Posterior hip instability relocation testing: a resident's case report

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ABSTRACT

Background: Micro-instability (non-radiographic clinical instability) continues to gain recognition as a problem at the hip. Although most research has been directed to anterior hip instability, posterior hip instability (PHI) has also garnered attention. PHI is under recognized, difficult to identify, and confused with other hip pathologies such as a simple sprain or strain. A novel clinical test is introduced that may have helped identify PHI in this patient. Additionally, a conservative rehabilitation approach emphasizing stabilization exercises is described.

Case Description: A 29-year-old female presented with complaints of posterior lateral and anterior hip pain of 1.5 years duration. Upon initiating an aggressive stretching program, her pain worsened. Examination revealed limited and painful hip flexion, and positive anterior impingement testing for femoroacetabular impingement. Both tests were significantly less painful with more motion when retested with manual repositioning of the femoral head from posterior to anterior, referred to as posterior relocation testing. The patient was instructed to discontinue stretching. A stabilization plan was established including strengthening of the deep external rotators with trunk and lower quarter neuromuscular re-education.

Outcome: The patient completed 12 appointments over 2.5 months. At discharge, the patient reported improvements with pain and function. The Lower Extremity Functional Scale improved from 64/80 to 77/80 and Oswestry Disability Questionnaire improved from 8 to 0%.

Discussion: PHI may have contributed to this patient's symptoms. The posterior relocation test may assist clinicians with identification of PHI, thus directing treatment toward stabilization and neuromuscular control rather than interventions designed to increase mobility.

Level of Evidence: 4

KEYWORDS

Hip micro-instability;
posterior hip instability;
posterior hip relocation test

Background

Micro-instability (non-radiographic clinical instability) continues to gain recognition as a problem at the hip [1–12]. Although most research has been directed to anterior hip instability (AHI), posterior hip instability (PHI) has also been garnering attention [1–3,5,6,8,12–14]. PHI is under recognized, difficult to identify with physical examination, confused with other hip pathologies, and misdiagnosed as a simple sprain or strain [1–6,11]. Imaging is often negative or inconclusive [1,2].

Failure to identify PHI can lead to misdiagnosis, persistent hip pain, and diminished function. The most common clinical presentation of PHI includes buttock or groin pain [1,2,6], painful, limited hip range of motion (ROM), weak hip musculature, and subjective feelings of instability [1,2,6,12].

Clinical hip instability is often associated with generalized ligamentous laxity [1,2,4–7,9–12]. An apparent association between PHI and femoroacetabular impingement (FAI) exists, in which abutment of the anterior bony structures may contribute to a subsequent

levering mechanism elongating the posterior capsulo-ligamentous structures [3,8,11,12,14–16]. Boykin et al. [1] advocated for improved clinical diagnosis, detailed management, and development of dependable hip outcomes for PHI.

The purpose of this case study is to introduce a relocation test (developed by the authors) used to detect possible clinical PHI. Additionally, the authors propose conservative rehabilitation emphasizing a stabilization approach including motor control and strengthening exercises for gluteal and trunk musculature [1,2,4,10,12].

Patient characteristics

A 29 year old female nurse was evaluated with the following complaints:

- (1) Intermittent tight ache in the left posterior lateral buttocks, and hip pain rated 0–6/10 on the Visual Analog Scale (VAS), with sharp pain upon direct manual pressure.

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- (2) Intermittent tired achy feeling in bilateral anterior hips (left > right) with intermittent sharp pinching pain in the left anterior hip rated as 6/10 on the VAS.

The patient reported an insidious onset of pain 1.5 years ago, which worsened over a few months prior to treatment. She experienced temporary improvement with a two-week reprieve from work. Six months prior to treatment, she began a hip stretching program, which included yoga and aggressive stretching by positioning the hip into end range flexion and external rotation, with passive overpressure. (Figure 1) The patient reported that stretching created pain but continued, thinking it would help. She reported temporary relief while sitting with her left leg crossed over her right into full flexion with adduction, but her symptoms worsened over time.

Other aggravating factors included walking, bending, lifting, prolonged standing, sitting with the left leg over her right, squatting, leg press exercise, ascending stairs, car transfers, running, and hopping. Sleep was disturbed at times. The preferred sleep position was prone with the left hip extended and the right hip partially flexed, abducted and externally rotated. (Figure 2) She reported generalized symptom relief with submaximal hip ROM.

The initial Lower Extremity Functional Score (LEFS) was 64/80 [17–20] and Oswestry Disability Index (ODI) [21–23] was 8% for this patient.

Although the past medical history was unremarkable for acute hip trauma, she reported generalized laxity of the lower extremity joints and occasional pain-free snapping with left hip coronal plane movements. She denied painful clicking, paresthesia, giving way or pain with Valsalva maneuvers. Diagnoses of polycystic ovary syndrome and anxiety were managed with medication.

