International Journal For Advanced Research In Science & Technology
A peer reviewed international journal www.ijarst.in
IJARST
ISSN: 2457-0362

DISUSE ATROPHY AND SACROILIAC JOINT BIOMECHANICS IN HIP OSTEOARTHRITIS

VIJAY SHANKAR YADAV
Research Scholar, OPJS University, Churu, Rajasthan
DR P.N PENSIA
Research Supervisor, OPJS University, Churu, Rajasthan

ABSTRACT

Connecting the vertebral column to the pelvis, the sacroiliac (SI) joint allows for 3 to 8 degrees of nutation. In the clinic, sacroiliac joint dysfunction may manifest as either low back pain (LBP) or sciatica-like symptoms. The position and volume of vacuum phenomena in the three-dimensionally recreated sacroiliac joints were evaluated, as was the degeneration score of the sacroiliac joints in axial view. The sums Joint space narrowing and vacuum phenomena in the sacroiliac joint increase in hip osteoarthritis, but osteophytes decrease. Overall, sacroiliac joint degradation scores were comparable in patients with hip osteoarthritis and controls. What Causes SI Joint Pain? Anatomy, Muscles, and Sexual Dimorphism The volume of vacuum phenomena in the sacroiliac joint was found to be considerably greater in the hip osteoarthritis group, and the vacuum regions were found to be concentrated in the antero-superior region of the sacroiliac joint, as demonstrated by three-dimensional reconstruction. hip osteoarthritis and sacroiliac joint degradation are linked, and the sacroiliac joint might be a novel therapeutic target in the condition if further research is conducted.

Keywords: sacroiliac joint, biomechanics, sexual dimorphism, causes of pain, hip osteoarthritis, vacuum phenomenon, degeneration

INTRODUCTION

One of the most common and debilitating illnesses affecting the elderly is osteoarthritis (OA) of the hip. Among those who make it to 85 years old, the chance of developing hip OA is 25% and the likelihood of needing a complete hip replacement due to advanced OA is over 10% The larger frequency of knee OA and the greater simplicity with which the knee joint may be scanned and accessible for therapeutic therapies may explain why hip OA research has lagged behind knee OA research. Hip and knee OA are often lumped together in clinical guidelines with some guidelines even extrapolating findings from knee OA studies to inform recommendations for the treatment of hip OA. Despite the fact that there is increasing understanding that OA is not a single illness affecting the joints but rather a collection of discrete disorders, each with unique etiological elements and viable therapies, which share a similar end route, OA is still widely misunderstood. The particular etiopathogenesis of hip OA will be discussed, along with its implications for future treatment methods. In order to enhance care, it may be necessary to change the emphasis from palliation of advanced illness to the early phases of the condition's development.

The sacroiliac (SI) joint connects the spine and the pelvis and allows for 3 to 8 degrees of nutation Diseases of the SI joints may cause low back pain (LBP) or

IJARST
International Journal For Advanced Research In Science & Technology
A peer reviewed international journal
ISSN: 2457-0362
www.ijarst.in

symptoms similar to sciatica in fact, research indicates that the SI joint is the root cause of LBP in 10%-30% of patients The use of intraarticular injection, nerve branch blocks, ablation, and surgical fusion for SI joint pain has led to an uptick in reports that SI joint disease may induce disabling LBP.

Clarification of SI joint disease is now more possible than ever before, thanks to the proliferation of several imaging modalities. Joint space narrowing, osteophytes, subchondral sclerosis, cysts, and vacuum phenomena are typical findings in pelvic CT for SI joint degeneration, which occurs in 65.1% of people and increases with age We hypothesized that vacuum phenomena in the SI joint may play a significant role in SI joint degeneration, but more research is needed.

Degeneration of the SI joint has been linked to issues in other nearby joints and bones, including the hip and the spine. Spinal fusion and hip arthrodesis have both been linked to an increase in SI joint degeneration although the underlying cause is unclear. The purpose of this research was to examine the sacroiliac (SI) joints of patients with hip OA, concentrating on the location and number of vacuum phenomena, to learn more about the connection between hip OA and SI joint degeneration.

LITERATURE OF REVIEW

Saviola Ribeiro et al (2019) One of the leading causes of disability and occupational absence is low back pain. A typical malfunction that may cause low back pain is anterior innominate dysfunction, in which the joint adjusts to an aberrant posture and locks itself in an anterior pelvic tilt, causing discomfort in the low back, buttocks, or even the legs. Mulligan mobilization has been shown to be beneficial in enhancing range of motion and decreasing discomfort, and it also aids in the rehabilitation of pain-free joint mobility. Instead, manipulation has been shown to be useful in reducing the activity of pain receptors, leading to muscular relaxation and an expansion of range of motion. The present research sought to determine the efficacy of both procedures on anterior innominate dysfunction due to a paucity of data comparing their relative effects.

