CASE REPORT

Recovery from Knee Strain in a Young Athlete: A Case Study on Gluteal Activation and Core Stabilization.

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Abstract
Knee strain is a common cause of knee injury, particularly among rugby players, due to the high physical demands and frequent contact involved in the sport. Such injuries typically affect the soft tissues, including muscles and tendons around the knee joint. Delayed intervention can negatively impact mobility and interfere with daily activities, potentially leading to compensatory movement patterns and secondary complications. This case study focused on a 20-year-old rugby player with a history of left knee strain who received treatment approximately three months after the initial injury. He experienced difficulty with stair climbing and achieving cross-leg position during prayer. The objective of this case study was to demonstrate how targeted rehabilitation; specifically gluteal muscle activation and core stabilization exercises, can improve function and postural control. Notably, the patient showed measurable improvement as early as the first day of intervention, highlighting the effectiveness of timely physiotherapy assessment and appropriate exercise prescription.

Keywords: *Core stabilization, gluteal muscle activation, knee strain.*

Introduction

Knee injuries are common sports injuries, predominantly in football and rugby. Ligament injuries account for approximately 40% of knee injuries, meniscal injuries for about 10% and the remaining cases are due to other conditions, including knee strains [1]. Knee strains involve damage to the soft tissues, such as tendons or muscles, around the knee joint. They can occur as a result of twisting, overstretching or overuse of the muscles [1,2]. Early clinical assessment by appropriately trained physiotherapists is essential for prescribing suitable exercises to support the patient's recovery and return to sport [3]. Improper management of prolonged inactivity can lead to compensations, weakness or other chronic issues. This case study presents a 20-year-old rugby player with a history of left knee strain who received treatment approximately three months after the initial injury. The aim of this case study is to highlight the importance of proper assessment and targeted treatment, as these may facilitate recovery when appropriate interventions are provided.

Case description

Subjective examination

On January 11, a 20-year-old male patient presented to the physiotherapy clinic, reporting an inability to bend his left knee normally, as he was unable to sit for *tahiyyatul awal* and *akhir,* following a knee injury sustained during a rugby tournament last October. He was diagnosed with a left knee strain, and was prescribed painkillers by a physician, along with a knee bandage for a month, which subsequently led to hypomobility of the left knee. No pain was reported in the left knee during activities of daily living, except during prayers. His pain score was 5 out of 10 during knee flexion, which reduced to 2 out of 10 within a minute of straightening the left knee.

Physical examination

The patient presented with an abnormal gait upon entering the physiotherapy clinic. The pelvis was rotated to the left, and the trunk leaned slightly to the left during right leg swing. No postural deformity was observed during left leg swing. During quiet standing, no bodyweight shifting was noted; however, a slight forward head posture and a mild posterior pelvic tilt were observed. During the sport movement assessment, the body shifted slightly to the right during squatting. He was unable to perform lunges when the left leg was positioned posteriorly. During stairs assessment, a slight drop of the left pelvis was observed when stepping up with the left leg, and poor control was noted when stepping down with the left leg, indicating reduced muscle power of left gluteus maximus. He also demonstrated impaired balance in both lower limbs, being unable to maintain a single-leg stance for more than 3 seconds bilaterally. There was no limitation in the range of motion of the knee flexion, knee extension, hip flexion and hip extension.

Several positions were included during physical examination; sitting, prone lying and bridging. In sitting position, alternate hip flexion and knee extension were assessed. Flickering of erector spinae was observed during that hip flexion, indicating reduced motor control of erector spinae. A slump was noted during knee extension, suggesting tightness or hamstring or erector spinae. In prone lying position, the right pelvis was observed to be higher than the left, and a deviation of the left tibia was noted. Reduced control during knee flexion and extension was observed, along with hyperactive of erector spinae during left extension, indicating reduced muscle power of left gluteus maximus. In bridging position, he was able to maintain the spine in a straight line, however complained of discomfort in the erector spinae, suggesting overactive of erector spinae and underactive of gluteus maximus muscle.

Treatment and evaluation

There was evident weakness of gluteus maximus and reduced control of erector spinae, hence, the treatment would focus on increasing muscle power of gluteus maximus and improving core

control of the erector spinae. Bridging, squatting and kneeling-to-half-kneeling exercises are aimed at strengthening the gluteus maximus, while lumbar stabilization in four-point kneeling is aimed at improving control of the erector spinal. Table 1 illustrates the details of the exercises, and Table 2 illustrates the pre- and post-intervention data. The evaluation of exercises is also illustrated in Figure 1 to Figure 6. Figure 1 and 2 show the pelvic level during prone lying, Figure 3 and 4 show position of *tahiyyatul awal* during prayer from posterior view and Figure 5 and 6 show position of *tahiyyatul awal* during prayer from lateral view.

