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Manipulation of the Connective Tissue of the Sacrum Iliac: A New Look at Sacroiliac Pain

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Abstract

Different therapeutic approaches for treating low back pain and sacroiliac pain are available in the scientific literature. Low back pain has a multifactorial origin and each individual present's low back pain in different ways. Physiotherapy acts conservatively in the treatment of acute and chronic low back pain promoting improvement in joint mobility, strength gain, central stability, specific muscle training, and functional training. Thus, this study aims to present a new therapeutic concept of approaching sacroiliac and low back pain by manipulating the connective and ligament tissue of the posterior pelvis.

Introduction

Different therapeutic approaches for treating low back pain and sacroiliac pain are available in the scientific literature. They include drug treatment (anti-inflammatories, corticosteroids and muscle relaxants) and conservative treatment (through physical exercises and medical infiltration) [1,2]. Several factors are related to pain in the lower trunk and pelvis, such as biomechanical, pathological, emotional, and labor alterations [2]. The result of these changes is pain [3].

According to the IASP - International Association for the study of pain, pain is defined as "a sensitive and emotional experience associated with or related to actual or potential tissue damage. Each individual learns to use this term through his previous experiences" [4]. Pain is closely related to disability, absence from work, and overload of health services [5,6].

Low back pain has a multifactorial origin. It can occur due to local anatomical alteration by muscle, bone, articulation such as compression of the intervertebral disc, peripheral nerve root, and nervous system attachments (dura mater), fascial, ligament tension, segmental deviation of the apophyseal joint surface, sacroiliac and lumbosacral joints [7], in addition to the sociodemographic relationship (such as age, sex, education, and income) and lifestyle (such as smoking, alcoholism, physical inactivity) [8].

This condition affects an average of 65% of people each year and approximately 84% of people will experience some episodes of low back pain throughout their lives [9]. However, these values may not be correct, since about 60% of people who have low back pain do not seek health services [5].

The stability and dynamic and static functions of the spine is given by the integration of three systems that act in a combined manner: passive system (vertebral bodies, facet joints, capsules, ligaments and the intervertebral disc itself), active (axial muscles and tendons) and neuro-modulator (central and peripheral nervous system) guaranteeing biomechanical conditions favorable to function [10,11].

Changes resulting from one of these systems can cause joint and/or segmental dysfunction, a deficit in muscle recruitment, and reproduce local or irradiated pain [12].

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Physiotherapy acts conservatively in the treatment of acute and chronic low back pain. Promoting improvement in joint mobility, strength gain, central stability, specific muscle training, functional training [13].

Thus, this study aims to present a new therapeutic concept of approaching sacroiliac and low back pain by manipulating the connective and ligament tissue of the posterior pelvis.

Capsule Ligament Manipulation

Capsule Ligament Manipulation, developed by Prof. Msc Camilo Cândido is a technique based on 6 posture manipulations of passive connective tissue involving the lumbopelvic and posterior sacroiliac joints and ligaments to promote the improvement of low and sacroiliac low back pain, functionality, mobility and force transmission through the pelvic cingulate.

The technique takes into account the histological, anatomical, kinesiological, and biomechanical importance of capsules and ligaments in the stability, the transmission of energy and strength, and the functionality of the segments.

Capsule ligament manipulation seeks to assist physiotherapists in the search for the resolution of the lumbopelvic, sacroiliac, and hip pain discomfort and complementing the therapeutic techniques already established for these dysfunctions in the scientific literature.

Anatomical Review

The hip anatomy

The hip is a ball-socket joint and is formed by the head of the femur and the acetabulum (located in the lateral region of the pelvis and formed by the fusion of the pubis, ischium, and iliac) and covered by hyaline articular cartilage in the shape of a cell. It has a fibrocartilage ring with the role of increasing the depth of the acetabulum (socket) called the acetabular lip **(Figure 1).**

The head of the femur is the most proximal portion of the femur, has a hemispherical (convex) shape, and is connected to the neck of the femur (between the greater and lesser trochanters). The neck of the femur guides the head of the femur at an inclination of approximately 125º in the medial, superior, and anterior direction.