Yuyeon Roh et al (2021) We looked at how people with anterior knee discomfort responded to 10 training sessions (with or without receiving modalities) followed by 4 weeks of detraining (AKP). Thirty people (19 men and 11 females, with an average pain duration of 46 months) were diagnosed with AKP and randomly allocated to either a rehabilitation program or a waitlist (with or without pre-exercise modality). Pre- and post-rehabilitation and detraining data on quadriceps (strength, activation, power, and endurance) and self-reported functions (pain perception and functional outcomes) were collected (4-weeks). No significant change in quadriceps strength or self-reported function was seen after electro-cryotherapy treatment (condition time: $F_{2,56}$ 2.27, $p > 0.11$ for all tests). Strength (12%), power (20%), and endurance (13%), as well as self-reported measures (pain perception during daily activities (-70%, p 0.0001), minimum (44%, $p = 0.04$), maximum (43%, p 0.0001), and functional outcome scores (13%, $p = 0.0003$), improved significantly over time regardless of the modality applied (time effect). The effects of rehabilitation were seen after just 10 sessions.

Eric Chun Pu Chu et al (2022) The primary function of the sacroiliac (SI) joint is stability with minor movements. SIJ dysfunction occurs when the SIJs don't move as they should. Evaluation and diagnosis of SIJ dysfunction may be challenging, including physical procedures and image-guided anesthetic administration. In this case study, we follow a 47-year-old woman as she deals with a severe limp and right buttock discomfort for around 2 months. Inflammatory sclerosis was seen around the right SIJ on standing ra-diographs. Tenderness was felt over the right SIJ, and the provocation tests (distraction, compression, and thigh thrust) were all positive, all of which are consistent with right SIJ dysfunction. After a 6-month regimen of combined thoracolumbar manipulation and rehabilitation activities, her discomfort was gone and her gait performance was restored. Surprisingly, the subsequent radiograph revealed a shift in the pelvic incidence (PI) angles. As the SIJs are not thought to be very mobile, PI is thought to be rather stable throughout adulthood. This talk is meant to go into the relevance of PI shift. Due to the PI discrepancy, it may be possible to identify SIJ dysfunction from successive radiographs.

Ojeniweh Ogechukwu (2022) Indeterminate fractures, ligamentous injuries, and myofascial trigger points may contribute to pain referred from the sacroiliac joint, which may be the consequence of dysfunction. The exact reason is unknown, however inflammation, unidirectional pelvic shear stress, and repeated torsional stresses are all possible contributors. Although no systematic reviews exist on the efficacy of combined physiotherapy interventions for the SIJD, physiotherapy (PT) interventions used in the management of SIJ include repetitive exercises, manual joint mobilization, manipulation, bracing, massage, patient education, aerobic conditioning, exercise therapy, and electrotherapeutic modalities. In this case study, we examine the efficacy of a multimodal physiotherapy strategy for the conservative treatment of sacroiliac dysfunction. The patient was referred from a regional hospital after 15 months of being diagnosed with low back pain, difficulty in standing discomfort with sitting over time, being intermittent in nature, and only being momentarily eased by pain medicines.

ANATOMY

Load transmission between the lumbar spine and the lower extremities is facilitated by the SIJ, the biggest axial joint in the body, which links the spine to the pelvis. There is a junction between the sacrum and the ilium that is kept together by a fibrous capsule and measures around 1 to 2 mm in width Hyaline cartilage covers the sacral side of the joint, and it's thicker (1.18 mm) than the iliac side (0.8 mm), which looks more fibro-cartilaginous. Cortical bone thickness varies between the pelvis and the sacrum, with the iliac cortical bone being greater (0.36 mm vs. 0.23 mm). Hence, there is an inverse connection between cartilage thickness and cortical bone thickness. For example, Dall et al. found no correlation between age and cortical bone thickness. While comparing the front, central, and posterior aspects of the joint, the iliac cancellous bone density was found to be higher than the sacral bone density.

LIGAMENTS

Numerous ligaments, some of which are shown in Figure 1, stabilize and restrict motion at the SIJ The Sacro tuberous (4), sacrospinous (3), iliolumbar (2), and interosseous sacroiliac (8) ligaments are all part of the lumbar spine's supporting structure (1 and 2). The S1 and S2 levels of the sacrum are connected to the ilium by the interosseous ligament (8), also called the axial ligament. Several bundles make up the lengthy, very powerful posterior sacroiliac ligament (5).