Diagnosis

Examination

After obtaining informed consent, a hip examination was performed including screening the lumbosacral spine, sciatic nerves [24,p.55–63], systemic joint laxity [25–31], and red flags of non-musculoskeletal origin [32]. Passive hip ROM was unremarkable for pain or limitation except for that summarized in Table 1. Provocative tests were repeated with the hip manually repositioned anteriorly from posterior, otherwise known as the posterior relocation test or posterior relocation testing (PRT) (Figure 3).

Resisted tests were unremarkable except for those summarized in Table 2.

The patient scored 7/9 on the Beighton scale, indicating distinct generalized hypermobility of the spine and extremities [25–31]. SIJ provocation [24,p.57, 33,p.664], supine passive unilateral straight leg raise tests with ankle dorsiflexion [24,p.58, 33,p.599], and seated slump tests [33,p.598] were all negative. Supine scour tests were

Figure 1. Patient stretching position.

Figure 2. Patient preferred sleeping position.

Table 1. Results of supine hip PROM testing without and with posterior relocation.

Provocative test	Without posterior relocation	With posterior relocation
Right hip flexion	140° with minimal ache in anterior hip	140° without ache
Left hip flexion	100° with moderate posterior hip ache and sharp anterior hip pain	140° without anterior or posterior pain
Left hip IR	No limitation or pain but reported stiffness	No limitation or stiffness
Left hip abduction	No limitation or pain except reproduction of the anterior snapping at 20°	No limitation or pain snapping persisted

Figure 3. Posterior relocation testing with passive hip flexion.

Table 2. Results of resisted hip tests for pain provocation and strength.

Resisted test	Results
Right side-lying hip abduction	4+/5 without pain
Left side-lying hip abduction	4+/5 without pain
Right side-lying hip external rotation	4+/5 without pain
Left side-lying hip external rotation	4–/5 without pain

Table 3. Results of hip supine FAI tests without and with posterior relocation.

Provocation test	Without posterior relocation	With posterior relocation
Passive right hip FADIR	No limitation with minimal sharp anterior hip pain	No limitation or pain
Passive left hip FADIR	Moderate sharp anterior hip pain	Minimal sharp anterior hip pain

negative [24,p.66, 34]. Anterior impingement test results suggesting FAI [35–38] are summarized in Table 3.

Clinical impression

Pertinent findings included significant limitation of left hip flexion with moderate provocation of left anterior and posterior hip pain. When reassessed with PRT, the left hip PROM improved significantly. Anterior impingement tests also improved with PRT. Patient complaints appeared to worsen with self-stretching.

Based on history and examination findings, the authors suspected that primary hip complaints were related to a recurrent posterior ligamentous hip sprain with probable underlying PHI and FAI.

Intervention

Exam findings, prognosis, and treatment plan were explained to the patient. The importance of tissue protection and the need to avoid stretching the left hip was emphasized. To decrease pain and facilitate joint re-stabilization, positions that increased stress on the posterior hip capsule such as sitting with excessive hip flexion and adduction were also discouraged. The patient was instructed to maintain a light activity level and to avoid activities that increased pain.

The treatment plan consisted of progressing the patient through a home program focusing on pain-free therapeutic exercise and neuromuscular re-education of the deep posterior hip and trunk musculature. This initially consisted of gentle, pain free activation of the deep hip external rotators and transverse abdominal musculature utilizing feed forward motor control before progressing to activation of the gluteus medius muscles. Subsequent instruction included activation of the quadriceps and posterior tibialis muscles to minimize lower extremity medial collapse. Exercises were initiated in a non-weight bearing position at the most basic level due to limited neuromuscular control throughout

the left lower extremity, and later progressed to a full weight bearing position, which emphasized feedback–somatosensory training and strengthening.

The patient reported gradual improvement over 11 treatments (2.5 months). Her right anterior hip ache completely resolved. At the 7th appointment one month later, she reported overall improvement of 60% in pain and function of her left hip during moderate activity. She also reported reduced intermittent pain at 2–3/10, and frequency of intermittent sharp pain reduced to 1–2 incidents per week. At that time, a trial of light jogging was tolerated well.

At discharge, the patient reported significant improvement in function and work activities. She reported no further anterior pinching pain and only noticed occasional discomfort rated at 1/10 with squatting and bending. LEFS and ODI scores improved to 77/80 and 0%, respectively. She reported no difficulties with sleeping, car transfers, prolonged standing, negotiating stairs, walking, running, or hopping. Resisted hip ER strength improved to 5/5 right and 4+/5 left. There was no pain with direct manual pressure over the posterior lateral buttocks or hip.

