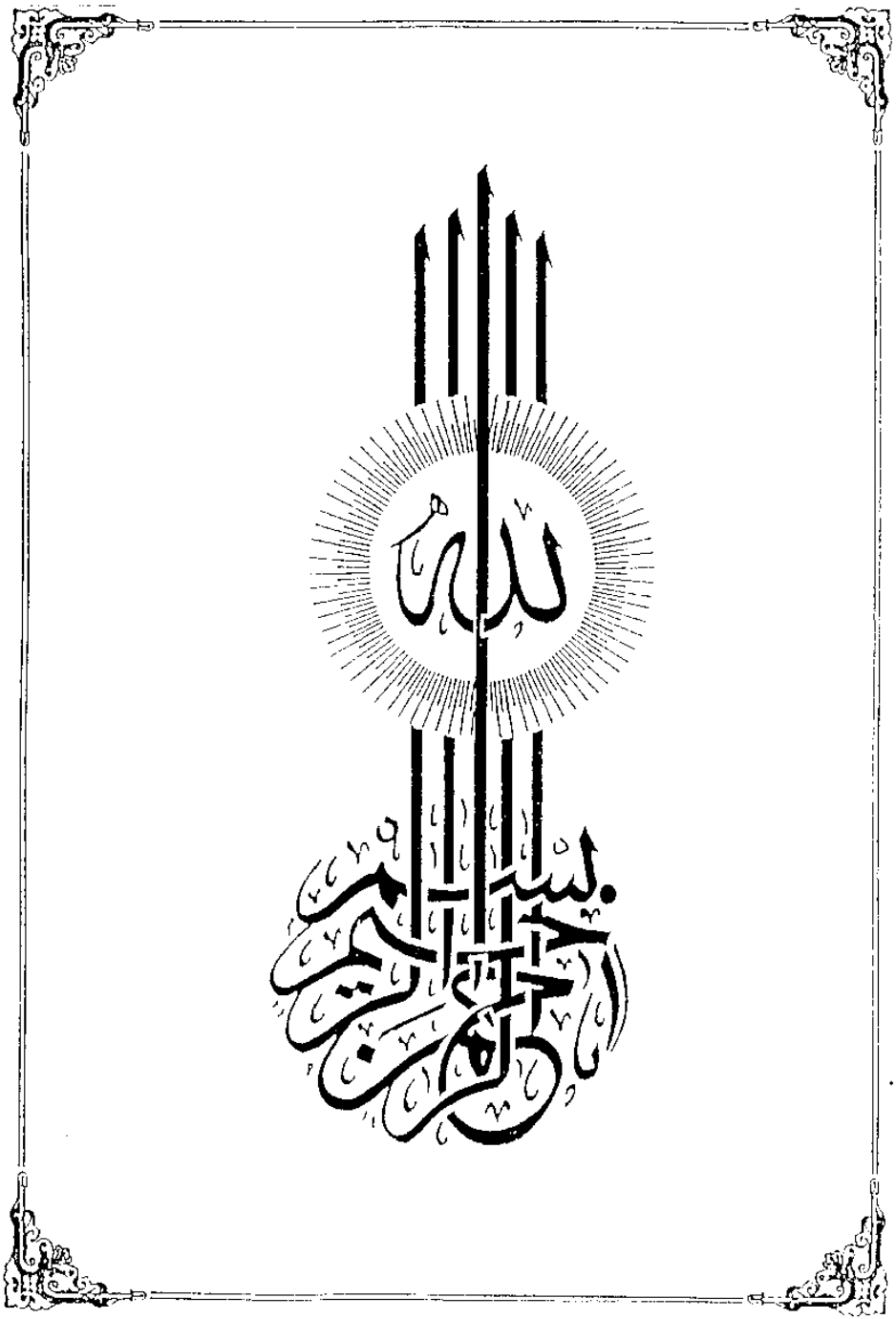
ANATOMY OF SACRO-ILIAC JOINT.



ANATOMY OF THE SACRO ILIAC JOINT

The sacro iliac joint is a synovial articulation between the three upper segments of the sacrum and the auricular surface of the ilium.

Although often described as a plane, the articular surface are nearly flat only in the infant, but in the adult they exhibit irregular elevations and depressions. These irregular elevations and depressions. are more pronounced in male, they fit into one another, restrict movements and contribute to the joints considerable strength in transmitting weight from the vertebral column to the lower limbs.