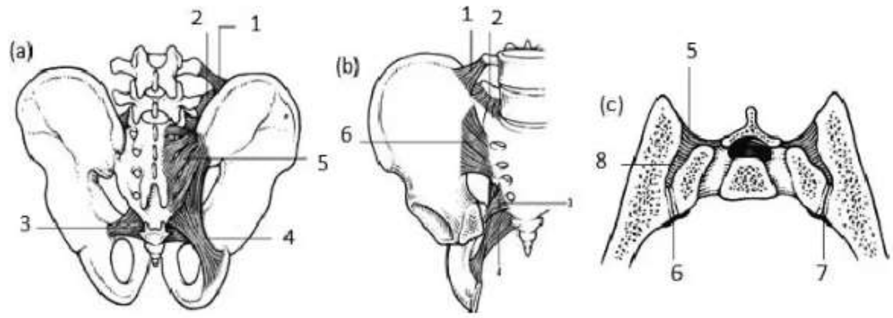


Figure 1. (a) Posterior view, (b) anterior view and (c) sacroiliac joint cut in transverse plane. 1, 2: superior and inferior iliolumbar ligaments, respectively; 3: sacrospinous ligament; 4: Sacro tuberous ligament; 5: posterior sacroiliac ligaments; 6: anterior sacroiliac ligaments; 7: sacroiliac joint; 8: interosseous ligament

Table 1. Sacroiliac joint (SIJ) ligaments, locations, and functions

Ligament	Location	Primary Restraint
Posterior ligaments (5)	Posterior superior iliac spine to sacral tubercles	Sacral extension
Long ligament		
Short ligament		
Sacrotuberous (4)	Posterior superior iliac spine and sacrum to ischial tuberosity	Sacral flexion
Sacrospinous (3)	Apex of the sacrum to ischial spine	Sacral flexion
Anterior ligament (6)	Crosses ventral and caudal aspect of SIJ	Sacral flexion, axial rotation
Interosseous (8)	Between sacrum and ilium dorsal to SIJ	Sacral flexion, axial rotation
Iliolumbar (1 and 2)	Transverse process of L5 to the iliac tuberosity and crest	Lateral side bending
Ventral band		Ventral band
Dorsal band		Forward flexion
Sacroiliac part		Dorsal band

lateral sacral crest, posterior superior iliac spine, and posterior iliac crest. Thin is the anterior sacroiliac ligament. This ligament is obliquely attached to the ilium from the sacrum and is much weaker than the posterior ligament. As seen from the front, the Sacro tuberous ligament connects the sacrum to the ischial tuberosity in the posterior, lower portion of the pelvis. The sacrospinous ligament attaches to the ischia of the ilium on the posterior aspect of the sacrum and coccyx, just behind the Sacro tuberous ligament. From the posterior aspect of the fifth lumbar vertebral body to the iliac crest is where the iliolumbar ligament begins their journey. Reductions in lumbar lordosis, as seen in pregnancy, may cause the long posterior sacroiliac ligament to lengthen. The ligaments, sites, and purposes of the sacroiliac joint are summarized in Table 1.

MUSCLES

Although though no muscles are specifically geared toward acting on the SIJ to create active motions, the joint is surrounded by some of the biggest and strongest muscles in the body. The erector spinae, psoas major and minor, quadratus lumborum, piriformis, obliques, gluteus maximus, hamstrings, and pelvic floor are all examples of such muscles The hip and the lumbar spine are affected by the crossing muscles rather than the SIJ itself. Instead of being directly caused by sacral motion, SIJ

International Journal For Advanced Research
In Science & Technology
A peer reviewed international journal
ISSN: 2457-0362
www.ijarst.in
IJARST

motion is generated by gravity and muscles working on the trunk and lower extremities. Joint stability is achieved, however, by the pelvic floor muscles Sacroiliac joint (SIJ) muscles, their functions, and their impact are summarized in Table 2.

Table 2. Sacroiliac joint (SIJ) muscles, actions, and effect on SIJ.

