



Effect of Joint Mobilization Versus Soft Tissue Mobilization Along with Conventional Exercise on Pain, Quality of Life and Hip Range of Motion in Patients with Femoroacetabular Impingement Syndrome

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ABSTRACT:

Background: Femoroacetabular impingement syndrome (FAIS) is a clinically important hip disorder that may contribute to the development of early hip osteoarthritis. It is frequently identified in physically active young and middle-aged adults, with symptomatic presentations commonly occurring in individuals between 20 and 40 years of age.

Methods: Twenty individuals diagnosed with femoroacetabular impingement syndrome who fulfilled the predetermined selection criteria were recruited for the study. The participants were randomly allocated into two equal groups. Group A received joint mobilization combined with conventional exercise, whereas Group B received soft tissue mobilization combined with conventional exercise. Pain intensity was assessed using the Numeric Pain Rating Scale (NPRS), hip-related functional status was evaluated using the Hip Outcome Score (HOS), and hip internal rotation range of motion was measured using a goniometer.

Result: Statistically significant improvements were observed in both groups for pain intensity, Hip Outcome Score, and hip internal rotation range of motion following the intervention. Between-group analysis also demonstrated a statistically significant difference in the post-intervention outcomes, with Group A showing greater improvement compared with Group B.

Conclusion: Both treatment approaches were associated with improvements in pain, hip-related functional outcomes, and hip internal rotation range of motion in individuals with FAIS. However, joint mobilization combined with conventional exercise demonstrated greater improvements compared with soft tissue mobilization combined with conventional exercise in the present study. These findings suggest that joint mobilization combined with conventional exercise may be a beneficial conservative physiotherapy approach for individuals with FAIS.

KEYWORDS: conventional exercise, femoroacetabular impingement syndrome, hip function, joint mobilization, pain, range of motion, soft tissue mobilization

INTRODUCTION

Femoroacetabular impingement syndrome (FAIS) is a clinically defined hip disorder characterized by symptoms related to the hip, clinical signs, and imaging findings indicating underlying morphological abnormalities. It commonly presents with hip or groin pain that may be aggravated by physical activity and movements involving hip flexion and rotation. Patients may also report symptoms such as stiffness, clicking, catching, or locking of the hip. The diagnosis of FAIS should therefore be based on the combination of appropriate symptoms, clinical findings, and imaging evidence rather than on hip morphology alone. [1]

Femoroacetabular morphology is commonly described as cam, pincer, or mixed morphology. Cam morphology is characterized by an abnormal bony prominence at the femoral head-neck junction, resulting in an aspherical femoral head-neck contour. Pincer morphology involves excessive acetabular coverage of the femoral head and may be associated with acetabular retroversion. Mixed morphology demonstrates features of both cam and pincer morphology and is frequently reported in clinical populations with FAIS. [2-4]



Manual therapy is frequently incorporated into conservative physiotherapy management for individuals with hip-related musculoskeletal disorders. Joint mobilization techniques, including traction and gliding techniques, may be used to address restrictions in hip joint mobility and improve movement. These techniques may also contribute to pain modulation through mechanical and neurophysiological mechanisms. [5,6]

Soft tissue mobilization is another treatment approach that may be used to address soft tissue restrictions around the hip. Techniques directed toward the muscles and connective tissues surrounding the hip may help reduce perceived muscular tightness and improve soft tissue mobility. [7,8]

Exercise-based rehabilitation is considered an important component of conservative management for FAIS. Therapeutic exercise programmes commonly include strengthening of the hip and trunk musculature, movement control exercises, and flexibility exercises, with the overall aim of improving physical function and reducing symptoms. [9,10]

Pain intensity can be assessed using the Numeric Pain Rating Scale (NPRS), a commonly used 0-to-10 scale for quantifying pain severity. The Hip Outcome Score (HOS) is a patient-reported outcome measure designed to assess hip-related functional limitations, including activities of daily living and sports-related activities. [11,12] Hip internal rotation range of motion is also clinically relevant in patients with FAIS, as restriction of hip motion, particularly internal rotation and flexion, may be associated with symptomatic hip pathology. [1,13]

Although conservative physiotherapy management commonly incorporates exercise and manual therapy, evidence directly comparing joint mobilization with soft tissue mobilization, when both are combined with a conventional exercise programme, remains limited. Therefore, the present study was designed to compare the effects of joint mobilization and soft tissue mobilization, when combined with conventional exercise, on pain, hip internal rotation range of motion, and hip-related functional outcomes in individuals with FAIS.