The sacral surface is covered by hyaline cartilage and the iliac by fibro cartilage. The articular capsule is attached close to both articular margins.

[Warwick & Williams, 1973].

Fibrous adhesions and gradual obliteration occur in both sexes, earlier in males, and after the menopause in females.

A radiological study of 94 healthy individuals showed such changes in 6 % before 50 years, in 24 % thereafter. In old age the joint may be completely fibrosed and occasionally even ossified.

[Cohen et al., 1967]

The Ligaments of sacro iliac joint:

The ligaments form the most important factor in the stability and preventing movements of the joints. They are classified as: ventral, interosseous and dorsal ligaments. (Fig. 1 & 2)

I. The ventral sacro iliac ligament:

Is an antero-inferior capsular thickening, particularly well developed near the arcuate line and posterior inferior to the iliac spine where it connects the third sacral segment to the lateral side of the pre-auricular sulcus. It is thin elsewhere.

II The inter osseous sacro iliac ligament:

Is the massive chief bond between the bones and fills the irregular space postero-superior to the joint. It is covered superficially by the dorsal sacro iliac ligament. its deeper part has superior and inferior bands passing from depressions posterior to the sacral auricular surface to those on the iliac tuberosity.

These bands are covered by, and blend with, a more superficial fibrous sheet connecting the dorso-superior margin of a rough area posterior to the sacral auricular surface to the corresponding margins of the iliac tuberosity. This sheet is often partially divided into superior and inferior parts, the former uniting the superior articular process and lateral crest on the first two sacral segments to the neighbouring ilium as a short posterior iliac ligament.

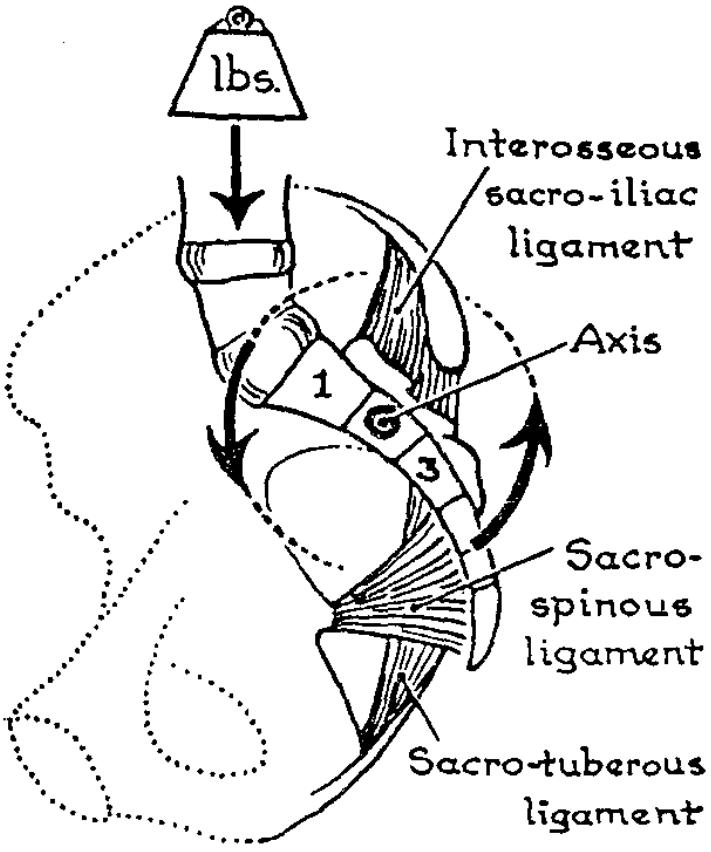


Fig. (1)

The ligaments which resist the rotation of the sacrum.

Quoted from: Warwick & Williams, 1973

III. The dorsal sacro iliac, ligament:

Lies over the interosseous but intervening are the dorsal rami of sacral spinal nerves and vessels. It has several weak fasciculi connecting the lateral sacral crest to the posterior superior iliac spine and internal lip of the iliac crest at its dorsal end.