Muscle	Primary Action	Effect on SIJ
Erector spinae	Bilateral: back extension Unilateral: side bending	Hydraulic amplifier effect
Iliocostalis lumborum Longissimus thoracis		
Multifidus	Back extension, side bending, rotation	Imparts sacral flexion, force closure of SIJ with deep abdominals
Gluteus maximus	Hip extension, hip lateral rotation	Stabilizes SIJ
Piriformis	Hip lateral rotation	May alter SIJ motion via direct attachment to the ventral aspect of the sacrum
Biceps femoris	Hip extension, knee flexion	Long head: Imparts sacral extension via attachment to the sacrotuberous ligament
Deep abdominals Transversus abdominis	Compression of abdominal cavity	Forces closure of SIJ
Iliacus	Hip flexion (open chain) and tilts pelvis/ sacrum ventrally (closed chain)	Synchronous tilting of the pelvis and sacrum ventrally (closed chain)
Pelvic floor	Support pelvic viscera	Imparts sacral extension

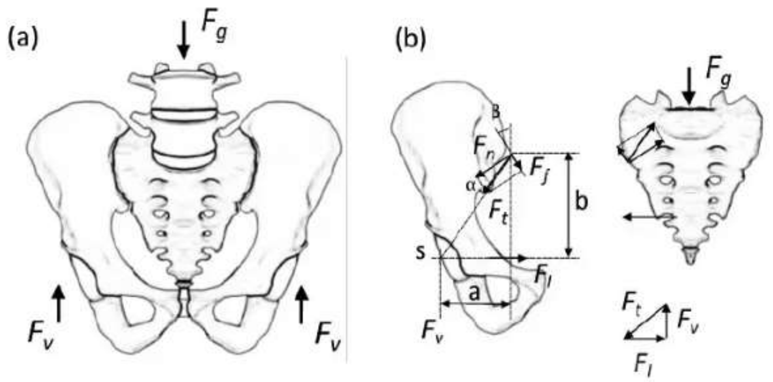


Figure 2. Pelvis free-body diagram due to gravity. Trunk weight (Fg) and hip joint forces (Fv). (b) Free-body diagram of the self-bracing effect of the sacroiliac joint. Sacroiliac joint reaction force: normal (Fn) and tangential (Ff), ligament or muscle force (Fl), and hip joint force (Fv)

SEXUAL DIMORPHISM

Males have a somewhat bigger pelvis than females do, although this difference narrows as they become older. Whereas the articular facet of the sacral base for the fifth lumbar vertebra takes up more than a third of the width of the sacrum in males, it takes up less than a third of the width of the sacrum in women. The female sacrum is broader, less curved, and more angled posteriorly than the male sacrum. As compared to women, males typically have a longer and narrower pelvis with a more conical pelvic cavity Both the sciatic notch and the acetabulum in females are more widely spaced than in males. The para-glenoidal sulcus is a groove in the iliac bone that develops in women in their second decade of life but seldom in males. Misalignment of the sacroiliac joint (SIJ) is more common in young women because of sex-related variations in SIJ development.

There is a little difference between male and female sacral cartilage thicknesses What's more, a woman's iliac cortical bone is more robust than a man's. Ebraheim and

Biyani found that mature males had a larger SIJ surface area than females, which enables them to bear bigger stresses. Whereas women's auricular surfaces are often reported to be between 10.7 and 14.2 cm, with a maximum limit of 18 cm, men's ligamentous areas are around 22.3 cm. Men have almost double the lumbar isometric strength of women, which might explain why they can bear heavier loads without injury.

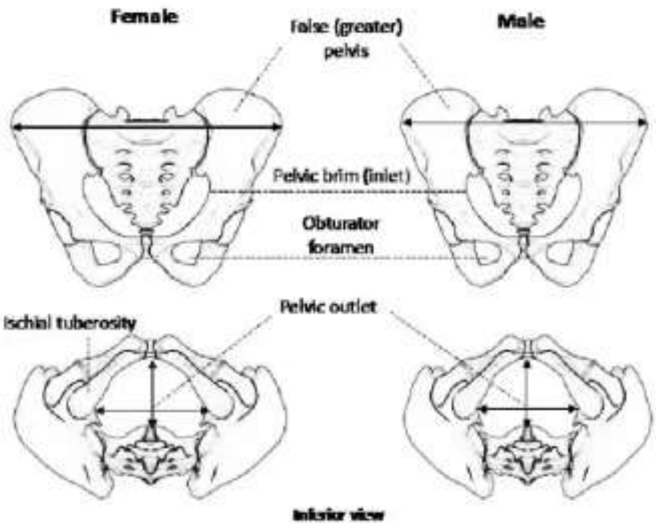


Figure 3. Comparison of the female and male pelvis: (top) brim (inlet) and (bottom) pelvic outlet.

CAUSES OF SIJ PAIN

Table 3. Causes of intra-articular and extra-articular SIJ pain.