Discussion

In this case, the clinical diagnosis of PHI with FAI was based on the patient's improved ROM and decreased pain with PRT. The rationale for such testing arose from the previously described posterior apprehension test in which the hip was positioned supine to 90° of hip flexion with combined adduction and internal rotation, using a steady posteriorly directed force applied through the femur to reproduce pain or apprehension [2,12]. In 2001, Maas and Riney [39] noted the phenomena of decreased posteriolateral hip pain with PRT. Conversely, they noted that applying anterior relocation testing further exacerbated these symptoms.

It is plausible that PHI may be more common than AHI due to the increased thickness and strength of the iliofemoral ligament supporting the anterior capsule. In contrast, the thinner ischiofemoral, arcuate femoral, and arcuate coxal ligaments reinforce the posterior capsule and are less robust [40]. It has been reported that the iliofemoral ligament is capable of resisting larger tensile forces than the ischiofemoral and arcuate femoral ligaments [41,42]. The decreased tensile strength of the posterior ligament complex may result in greater susceptibility to injury, explaining the lower incidence of anterior dislocation of the hip, which accounts for only 10–15% of all occurrences [6,42].

We hypothesize that when pain originates from a posterior hip capsuloligamentous structure, deep posterior musculature or bursa, the PRT may re-center the femoral head in the acetabulum unloading the irritable structures. This is similar to symptomatic relief in anterior instability of the shoulder experienced with re-centralization of the

humeral head during the anterior relocation test [39]. Multiple authors have identified the relationship of FAI with PHI in which FAI may contribute to levering of the femoral neck, which loads the posterior hip structures leading to PHI [3,8,11–15]. The PRT may re-center the femoral head in the acetabulum, unloading the levering of the approximated femoral neck on the acetabulum. Again, similarities can be related to a symptomatic shoulder in which pain from posterior internal shoulder impingement is relieved with the anterior relocation test, centralizing the humeral head in the glenoid, unloading the impinged posterior structures. Furthermore, this case demonstrates how functional activities involving end range hip flexion reproduced posterior hip pain. The patient reported that activities including ascending stairs, and crossing her legs were painful. Each increased stress on posterior hip structures. Also interesting to note was that the patient preferred to sleep prone with the left hip extended and the right hip in a Figure 4 position. This position results in more left hip extension, potentially relocating the femoral head anteriorly, unloading the painful posterior capsule and subsequent anterior impingement, creating symptomatic relief.

Numerous authors advocate incorporation of the Beighton scale as measure of overall general ligamentous laxity when suspecting PHI [1,2,4,6,7,10,12,42,43]. This patient had a Beighton score of 7/9. A study by McGrory et al. [42] describes the first case of posterior recurrent hip instability of an adult at age 22, with first onset of pain in the flank, buttock, and anterior thigh that would worsen after increased activities. The subject was reported to have generalized laxity throughout the hip joint in combination with acetabular dysplasia without a reported traumatic dislocation or systemic collagen disease. Bellabarba et al. [43] published a case series of five patients who were diagnosed with idiopathic dynamic atraumatic instability of the hip. All presented with generalized ligamentous laxity, as well as increased pain with hip flexion, adduction, and internal rotation.

Previous research supports the use of conservative measures for instability of other joints. It is possible that a conservative approach could remedy symptoms and delay or prevent surgery for patients with clinical hip instability as well. Physical therapy has been advocated by numerous authors as the first course of treatment for clinical hip instability [1,2,4,10–12,44].

A successful short term outcome was noted in this case after intervention emphasizing a formalized stabilization approach. Although patients with PHI often present with limitations of motion, stretching is contraindicated according to the Nonarthritic Hip Joint Pain Clinical Practice Guidelines [45]. Rather, patients should be advised to avoid activities that place strain on passive posterior hip structures [44,45]. Additionally, emphasis on proper activation of the deep trunk and the gluteal musculature appears to be valuable [1,2,4,10,12]. As Sizer et al. [24,p.7–10] suggest, the deep six external rotators

of the hip course parallel to the femoral neck and create compressive forces to stabilize the joint. Proper activation of the trunk musculature also promotes proximal stability. Proprioceptive exercises incorporating somatosensory control of the knee and ankle can also address closed chain stability of the lower extremity.

In conclusion, the authors recognize that the patient in this case study experienced multiple treatments, and had no control group for comparison. Without further research, our ability to generalize this patient's outcome to similar cases is significantly limited.

We emphasize that when a passive limitation of motion is noted in the hip, it may be warranted to screen for potential PHI with PRT, especially before initiating a stretching or manual mobilization program. Future research into PHI, its clinical presentation and management is warranted. Similarly, it will be important to identify patients more suited for conservative intervention vs. surgical intervention. Future studies should include reliability and validity testing specific for PRT incorporating the use of imaging.

Disclaimer statements

Contributors

RM conceived and designed the study, collected the data, and obtained funded and ethics approval. RM, SW, and DG analyzed the data. RM, SW, DG, SC, and JS wrote the article in whole/part and revised the article.

Disclosure statement

No potential conflict of interest was reported by the authors.

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