OBJECTIVE OF THE STUDY

The aim of this study was to compare the effects of joint mobilization and soft tissue mobilization, both combined with conventional exercise, on pain, hip-related functional status, and hip internal rotation range of motion in individuals with femoroacetabular impingement syndrome.

MATERIALS Study Design

Pre-test and post-test experimental study.

Study Setting

The study was carried out at the Outpatient Department of KG College of Physiotherapy, Coimbatore.

Study Duration

The total duration of the study was six months. Each participant received treatment sessions lasting 45 to 60 minutes, conducted three times per week for a period of four weeks.

Sample Size

A total of 20 participants who satisfied the eligibility criteria were recruited using a convenience sampling technique. The participants were equally divided into two groups, with 10 subjects in each group.

Selection Criteria

Inclusion Criteria

- Individuals diagnosed with femoroacetabular impingement syndrome (FAIS) based on established clinical assessment criteria [14].
- Participants aged between 20 and 40 years.
- Individuals experiencing hip-related symptoms for a minimum duration of 6 months.
- Participants demonstrating a positive FADIR (Flexion, Adduction, and Internal Rotation) test during clinical assessment [15].
- Participants reporting clinically relevant hip pain, with a Numeric Pain Rating Scale (NPRS) score of $\geq 5/10$. [16]



- Participants demonstrating clinically relevant functional limitations associated with the affected hip, as assessed using the Hip Outcome Score (HOS) [17].
- Participants who were able to understand the instructions provided by the researcher and safely perform the required assessment and intervention procedures.
- Individuals who were willing to participate in the study and provided written informed consent before the commencement of the intervention.

Exclusion Criteria

- Participants were excluded from the study if they fulfilled any of the following criteria:
- Previous surgical intervention involving the affected hip.
- Previous fracture or dislocation of the hip or pelvis.
- Presence of active infection involving the hip or pelvic region.
- Individuals presenting with osteonecrosis affecting the femoral head were not eligible for participation.
- History of significant traumatic injury to the hip that could influence the study outcomes.
- Presence of inflammatory arthropathy or other systemic conditions affecting the hip joint.
- Presence of neurological conditions affecting lower-limb or hip function.
- History of developmental hip disorders, including Legg-Calvé-Perthes disease or slipped capital femoral epiphysis.
- Individuals whose symptoms were suspected to originate from the lumbar spine with referral to the hip region were not included in the study.
- Participants who had received recent physiotherapy or manual therapy for the affected hip that could influence the study outcome measures.
- Individuals who were unable to safely perform the prescribed exercises or receive the planned manual therapy intervention.
- Participants who were unwilling to comply with the treatment schedule or unable to complete the required assessment procedures.

Procedure

The study was conducted among individuals diagnosed with femoroacetabular impingement syndrome who fulfilled the predetermined eligibility criteria. Participants who met the selection requirements were informed about the purpose and nature of the study. The treatment procedures, possible benefits, and general requirements for participation were explained to each participant. Written informed consent was obtained before beginning the study.

A total of 20 eligible participants were recruited for the investigation and equally allocated into two groups, with 10 participants in each group.

Group A (n = 10): Participants received hip joint mobilization combined with a conventional exercise programme.

Group B (n = 10): Participants received soft tissue mobilization combined with the same conventional exercise programme.

Before initiating the intervention, baseline measurements were obtained from all participants. Pain intensity was assessed using the Numeric Pain Rating Scale (NPRS), hip-related functional status was evaluated using the Hip Outcome Score (HOS), and hip internal rotation range of motion was measured using a standard goniometric procedure. [16–18]

Following the initial assessment, participants in Group A underwent manual therapy consisting of hip joint mobilization techniques. The mobilization techniques included appropriate anterior, posterior, and lateral gliding movements of the hip joint, selected according to the participant's clinical presentation and treatment requirements. These techniques were administered using established manual therapy principles and were combined with the conventional exercise programme.

Participants assigned to Group B received soft tissue mobilization directed towards the muscles and soft tissues commonly associated with hip movement and function. The treatment focused on the iliopsoas, piriformis, gluteus medius, gluteus maximus, and tensor fasciae latae regions. Soft tissue techniques were performed according to the participant's tolerance and clinical findings. The intervention was followed by the same conventional exercise programme provided to Group A.

The conventional exercise programme consisted of flexibility, strengthening, core stability, and functional exercises intended to improve hip mobility, muscular performance, pelvic control, and overall lower-limb function. The exercise programme included



stretching of the hip flexors, piriformis, hamstrings, gluteal muscles, and tensor fasciae latae / iliotibial band region, together with pelvic bridging, straight leg raises, clamshells, donkey kicks, dead bug exercises, bird-dog exercises, and planks.