Intra-articular Pain
Arthritis
Spondyloarthropathy
Malignancies
Trauma
Infection
Extra-articular Pain
Ligamentous injury
Bone fractures
Malignancies
Myofascial pain
Enthesopathy
Trauma
Pregnancy

surgical procedures may potentially contribute to SIJ discomfort and dysfunction. Several studies have shown that a patient's angular motion and stress levels at the SIJ are directly affected by their history of lumbar fusion, and that these changes are closely associated with the number of fused lumbar levels.

It is widely established that neighboring segment disease/disorder develops after surgical arthrodesis at one level. Another possible cause of SIJ discomfort is limb length inequality (LLD). Several publications have noted the link between LLD, LBP,

International Journal For Advanced Research In Science & Technology
A peer reviewed international journal
www.ijarst.in
ISSN: 2457-0362

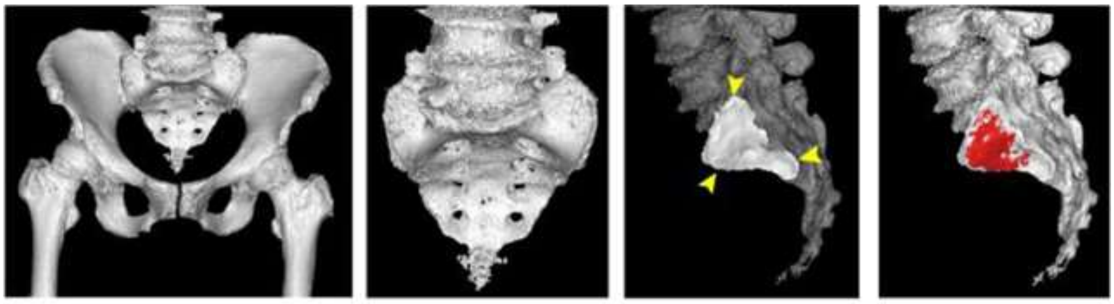
and SIJ dysfunction. When there is a mismatch in length, the mechanical alignment of the SIJs shifts out of whack, leading to a load that is split unequally between the two joints.

measured the effects of LLDs of 1, 2, and 3 cm on load distribution across the SIJ. As compared to the intact or normal model, the peak loads and stresses experienced by both legs were greater, with the longer-leg side continuously experiencing larger values. Stresses at the SIJ also rose from 1 to 3 centimeters as the length differences grew. Many reasons contribute to the slow but steady development of SIJ pain, including but not limited to traumas, past lumbar fusion, and degenerative disc disease (DDD). Infection of the joints, spondyloarthropathies including ankylosing spondylitis, inflammatory bowel disease, gastroesophageal abnormalities, scoliosis, and overtraining are all potential causes of joint pain. Consistently, pain is linked to SIJ dysfunction, regardless of the underlying reason. Causes of both intra- and extra-articular SIJ discomfort are summarized in Table 3.

METHODS

THREE-DIMENSIONAL RECONSTRUCTION OF SI JOINT

The pelvic bones and vacuum phenomena were reconstructed in 3D using a 3D reconstruction software program Sacroiliac joint surface of the sacrum was overlaid with a 3D reconstruction of the gaseous region inside the SI joints, characterized by voxels of smaller than -300 Hounsfield units as reported was used to determine the volume of vacuum phenomenon by counting the number of voxels inside the region of vacuum.



(a) (b) (c) (d)

The Mann-Whitney U test was used to examine the difference in vacuum phenomenon volume between those with hip OA and those without. We used the Pearson correlation coefficient to study the association between the SI joint degeneration score and the vacuum volume.

Statistical Analysis

International Journal For Advanced Research In Science & Technology
A peer reviewed international journal www.ijarst.in
ISSN: 2457-0362
IJARST

The Mann-Whitney U-test was used to analyze the statistical significance of the differences between the two groups. Pearson's correlation coefficient and Spearman's rank-order correlation were used to examine the relationship between the two variables. SPSS version 23 was used to analyze the data, and a significance level of p 0.05 was determined.

RESULTS

Patient characteristics

Mean ages for those with hip OA were 69.1 (SD = 7.6) and 67.9 (SD = 8.2) for those in the control group (Mann-Whitney U test, p = 0.688). Fifteen of the 62 hip joints (31 hip OA patients) had no OA, seven had mild OA, fourteen had moderate OA, twenty-three had severe OA, and four had severe OA. Among the 31 people with hip OA, every single one of them had at least one joint in the third or fourth grade.