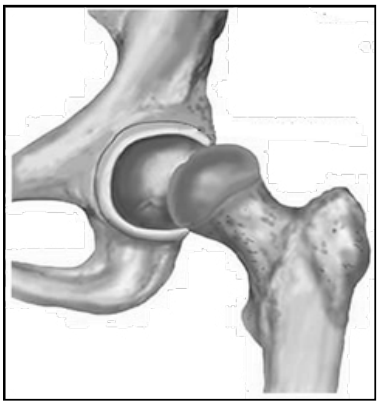

Figure 1: Lateral view of the decoapted hip joint. Highlights the head of the femur and acetabulum (with the acetabular lip in evidence).

Pelvis

The pelvis is formed by the union of innominate bones ileum, pubis, and ischia and which connect anteriorly through the pubic symphysis and posteriorly with the sacrum (odd bone). The pelvis, as it is also known, has a thicker and more resistant anterior and posterior ligament implement that form an osteoligamentous ring (pelvic ring). The pelvis has a network of mechanical and kinesiological functions such as transmitting the weight of the head, trunk, and upper limbs to the sitting bones and the lower limbs with the person standing or walking, running and/or jumping (locomotion).

The pelvis needs to be solid and stable as it supports a range of mechanical stresses during locomotion activities. Another functional role of the pelvis is to house part of the digestive, urinary, and sexual ducts, that is, it allows defecation, urination, and expulsion of the fetus, in the case of placental mammals.

As for the shape, there are specific differences in the shape of the male and female pelvis, which allows an expert when analyzing a bone, by the characteristics of the pelvis to be able to determine whether it is a male or a female. The male pelvis is narrow, assuming a more triangular profile (of the isosceles type), presenting a smaller, more closed upper narrower, since the man does not have a parturition role. On the other hand, the female pelvis is broader, presenting a larger upper narrow, assuming a triangular profile (of the equilateral type).

This characteristic of the female pelvis of having a greater opening of the eyelids causes an increase in the angle of the femur to the hip (obliquity), favoring an increase in the more pronounced knee valgus. These characteristics may become more evident during the final months of delivery due to the actions of hormones and cytokines that act on collagen **(Figure 2).**

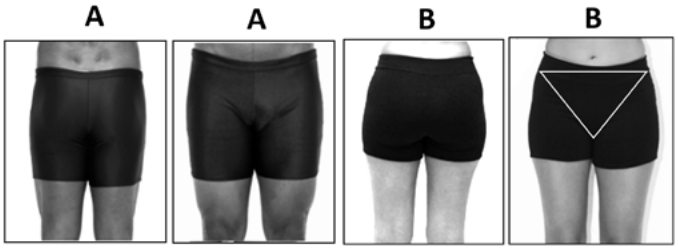

Figure 2: They present the differences between the shape of the pelvis of (A) man - narrower pelvis - and (B) woman - wider pelvis.

The distribution of loads through the pelvis is an important feature in the analysis of the functional role of the pelvis and its association with the role of the pelvic ligaments. One of these characteristics of the pelvis is to support the weight of the trunk in the fit between L5 and S1, dampened by the L5-S1 intervertebral disc. In an individual with bipedal support, the loads coming from the trunk towards the sacrum are divided equally on each side of the pelvis by the sacroiliac joints and transmitted in the direction of the acetabulum,

where the head of the femur rests, thus allowing these loads to be transmitted to the limbs inferior to the ground **(Figure 3).**

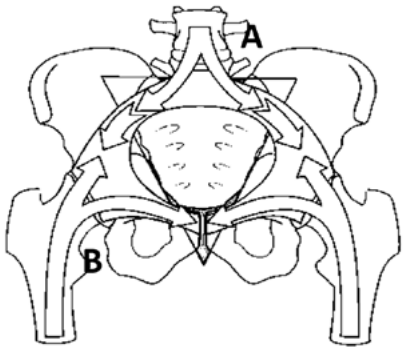

Figure 3: (A) Shows the transmission of loads from the spine through the sacrum (via the sacroiliac joint), iliac, acetabulum, femur head to the lower limbs and soil. (B) shows the ground reaction force, ascending and which is transmitted via the femur and acetabulum to the pubis.

With the individual in one-leg support, the load transfer through the pelvis is asymmetrical. Featuring a supported member, loaded pelvis, and a suspended member, unloaded pelvis. Downward movement occurs in the pelvis on the side of the limb, which causes the vertebral column to increase in its lateral curvature, where convex curvature is seen to the same side as the suspended pelvis.