Discussion

There was an improvement in posture during prone lying and sitting *tahiyyatul awal* after the first day of exercise. Figure 2 shows that the pelvic levels were symmetrical both left and right compared to before the exercises. Figures 4 and 6 also demonstrate improvement during sitting *tahiyyatul awal,* as the patient was able to cross his legs and sit slightly on his heel, and maintain a more relaxed back compared to the pre-exercise condition. These findings indicate that the prescribed exercises appeared to contribute to initial improvements in posture and spinal alignment, following a single day of intervention. From this case study, it was found that the patient had weakness of the gluteus maximus muscles; therefore, bridging, squatting, and kneeling-to-half-kneeling exercises were prescribed. Gluteal muscles play a significant role during many upright activities and lower extremity function, such as walking as they help transmitting forces from the legs to the pelvis [4,5]. Gluteal muscles also act as a stabilizer of pelvis in a single-leg-stance position, including stepping up and down stairs [5,6]. Hence, the gluteal strengthening exercise would help the patient in controlling pelvic and knee control when stepping up and down stairs.

This case study also reported no limitation in the range of motion of knee flexion and extension, indicating that the soft tissue around the knee had fully recovered. However, the patient was unable to perform weight-bearing activities such as stairs climbing and the cross-legged position during prayer. The primary contributing factor to these limitations was weakness of the gluteal muscles. Gluteal muscles are often inhibited or weaken, increasing the risk of chronic injury and limiting athletic performance [7]. Many studies have found that the gluteal muscles contribute to the prevention of knee sprains, as the hip muscles help absorb impact forces during landing; therefore, weakening of the gluteal muscles may predispose individuals to knee injuries [4].

Besides treating the symptoms, for instance, gluteal muscles weakness, it is important for the therapist to understand the underlying causes; for example, lifestyle factors, which are thought to be major role in reducing gluteal muscles activation [7,8]. Prolonged sitting and reduced physical activity may contribute to decreased activation of the lower extremity muscles [7], as the patient was unable to play due to his injury. This sedentary lifestyle also reduces the activation of the core muscles, leading to improper posture during walking and standing [9].

This case study also showed weakness of the core muscles, as the patient leaned his body to the left side while walking and was unable to maintain an erect posture. In addition, the patient demonstrated flickering of the erector spinae muscle during hip flexion in the sitting position, indicating core weakness. Therefore, lumbar stabilization exercises in a four-point kneeling position were prescribed to increase core activation and improve trunk stability. Besides, core exercise can enhance the stability in the pelvis, hip, and knee by stimulating periarticular muscle of the knee and lumbopelvic hip complex [10].

This case study demonstrated initial improvement after the first day of intervention. However, as a single-case report, the findings are limited in generalizability. Long-term follow-up and studies involving larger samples are needed to provide deeper insight into sustained recovery.

Conclusion

Managing knee strain in athletes can be complex, as prolonged muscle inactivation may contribute to a secondary problem. Therefore, suitable assessments are essential, particularly for athletes; for example, sport movement assessments and postural evaluations in positions such as sitting, prone lying, and standing. The physiotherapist must carefully observe for deformities, as even small flickers of muscle activity may contribute to postural deviation. This case study demonstrated that accurate assessment can lead to targeted exercises prescription, resulting in observed initial improvements after the first day of intervention.

Implication of the study

The case study demonstrates to readers that knee strain can affect gluteal muscles and core stabilization. These secondary complications may interfere with posture, mobility, and overall lower limb functions. Therefore, accurate assessment is essential to determine the suitable exercises targeting the affected muscles, ultimately improving patient's condition.

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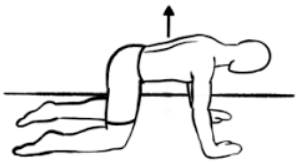
Conflict of interest statement

The author agree that this research was conducted in the absence of any self-benefits, commercial of financial conflicts and declares absence of conflicting interest.

Table 1. Treatment for patient with knee strain at Day 1.

Goals	**Exercises**		**Dosage**
Strengthening gluteus maximus	Bridging		I: 10 seconds hold, 30 times, 3 sets T: Isometric exercise
	Squatting		I: 10 seconds hold, 30 times, 3 sets T: Isometric exercise
	Kneeling-to-half-kneeling		I: 30 times, 3 sets T: Concentric exercise
Improving control of erector spinae	Lumbar stabilization in four-point kneeling		I: 10 seconds hold, 30 times, 3 sets T: Isometric exercise

I: Intensity of exercises; T: Type of exercise

Table 2. Pre- and post-intervention data

Items	**Pre-intervention**	**Post-intervention**
Pain scale	5/10	2/10
Static balance test	< 3 seconds	> 3 seconds
Pelvic alignment	Right pelvic is higher than left in prone lying position	Right and left pelvic are symmetrical
Functional activity	Unable to cross his leg while sitting *tahiyyatul awal*	Able to slightly cross his leg during *tahiyyatul awal*

Figure 1. Pelvic level during prone lying before exercise

Figure 2. Pelvic level during prone lying after exercise

Figure 3. Position of *tahiyyatul awal* during prayer from posterior view before exercise.

Figure 4. Position of *tahiyyatul awal* during prayer from posterior view after exercise.

Figure 5. Position of *tahiyyatul awal* during prayer from lateral view before exercise.

Figure 6. Position of *tahiyyatul awal* during prayer from lateral view after exercise.

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