SI joint degeneration score

There was no significant difference between hip OA patients and controls on the overall SI joint degeneration score (p = 0.123). Compared to those without hip pathology, people with hip OA had a considerably greater score for vacuum phenomena and joint space narrowing, and a significantly lower score for osteophytes in the SI joint When comparing hip OA and controls, there was no significant difference in the SI joint degeneration scores at ages 50–59, 60–69, or 70–plus

Table 4: Comparison of SI joint degeneration scores andtheir breakdown in hip OA patients and controls.

SI joint degeneration score (maximum score per patient)	hip OA		control		
	mean	s.d.	mean	s.d.	p
total (16)	12.3	1.9	11.4	2.3	0.123
joint space narrowing* (4)	3.8	0.5	2.8	0.9	<0.001
osteophytes* (4)	2.7	0.7	3.6	0.6	<0.001
subchondral sclerosis (4)	2.6	0.7	2.6	0.8	0.948
Cysts (2)	1.2	0.9	1.1	0.8	0.585
vacuum phenomena* (2)	2.0	0.0	1.3	0.9	<0.001

in the SI joint degeneration scores at ages 50–59, 60–69, or 70–plus (Table 4). * p < 0.05, Mann-Whitney U test; OA: osteoarthritis, s.d.: standard deviation.

joint than those with no hip pathology When comparing hip OA and controls, there was no significant difference

Quantification of vacuum phenomena in the SI joint Significantly more SI vacuum occurrences occurred in the hip OA group (median 273mm3, IQR 126-422) compared to the control group Both the hip OA group (R = 0.333, p = 0.00817; Pearson correlation) and the control group showed a modest relationship between SI joint degeneration score and volume of vacuum phenomenology.

IJARST
International Journal For Advanced Research In Science & Technology
A peer reviewed international journal
www.ijarst.in
ISSN: 2457-0362

Table 5: Comparison of SI joint degeneration scoresdivided by age group in hip OA patients and controls.

age group		hip OA			control		
	n	mean	s.d.	n	mean	s.d.	p
50–59	2	12.0	0.0	5	11.6	1.5	0.617
60–69	15	12.3	1.6	15	11.8	2.8	0.613
70+	14	12.2	2.3	14	10.9	2.1	0.126

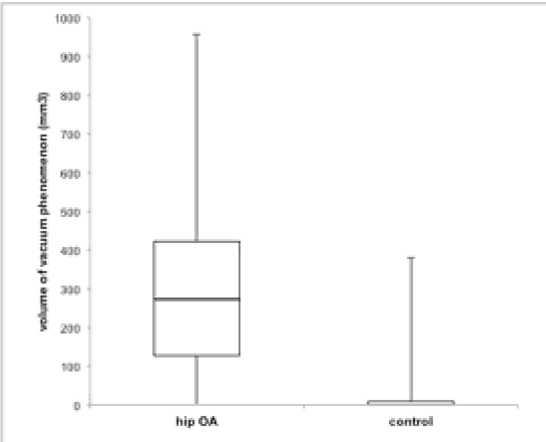


Figure 4: Volume of vacuum phenomena in SI joints ofhip OA patients and controls. (p < 0.001, Mann-Whitney U test).

