



A rare case of vastus intermedius tear in a middle-aged gentleman: a case report

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ABSTRACT

Although quadriceps strain injuries are common, reports of isolated vastus intermedius tears are rare. We highlight the case of a middle-aged gentleman who sustained this injury when he slipped while bending down, with a 'pop' sound. Subsequently, he experienced pain, swelling, and reduced knee flexion but was able to extend his knee fully. A plain radiograph revealed a non-displaced chip avulsion fracture of the patella, which was immobilized with an above-knee back slab. A sonogram revealed a grade 2 tear. During the acute stage, we treated the patient conservatively with progressive rehabilitation and physiotherapy. Six weeks later, the patient reported a good recovery. We admittedly considered platelet-rich plasma as an adjunct to augment the healing process of the avulsed tendon if recovery was unsatisfactory. In conclusion, vastus intermedius strains can be successfully treated conservatively with timely rehabilitation, paying attention to progress along the healing process as demonstrated in this case.

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Introduction

The vastus intermedius (VI) originates from the proximal two-thirds of the anterolateral femur and inserts into the quadriceps tendon, which then inserts into the superior pole of the patella. In the literature, although reports of isolated VI strains are rare, epidemiological studies on quadriceps strains are not uncommon. Cross et al. reported an incidence of six cases of VI strain among 25 quadriceps injuries sustained by male Australian Rules football players over the course of three years.¹ A muscle strain is defined by excessive tensile and/or shear forces within the muscle that cause the fibers and their surrounding connective tissue to fail.² The most common mechanism of VI tears is during forceful eccentric overloading of the extensor mechanism when the knee is flexed and the hip is extended, as seen in our case. The other three muscles of the quadriceps are the rectus femoris, vastus medialis, and vastus lateralis. They act as hip flexors and knee extensors.³ Among the four muscles of the quadriceps, the rectus femoris is the most frequently injured.⁴ In a study conducted among elite Australian male football players, 91.3% of quadriceps muscle strain injuries involved the rectus femoris.⁵ They reported kicking and running-related injuries such as acceleration and high-intensity running to be the main mechanisms of injury. In the non-athletic population, it is often seen in individuals over the age of 40 and is usually associated with tendinopathy changes over the distal attachment site of the quadriceps tendon.⁶ Classical hallmark symptoms include pain, swelling, knee extensor mechanism injury, loss of muscle strength, and deficits in the range of motion of the knee. We present the case of a 57-year-old gentleman who sustained a vastus intermedius muscle injury during a fall.

Case Report

A 57-year-old gentleman presented with left anterior thigh pain lasting for prior 3 days. He slipped while bending down to pick up fruits in his orchard. In his attempt to break the fall, he lunged forward. The left knee was flexed while his hip was in

extension when he heard a 'pop' sound over his anterior thigh. Subsequently, his thigh was swollen, and he experienced pain and difficulty to walk or stand.

His gait was antalgic with swollen anterior distal thigh. Maximal palpation tenderness was elicited over the anterior aspect of the distal thigh, about 4 cm from the superior pole of the patella. However, there was no visible ecchymosis or any palpable gapping. The knee extensor mechanism was intact, but flexion was limited to 125 degrees, and the resisted knee extension test was positive for pain and weakness. Other examinations were unremarkable. Plain radiographs of the affected knee (Figure 1) revealed an undisplaced chip avulsion fracture of the patella, which we treated conservatively with the application of an above-knee back slab with crutch ambulation. A sonogram was performed (Figure 2), and revealed a hypoechoic area within the vastus intermedius muscle suggestive of a grade 2 muscle tear.

Two weeks later, the patient reported only minimal pain in his thigh. A closer inspection revealed reduced quadriceps muscle bulk in comparison to the uninjured limb. However, quadriceps tone was normal, and he was able to perform straight leg raises with good control. The patient was able to flex his knee fully and was walking with a normal gait. A repeat ultrasound revealed fibre continuity within the previously mentioned hypoechoic area. The back slab was then removed, and he was allowed to bear weight as tolerated. The patient was also referred to physiotherapy for ultrasound phonophoresis as a pain-relieving modality and also for the initiation of quadriceps strengthening exercises. At subsequent follow-up 6 weeks post-injury, he was happy to report that he was pain-free and had no limitations on performing activities of daily living. We did note that

his left quadriceps muscle bulk was still reduced in comparison to the opposite side, but there was no focal tenderness and muscle power was full. Ultrasonography (Figure 3) revealed a reduction in the size of the lesion with improved muscle fibre continuity and good new fibre formation.

Discussion

Injury to the quadriceps muscle is prevalent during sporting activities, especially in football and athletics. When the knee is flexed and the ipsilateral hip extends, a sudden, forceful, eccentric contraction of the quadriceps typically causes a strain injury.⁴ Although rectus femoris is the most commonly injured muscle of the quadriceps, we must pay close attention to all other mus-