All participants were instructed regarding the correct performance of each exercise, and the exercises were carried out under appropriate supervision. The intervention programme was provided according to the planned treatment schedule, with the same general exercise programme being used for both groups. Participants were monitored throughout the treatment period for exercise tolerance and any adverse responses.

At the completion of the intervention period, participants were reassessed using the same outcome measures applied during the baseline evaluation. The post-intervention findings were recorded and compared with the initial assessment results to determine the effects of the two treatment approaches on pain, hip-related functional status, and hip internal rotation range of motion in individuals with FAIS.

Outcome Measures

Numerical pain rating scale, Hip outcome score, Goniometer [16- 18]

RESULTS

The paired t-test analysis was performed to compare the pre-test and post-test scores of the Numerical Pain Rating Scale (NPRS), which was used to assess pain in patients with femoroacetabular impingement syndrome (FAIS). The calculated t-value was 21.00 for Group A and 8.57 for Group B, indicating a statistically significant difference between the pre-test and post-test NPRS scores within both groups.

An unpaired t-test was performed to compare the post-test NPRS scores between Group A and Group B. The analysis demonstrated a statistically significant difference between the two groups. Group A showed a greater improvement in pain scores compared with Group B, as reflected by the higher mean difference. The calculated t-value for the comparison between the posttest scores of the two groups was 8.4971.

The paired t-test analysis was performed to compare the pre-test and post-test Hip Outcome Score (HOS), which was used to assess hip-related functional status and quality of life in patients with FAIS. For Group A, the calculated t-value was 12.1546, while for Group B, the calculated t-value was 7.4745. Both groups demonstrated a statistically significant difference between their pre-test and post-test HOS scores.

An unpaired t-test was performed to compare the post-test HOS scores between Group A and Group B. A statistically significant difference was observed between the two groups. Group A demonstrated greater improvement in HOS compared with Group B, as indicated by the higher mean difference. The calculated t-value for the comparison of the post-test HOS scores between the two groups was 5.6849.

The paired t-test analysis was conducted to compare the pre-test and post-test measurements of hip internal rotation range of motion, assessed using a goniometer. Both groups demonstrated statistically significant improvements in hip internal rotation from pre-test to post-test assessment. The calculated t-value was 31.8812 for Group A and 26.0888 for Group B.

An unpaired t-test was subsequently performed to compare the post-test hip internal rotation range of motion between Group A and Group B. A statistically significant difference was observed between the two groups. Group A demonstrated greater improvement in hip internal rotation compared with Group B, as indicated by the higher mean difference. The calculated t-value for the comparison of the post-test measurements between the two groups was 18.3303.

FIGURES & TABLES

TABLES: NUMERICAL PAIN RATING SCALE UNPAIRED 't' TEST OF GROUP A AND GROUP B

S. N	NPRS	MEAN	MEAN IFFERENCE	S. D	't' VALUE
1.	GROUP A	3.40	1.90	0.52	8.4971
2.	GROUP B	5.30		0.48	

HIP OUTCOME SCORE

UNPAIRED 't' TEST OF GROUP A AND GROUP B

S. N	HOS	MEAN	MEAN DIFFERENCE	S. D	't' VALUE
1.	GROUP A	81.60	8.40	2.63	5.6349
2.	GROUP B	73.20		3.91	

GONIOMETER – HIP INTERNAL ROTATION

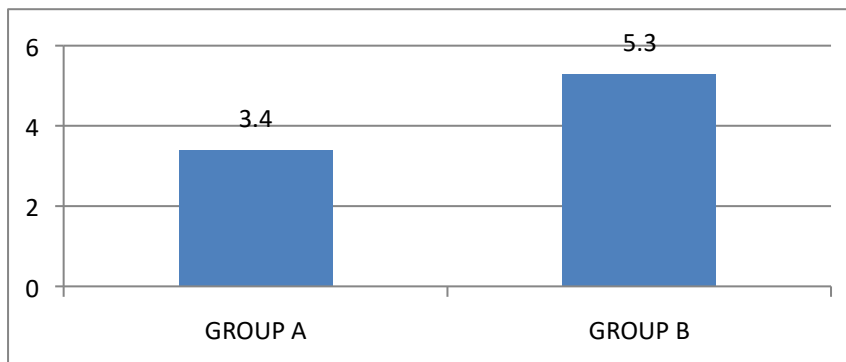
UNPAIRED 't' TEST OF GROUP A AND GROUP B