Inferior fibres, from the third and fourth sacral segments, ascending to the posterior superior iliac spine, may form a separate long posterior sacro-iliac ligament. The latter is continuous laterally with part of the sacrotuberous ligament and medially with the thoracolumbar fascia's posterior lamina ***[Weisl, 1954].***

Accessory synovial articulations between lateral sacral crest posterior superior iliac spine and iliac tuberosity are not uncommon ***[Trotter 1937].***

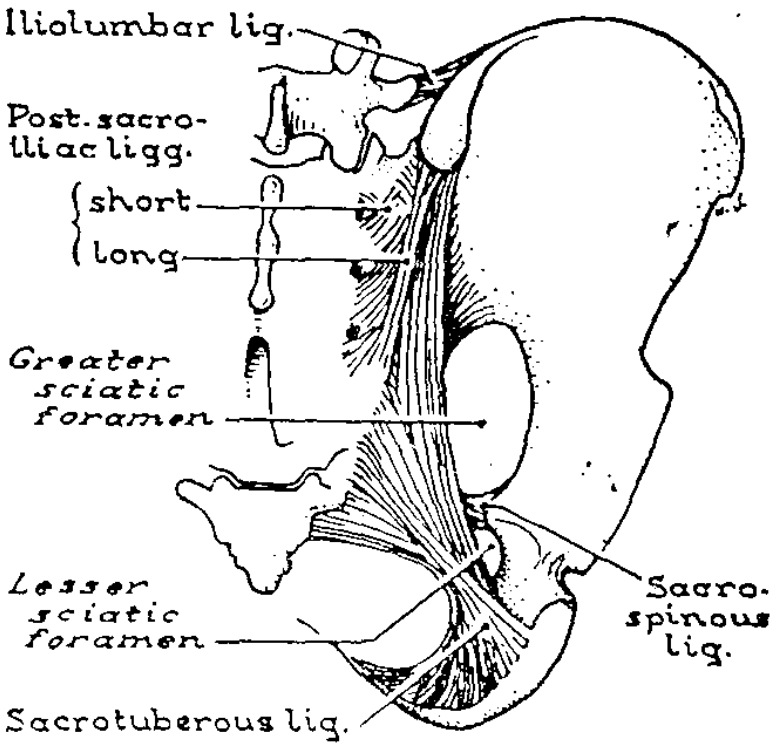


Fig. (2)

The ligaments of the pelvis;

seen from behind.

Quoted from Warwick & Williams, 1973

Surface Anatomy

Medial to the easily palpable, blunt, posterior superior iliac spine is a depression corresponding to the sacro iliac joint line. The underlying, tense soft parts offer great resistance to deep palpation in examination for tenderness following strain.

On the sacrum, near the joint line, a row of dorsal projections corresponding to the rudimentary, fused transverse processes of the sacral vertebrae, may be palpated.

The articulating surface of the sacrum is directed posteriorly and laterally, while that of the ilium is directed forward and medially.

The plane of the joint looking from the pelvis is directed posteriorly and medially, and the joint space is an unevenly curved slit. The articular surfaces, in the main, are smooth but they have irregular projections and depressions which help to lock and stabilize the joint.

Post to the articulating areas, the bony surfaces of the sacrum and iliac are rough, for attachment of strong reinforcing ligaments. ***[Mcvay, 1984].***

Movement of the sacro Iliac joint:

A very slight gliding or rotatory movement occurs between both surfaces when the trunk moves on the lower limbs. During pregnancy the ligaments of the joints become less firm and tend to help in widening the pelvic cavity during delivery.

[Mahran, 1976].

A small amount of antero-posterior rotatory movement occurs at the sacro-iliac joint around a transverse axis which is usually about 5 - 10 cm vertically below the promontory of the sacrum. These movements occur during flexion and extension of the trunk and the range is the same in the male and non pregnant female. The range is increased temporarily in pregnancy, the greatest change in position of the sacrum relative to the iliac bones occurs when rising from the recumbent to the standing position. The sacral promontory moves forward as such as 5 - 6 mm as the body weight is taken upon the sacrum.