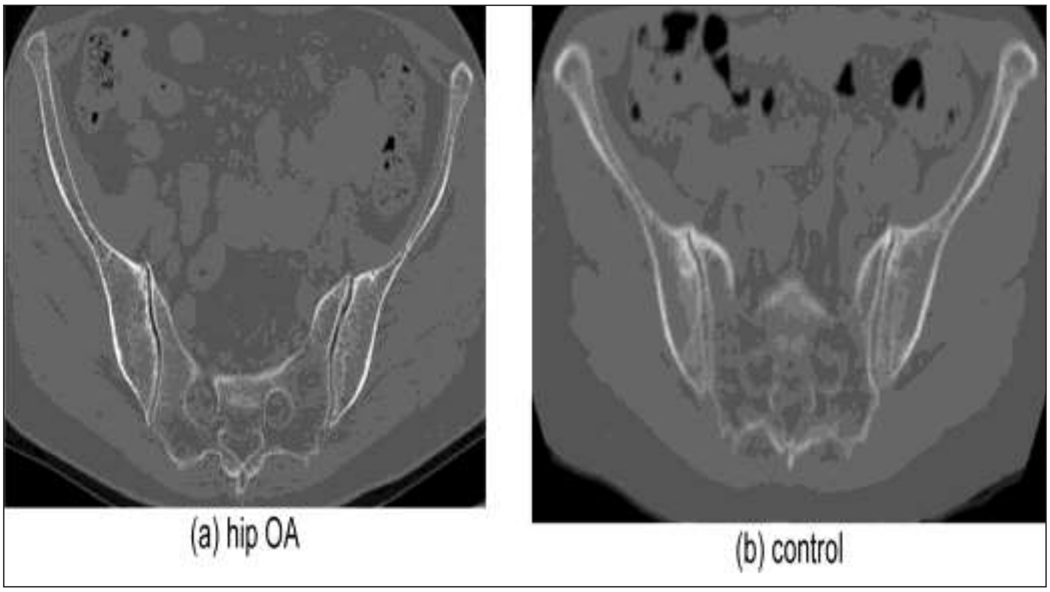


Figure 5: Representative axial views of SI joints exhibiting degenerative changes. (a) Vacuum phenomena and jointspace narrowing were more distinguishable in hip OA while (b) the control displayed more pronounced osteophytes

International Journal For Advanced Research
In Science & Technology
A peer reviewed international journal
IJARST
ISSN: 2457-0362
www.ijarst.in

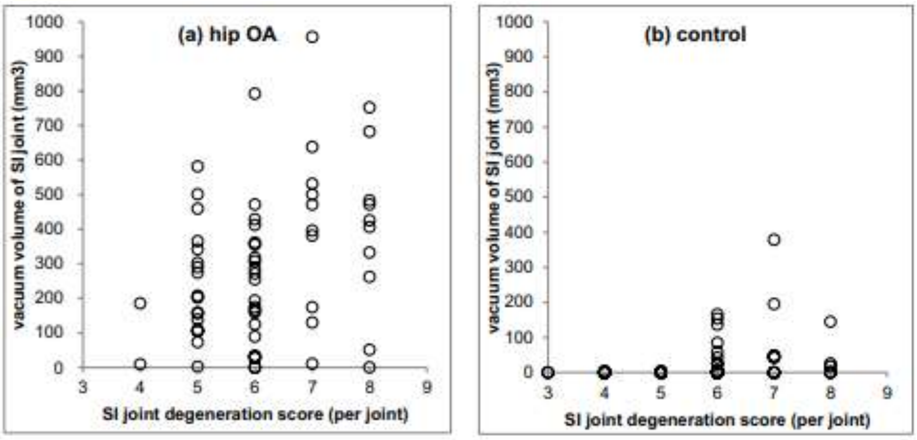


Figure 6: Relationship between degeneration score and vacuum volume of SI joints in (a) hip OA group and (b) control group.

Vacuum phenomena localized to the sacroiliac joint the bulk of the vacuum phenomena were found in the anterosuperior area of the SI joint, as shown by the 3D model.This research confirmed that hip OA is associated with an increase in joint space narrowing and vacuum phenomena in the SI joint and a reduction in osteophytes. Degeneration of the sacroiliac (SI) joint may occur as a result of increased biomechanical stress in hip OA due to factors such limited hip mobility. While SI joint degeneration has previously been reported, most of these studies have focused on CT's axial view, and neither the SI joints nor the vacuum phenomena that we describe here have ever before been shown in three dimensions. According to our findings, vacuum phenomena are concentrated in the head. Because of its synovial and more mobile nature compared to the posterior ligamentous section of the SI joint, this region may have had a role in the uneven distribution of vacuum phenomena. It has been demonstrated in the past that degradation of the SI joint is more common in the older population, but that the rate of change tends to level out after a certain point in life Patients under the age of 50 were excluded from our investigation, and as expected, there was no statistically significant difference in degeneration scores between the young and old.

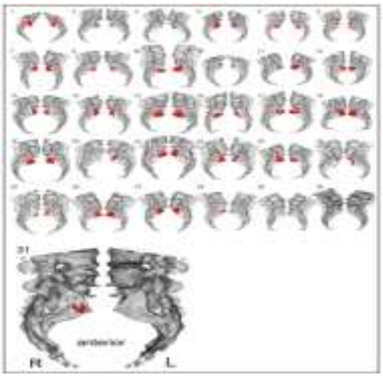


Figure 7: List of the 31 patients with hip OA; many SI joints show significant area of vacuum phenomena Note that the vacuum tends to be in the anterosuperior (synovial) part rather than the posterior, ligamentous part of the joints. Patient #31's enlarged view of bilateral 3-D reconstructed SI joint with overlaid vacuum phenomenon.