S. N	GONIOMETER	MEAN	MEAN DIFFERENCE	S. D	't' VALUE
1.	GROUP A	34.60	5.60	0.52	18.3303
2.	GROUP B	29.00		0.82	

GRAPHS

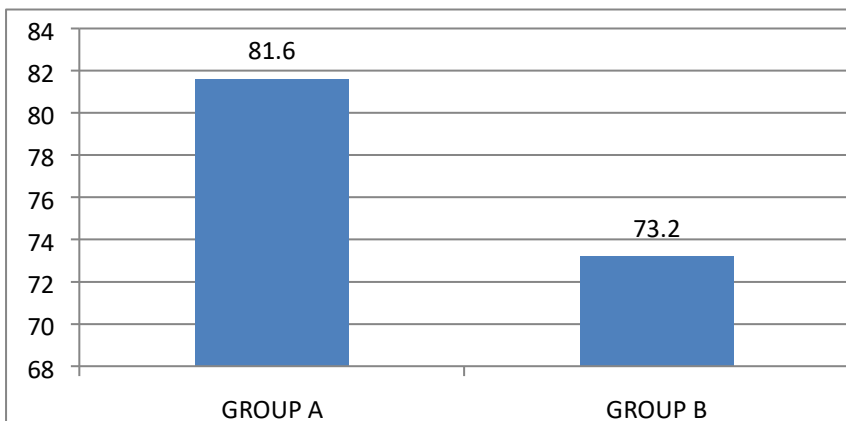
NUMERICAL PAIN RATING SCALE

UNPAIRED 't' TEST OF GROUP A AND GROUP B

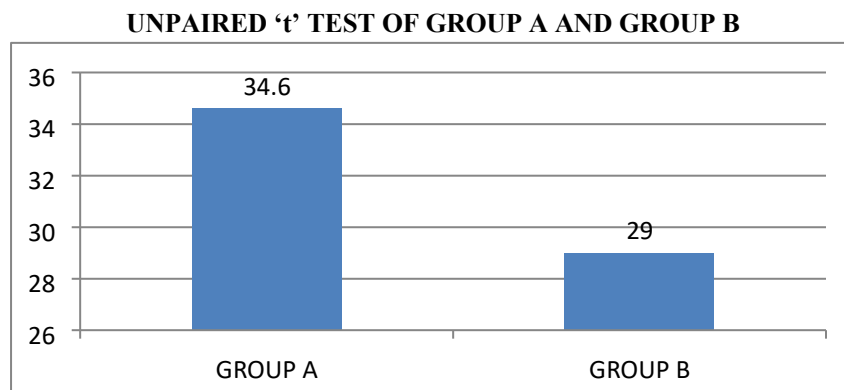


HIP OUTCOME SCORE

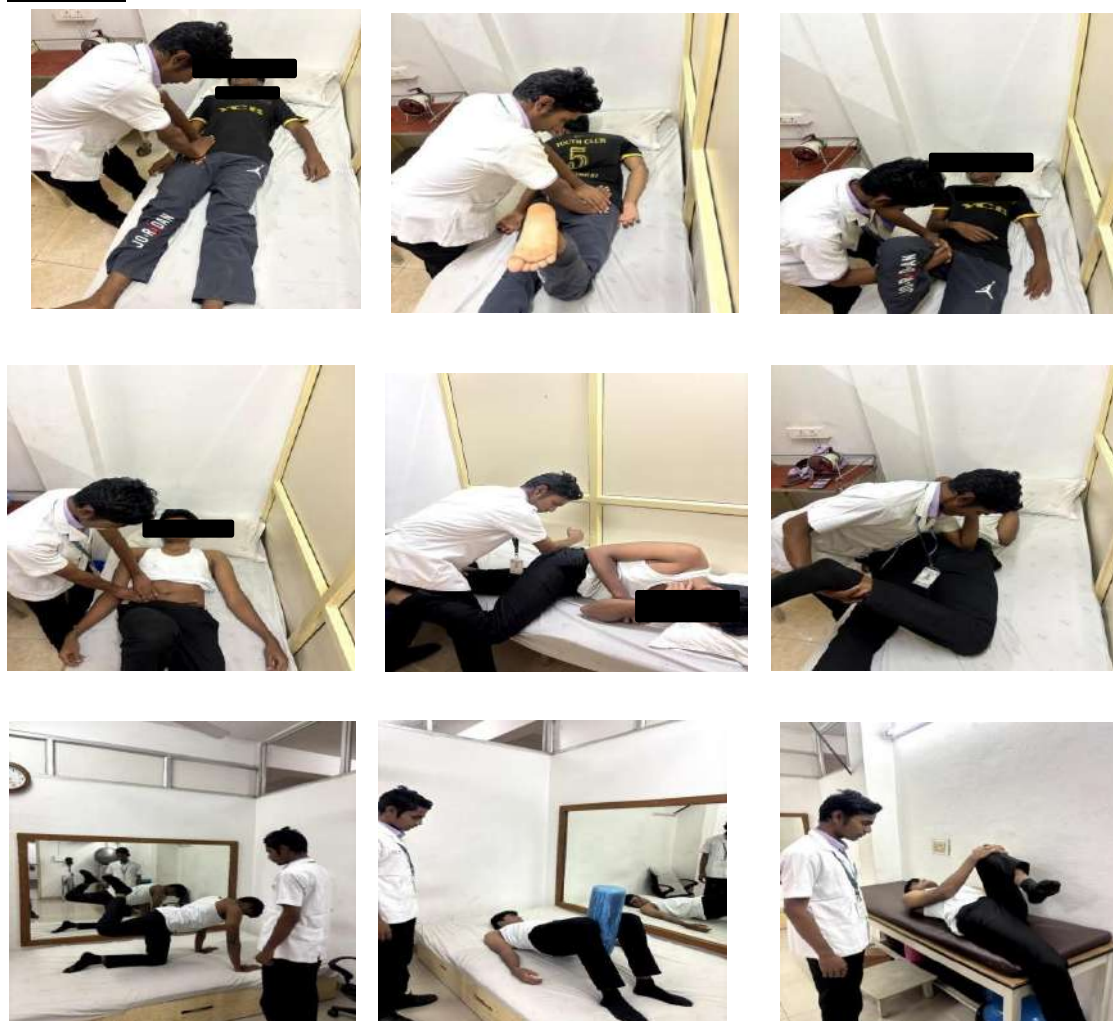
UNPAIRED 't' TEST OF GROUP A AND GROUP B