Regarding tensions in the pelvic complex, the same phenomenon described in the bipedal support on the side of the pelvis with the support of the sacrum is observed to perform forward rotation (nutation) that is limited by the inferior sacral ligaments. On the suspended side, the pelvis falls, that is, it projects downwards, developing a shear in the pubic symphysis since on the carrier side the pelvis rises and on the suspended side the pelvis falls.

This static demonstration of the functioning of forces on pelvic structures is of paramount importance to understand the role of the ligaments that make joints and structures in the pelvis. Since they need to be strong enough that during gait or running in which they swing between one support member and another in suspension, this shear load does not affect joint homeostasis and consequently it's functioning.

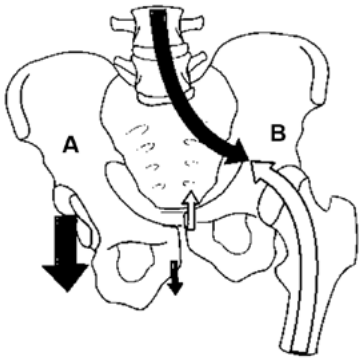

Figure 4: It shows the action of the loads on the pelvis in the unipodal position (A) in the suspended pelvis (Swing phase), illustrating the pelvis down and (B) in the sustained pelvis (Support phase) in elevation.

The joints

The pelvis has three joints, two sacroiliacs, and the pubic symphysis. The sacroiliac joint is a diarthrodial joint formed by the auricular face (for the sacrum) present in the ilium and the auricular face (for the ilium) present in the sacrum.

Sacroiliac joints have two types of articulation, one synovial (inferior, vascularized and innervated basement, and produces synovial fluid) and another syndesmosis (upper, fibrous portion).

Ligaments

The sacroiliac joint is surrounded by powerful and thick ligaments that join the sacrum to the ilium and the last two lumbar vertebrae to the ilium **(Figure 2)**. Are they:

Sacroiliac ligament: divided into anterior and posterior sacroiliac.

Spinal sacrum: extends from the ischial spine of the ilium and inserts itself on the lateral edge of the sacrum in its lower portion and the coccyx.

Sacrotuberal: extends from the posterosuperior portion of the sciatic tuber and inserts itself on the lateral border of the sacrum and coccyx. It has ligamentous branches of the posterior sacroiliac ligament (iliotuberal).

Iliolumbar: extends from the lower face of the costiform process of the L4 lumbar vertebra and throughout the costiform process and the lateral face of the body of the L5 lumbar vertebra and inserts on the anterior face of the posterior superior iliac spine and has a branch of the costiform process from L5 to the anterior sacroiliac ligament close to the iliac wing.

Supraspinatus: ligament that extends over the spinous process of vertebrae C2 to C7, T1 to T12, L1 to L5, and median sacral crest.

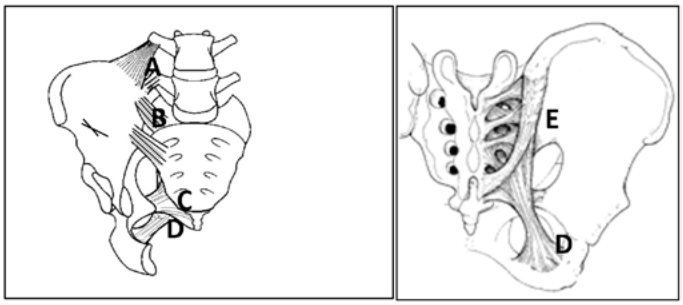

Figure 5: It shows an anterior view of the pelvis and pelvic ligaments (A) iliolumbar, (B) anterior sacroiliac, (C) sacrospinal and (D) sacrotuberal. (E) sacrum spinal.

The technique

Based on the reduction of tension in passive connective tissues that involve the pelvic, sacroiliac and coxofemoral loin joints to promote the improvement of low back and sacroiliac pain, and improvement of functionality, mobility and transmission of strength through the pelvic cingulate, it works directly with direct intervention in tension pre-existing capsular and ligament ligaments that may be causing

an increase in pelvic stiffness, changes in the distribution of forces by the pelvic cingulate to lower limbs and/or greater force transmission over one or more tissue or joints of the column-pelvis-hip complex; reduced ROM, reduced function of the lumbar spine, pelvis, hip.