IJARST
International Journal For Advanced Research In Science & Technology
A peer reviewed international journal
www.ijarst.in
ISSN: 2457-0362

CONCLUSION

As the sacroiliac joint (SIJ) is so complicated, it is often disregarded as a possible cause of low back pain (LBP). Yet, the SIJ may really be involved in what are often thought of as radicular pain disorders. Vacuum phenomenon in the SI joint of women with hip OA was substantially more common and bigger in volume compared to age-matched controls, while the same was true of osteophytes. Hip OA may increase biomechanical stress on the SI joint because of decreased hip range of motion. Nevertheless, the clinical relevance of SI joint degeneration and vacuum phenomena in hip OA remains unclear, and further study is required to shed light on this theory.

REFERENCE:

1. Ribeiro s, heggannavar a, metgud s. Effect of mulligans mobilization versus manipulation, along with mulligans taping in anterior innominate dysfunction – a randomized clinical trial. Indian j phys ther res 2019; 1:17-23

2. Roh, yuyeon & park, jihong. (2021). Training and detraining effects of a rehabilitation program with or without electro-cryotherapy in patients with anterior knee pain: a randomized trial. Applied sciences. 11. 4812. 10.3390/app11114812.

3. Chu, eric & wong, arnold. (2022). Change in pelvic incidence associated with sacroiliac joint dysfunction: a case report. Journal of medical cases. 13. 31-35. 10.14740/jmc3816.

4. Ojeniweh ogechukwu (2022) effectiveness of combined physiotherapy interventions as a conservativetreatment for sacroiliac joint dysfunction pain: a case report. International academic journal of medical and clinical practice vol.7, no.2, 2022; issn (5353 – 5523); p – issn 8156 – 7532impact factor: 3.15

5. Toyohara, ryota & kurosawa, daisuke & hammer, niels & werner, michael & honda, keita & sekiguchi, yusuke & izumi, shin-ichi & murakami, eiichi & ozawa, hiroshi & ohashi, toshiro. (2020). Finite element analysis of load transition on sacroiliac joint during bipedal walking. Scientific reports. 10. 10.1038/s41598-020-70676-w.

6. Prather h, bonnette m, hunt d. Nonoperative treatment options for patients with sacroiliac joint pain treatment of sacroiliac joint. 2020; 14:35–40. Available from: https://pubmed.ncbi.nlm.nih.gov/32123656/

7. Beatriz minghelli, musculoskeletal spine pain in adolescents: epidemiology of non-specific neck and low back pain and risk factors, journal of orthopaedic science, volume 25, issue 5, 2020, pages 776-780, issn 0949- 2658, https://doi.org/10.1016/j.jos.2019.10.008

8. Page mj, moher d, bossuyt pm, boutron i, hoffmann tc, mulrow cd, etal. Prisma 2020 explanation and elaboration: updated guidance and exemplars for reporting systematic reviews. Bmj. 2021;372: n160

IJARST
International Journal For Advanced Research
In Science & Technology
A peer reviewed international journal
ISSN: 2457-0362
www.ijarst.in

9. Page mj, moher d, bossuyt pm, boutron i, hoffmann tc, mulrow cd, etal. Prisma 2020 explanation and elaboration: updated guidance and exemplars for reporting systematic reviews. Bmj. 2021;372: n160

10. Santos c, donoso r, ganga m, eugenin o, lira f, santelices jp. Dolor lumbar: revisión y evidencia de tratamiento. Rev méd clín condes. 2020;31(5/6):387-95.

11. Maxwell, cm, lauchlan, dt & dall, pm 2020, ' the effects of spinal manipulative therapy on lower limb neurodynamic test outcomes in adults: a systematic review', journal of manual and manipulative therapy, vol. 28, no. 1, pp. 4-14. Https://doi.org/10.1080/10669817.2019.1569300

12. De oliveira rf, costa lop, nascimento lp, rissato ll. Directed vertebral manipulation is not better than generic vertebral manipulation in patients with chronic low back pain: a randomised trial. J physiother. 2020;66(3):174-9.

13. Fosberg kk, puentedura e, schmitz b, jain tk, cleland ja. The effects of thrust joint manipulation on the resting and contraction thickness of transversus abdominis in patients with low back pain: a randomized control trial. J manipulative physiol ther. 2020;43(4):339-55.

14. Mehyar f, santos m, wilson se, staggs vs, sharma nk. Effect of grade iii lumbar mobilization on back muscles in chronic low back pain: a randomized controlled trial. J allied health. 2020;49(1):20-8.

15. García-peñalver, u.j.; palop-montoro, m.v.; manzano-sánchez, d. Effectiveness of the muscle energy technique versus osteopathic manipulation in the treatment of sacroiliac joint dysfunction in athletes. Int. J. Environ. Res. Public health 2020, 17, 4490.https://doi.org/10.3390/ijerph17124490