Backward movement of the lower end of the sacrum is considerably less. The movement is not a pure rotation, the axis being dynamic. ***[Warwick & Williams, 1973]***

The movements of the sacrum are regulated by its form and ligamentous attachements. viewed as a whole it presentes the shape of a wedge with its base upwards and forwards. The first component of the force is therefore acting against the resistance of

the wedge and its tendancy to separate, the iliac bones is resisted by the sacro-iliac and ilio - lumber ligaments and by the ligaments of the symphysis pubis. ***[Warwick & Williams, 1973]***

If a series of coronal sections be made through the sacro-iliac joints, the articular portion of the sacrum may be divided into three segments; anterior, middle and posterior.

In the anterior segment; which involves the first sacral vertebra, the articular surfaces show slight sinuosities and are almost parallel to one another.

In the middle segment the width between the dorsal margins of the sacral articular surfaces is greater than that between the ventral margins, and in the centre of each surface there is a concavity into which a corresponding convexity of the iliac surface fits. This forms an inter-locking mechanism which relieves strain of the body weight on the ligaments.

In the posterior segment the ventral width of the sacrum is greater than the dorsal and the articular surface are only slight concave.

In all these movement the effect of the sacro iliac ligaments and ilio lumber ligaments in resisting the separation of the iliac bones must be recognised. ***[Warwick & Williams, 1973].***

PATHOLOGY OF SACRO ILIAC JOINT DISEASES.

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The sacro iliac joint is bridged by fibrocartilage (***Amphiarthroidal joint)*** or separated by a synovial cavity "diarthroidal joint" or consists of a combination of both types of joints. ***[Turek, 1977].***

Normal joint structure and function:

Joint spaces are open tissue spaces, communicating directly with the periarticular tissues. The articulating ends are held together by the joint capsule, a tubular structure of dense connective tissue inserting at the outer surfaces of the bony shafts.

The capsule has an abundant supply of sensory nerve fibers that are highly sensitive to stretching and twisting and that are ·arily responsible for the intense pain accompanying joint ɔns. ***[Clarke, 1971].***

The capsule is lined by the synovial membrane, or synovium which is composed of an outer layer of losse vascular connective tissue and an inner discontinous layer of specialised cells, the synoviocytes which synthesize and secrete hyaluronate, which is a given off into the joint space. ***[Anderson's, 1977].***

The synovial fluid is a dialysate of plasma which becomes viscid because of the discharge into it of protein hyaluronate, secreted by the synoviocytes.

Under normal conditions, the synovial fluid forms a thin film on the cartilaginous surfaces, the total amount of synovial fluid is small and it has a lubricating effect. ***[Andresson, 1977].***

The synovial membrane also, covers the soft structures within the joint, fat pads, and ligaments which forms bursae. The bursae communicate with the joint space and therefore likely to become involved in pathologic processes affecting the joint and vice versa.

The articulating surfaces of the bones are covered by bluish, glistening hyaline cartilage which varies in thickness, the cartilage is supported by a layer of cancellous bone . A small amount of free ·id fluid is present in the joint space and by forming a thin layer · the cartilage, acts as a lubricant during joint motion.

Histologically and by electron microscopy, the surface of the articular cartilage is not smooth but shows innumerable pits 20 to 30 Um. in diameter which correspond to the underlying most superficially located cartilage cells. ***[Clarke, 1971].***

Diseases affecting sacro iliac joint:

Classification : [Turek, 1977]

[A] Congenital lesions.

[B] Acquired lesions:

I. ***Infectional arthritis:***

1) Acute : streptococcus, staphylococcus, gonococcus.

2) Chronic : Tubercle bacillus.

II. ***Probably infectional:***

1. Ankylosing spondylitis and other sero negative spondylo-arthropathies as: Reiter's syndrome, Still's disease, Behcet's syndrome and Psoriatic arthritis.

2. Rheumatic.

3. Rheumatoid arthritis (atrophic arthritis, proliferative arthritis and chronic infectious arthritis).

III. ***Degenerative arthritis***: osteo arthritis, hypertrophic arthritis, osteoarthrosis.

IV. ***Traumatic arthritis.***

Arthritis associated with metabolic diseases: Gout

Toxic arthritis.

I. ***Local joint disturbances:***

1. A septic necrosis.

2. Osteochondritis dissecans.

VIII. ***Neoplasms of joints:*** Cyst, xanthoma, haemangioma, giant cell tumour, synovioma.

IX. ***Systemic diseases affecting bones articulating in sacro iliac joint:*** Sacrum - Ilium - Pubic bones.