The postures can be applied to any individual (after careful evaluation), regardless of sex, age, body composition, taking into account the relative and absolute contraindication criteria (related to injuries and morphofunctional changes already known and discussed in the literature on the rehabilitation of the pelvis), which promote improvement in the quality of life, well-being, relief of pain or discomfort, improvement in ROM and functionality.

The application of capsule ligament manipulation postures takes into account the position of the pelvic narrows in relation to the position of the lower limbs and the tension produced by the action of the physiotherapist.

Flexion of the hip at 90 degrees associated with rotation of the femur, promotes tension in the pelvic ligaments and muscles, varying according to the type of rotation **(Figure 3)**, increasing or decreasing the opening of the pelvic ring [14].

The association of hip flexion at 90 degrees with medial rotation of the femur produces tension in the posterior superior sacroiliac ligaments (anterior and posterior sacroiliac, Ilio-tuberous and iliolumbar) through the tension transmission mechanisms of the iliofemoral ligament that pulls the anterosuperior surface of the iliac bone downwards and using a lever, moves the anteroposterior surface upwards, that is, projecting the iliac wings outward, increasing the upper strait and counteracting the sacrum (when performed with both femurs). This movement, when the sacrum is fixed, increases the traction force in the posterosuperior sacroiliac ligaments unilateral to the rotating limb.

In contrast, the association of 90-degree hip flexion with lateral rotation of the femur will produce tension in the posteroinferior sacroiliac ligaments (sacrotuberous, sacrospinal and sacroiliac capsule) through the transmission of tension from the ischial femoral ligament that pulls the ischial tuber away them, increasing the lower pelvic narrow and producing sacral nutation (when performed with both femurs). When one of the pelves is fixed, the traction in the posteroinferior sacroiliac ligaments increases

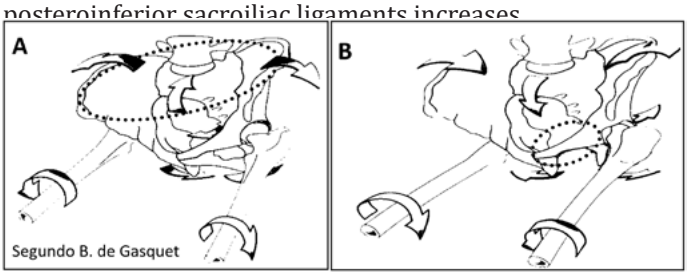

Figure 6: shows in A: lateral rotation of the femur with 90º of hip flexion and the counter-mutation of the sacrum with opening of the iliac wing represented by the larger dashed rim and consequent reduction of the lower narrow of the pelvis; and m B: medial rotation of the femur with 90º of hip flexion and sacral nutation with closure of the iliac wing and consequent closure of the upper pelvis narrow and increase in the lower narrow pelvis represented by the smaller dashed rim between the ischia.

In this way, we present the six capsule ligament manipulation postures. Manipulation of the Upper Ligaments - M-LS **(Figure 4)**, Manipulation of the Lower Ligaments - M-LI **(Figure 5)**, Manipulation of the Femoral Capsule - M-CF **(Figure 6)**, manipulation of the Active-assisted Sacroiliac Ligaments - M-LSA **(Figure 7)**, Manipulation of the iliolumbar ligament - M-LI **(Figure 8)**, Manipulation of the posterior femoral capsule - M-CFP **(Figure 9)**. The postures were developed based on biomechanical bases and physiology of the joint tissues in order to relieve pain and restore function.

Figure 7: Manipulation of the Upper Ligaments - anterior and posterior sacroiliac, iliotuberal and iliolumbar ligaments.

Figure 8: Manipulation of the Lower Ligaments - sacrotuberal and sacrospinal and sacroiliac capsule.

Figure 9: Manipulation of the femoral capsule - anterior femoral capsule.

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Figure 10: Manipulation of Active-Assisted Sacroiliac Ligaments - sacro-spinal and sacrotuberal and sacriliac capsule.

Figure 11: Iliolumbar - Ilolumbar Ligament Manipulation.

Figure 12: Posterior Femoral Capsule Manipulation.

Conclusion

The capsule ligament manipulation technique proposes reducing tension in capsules and joint ligaments in promoting pain relief and periarticular discomfort and improving functionality. They are applied in the sacroiliac, lumbar-pelvic, coxofemoral regions. With results in reducing pain, joint discomfort, and functionality and can be a technique combined with other therapies known to combat low and sacroiliac pain.

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