GONIOMETER – HIP INTERNAL ROTATION



FIGURES



DISCUSSION

The present study compared joint mobilization and soft tissue mobilization, both combined with conventional exercise, in individuals with femoroacetabular impingement syndrome (FAIS). Both groups demonstrated improvements in pain, hip-related



functional status, and hip internal rotation range of motion. The reduction in pain observed in both groups may be associated with the combined effects of manual therapy and therapeutic exercise. Manual therapy may contribute to pain modulation through mechanical and neurophysiological mechanisms, while therapeutic exercise may improve muscular performance and movement control. [19,20]

Greater improvement in hip internal rotation was observed in the joint mobilization group. This finding may be related to the effects of joint mobilization techniques, including hip distraction and gliding movements, which may improve accessory joint motion and reduce restrictions in hip mobility. [21,22] Although soft tissue mobilization may improve hip movement by addressing surrounding muscular tightness and soft tissue restrictions, its effect on joint-specific mobility may be less direct. [23]

Improvements in the Hip Outcome Score (HOS) observed in both groups may reflect the combined effects of reduced pain, improved hip mobility, and enhanced muscular performance following the conventional exercise programme. Exercise-based rehabilitation is considered an important component of conservative management for FAIS and may contribute to improvements in hip strength, functional capacity, and movement control. [24,25]

The greater improvements observed in the joint mobilization group suggest that incorporating joint mobilization with conventional exercise may provide additional benefits, particularly in individuals presenting with restricted hip mobility. However, both treatment approaches demonstrated positive changes in the present study, indicating that joint mobilization and soft tissue mobilization may be useful adjuncts to an exercise-based rehabilitation programme for individuals with FAIS.

The findings of the present study should be interpreted in consideration of the small sample size and relatively short intervention period. Further research involving larger sample sizes, longer follow-up periods, and standardized intervention protocols is required to establish the comparative effectiveness and long-term effects of joint mobilization and soft tissue mobilization in individuals with FAIS.

CONCLUSION

Based on the findings of the present study, both joint mobilization combined with conventional exercise and soft tissue mobilization combined with conventional exercise were effective in improving pain, hip-related functional outcomes, and hip internal rotation range of motion in individuals with femoroacetabular impingement syndrome.

However, joint mobilization combined with conventional exercise demonstrated greater improvements compared with soft tissue mobilization combined with conventional exercise in the present study. Therefore, joint mobilization may be considered as an effective component of conservative physiotherapy management for individuals with FAIS, particularly when pain and limitations in hip mobility are prominent.

Nevertheless, the findings should be interpreted in consideration of the small sample size of 20 participants and the relatively short intervention period. Further studies involving larger sample sizes, longer follow-up periods, and standardized intervention protocols are recommended to confirm the comparative effectiveness and long-term benefits of joint mobilization and soft tissue mobilization in the management of FAIS.

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