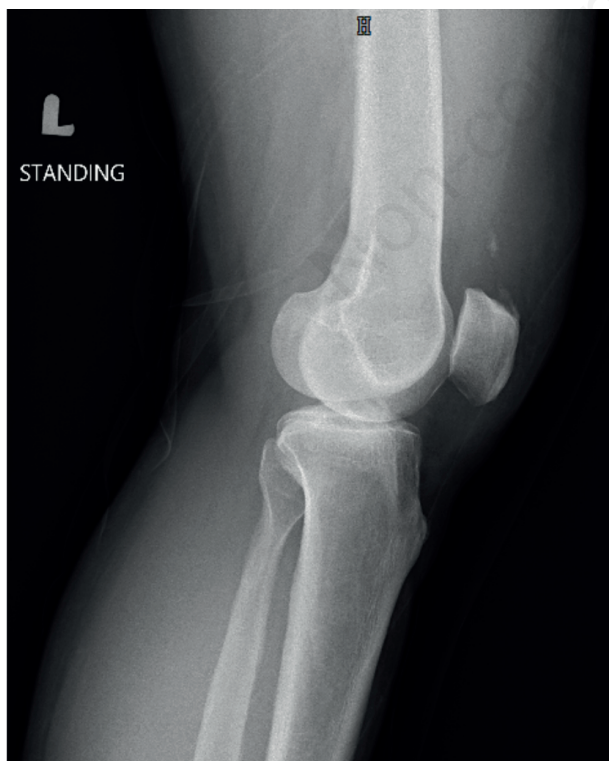


Figure 1. Lateral view plain radiograph of the injured extremity.



Figure 2. Ultrasound image of vastus intermedius at diagnosis.

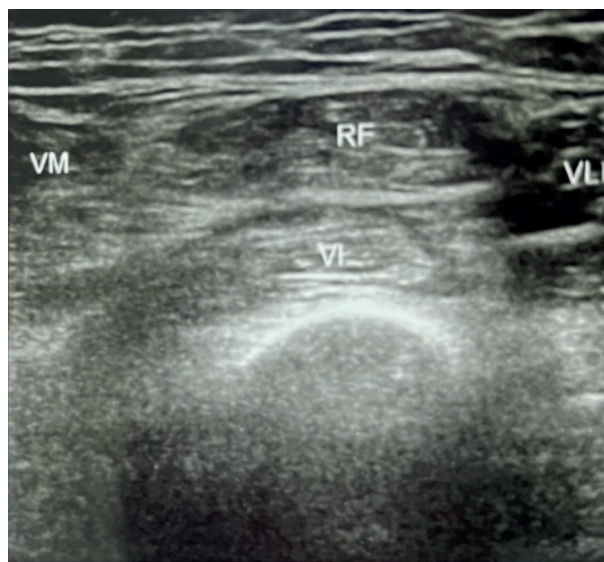


Figure 3. Ultrasound image of vastus intermedius (VI), rectus femoris (RF), vastus medialis (VM) and vastus lateralis (VL) at 6 weeks post injury.



Table 1. Adapted clinical and radiological grading systems for muscle injuries.

Grade	Clinical examination		Ultrasonography
	Järvinen <i>et al.</i> (2005)	Schneider-Kolsky <i>et al.</i> (2006)	Peetrans (2002)
0			No ultrasound lesion
I	Mild (first-degree): strain/contusion represents a tear of only a few muscle fibres with minor swelling and discomfort accompanied by no or only minimal loss of strength and restriction of the movements	<10° ROM deficit	Minimal elongations with less than 5% of muscle involved. These lesions can be quite long in the muscle axis being usually very small on cross-sectional diameter (from 2 mm to 1 cm maximum)
II	Moderate (second-degree): strain/contusion with greater damage of the muscle with a clear loss in function (ability to contract)	10-25° ROM deficit	Partial muscle ruptures; lesions involving from 5 to 50% of the muscle volume or cross-sectional diameter. The patient often experiences a “snap” followed by a sudden onset of localized pain. Hypo-and/or anechoic gap within the muscle fibres
III	Severe (third-degree) strain/contusion: tear extending across the entire cross section of the muscle, resulting in a virtually complete loss of muscle function is termed	>25° ROM deficit	Muscle tears with complete retraction

cles of the quadriceps which could be concomitantly injured or torn in isolation especially in cases where the knee extensor mechanism is still intact, such as reported in this case.

We diagnosed the patient with a grade 2 vastus intermedius tear based on muscle injury grading (Table 1) from both clinical and ultrasonographic findings.⁷⁻¹⁰ Previous research has indicated a high degree of clinical accuracy of ultrasound imaging for identifying partial and full-thickness quadriceps tendon tears in comparison to MRI.¹¹ It is also more reliable and rapid in diagnosing grade 2 muscle injuries in the acute phase.¹²

The lack of an established protocol for treatment of isolated VI tears is attributed to the scarce incidence and reports of such injuries.¹³ Depending on the degree of the strain, the injury may be successfully treated conservatively with adequate physiotherapy.⁷ We preferred a non-operative approach as the mainstay of treatment for this patient, as he neither works in a high-demand occupation nor is an athlete. In accordance with the POLICE principle (protect, optimal loading, ice, compression, and elevation), the early phase of quadriceps strain rehabilitation is focused on minimizing intramuscular bleeding.¹⁴ Cryotherapy is effective in reducing the pain associated with muscle injuries.¹⁵ Compression and elevation may help decrease blood flow and avoid excess surrounding tissue edema. We immobilized his thigh with the application of an above-knee back slab and off-loaded his injured extremity with the use of crutches for a period of two weeks to facilitate healing by providing a protective environment to the injured tissue. He was also given a short course of non-steroidal anti-inflammatory drugs (NSAIDs) to reduce overt pain from inflammation.

Primary components during active phase of rehabilitation were pain control, stretching, and strengthening – all aiming to achieve full range of motion, maintaining aerobic fitness, restore proprioception, and progress to functional training. Strengthening exercises were gradually progressed through isometric, isotonic, eccentric, and functional exercises.¹⁶

Over the last decade the use of platelet-rich plasma (PRP) has been gaining popularity in the treatment of sports injuries, including acute muscle injuries. Growth factors in PRP were believed to accelerate and augment the natural healing process of the injured tissue. Studies regarding the use of PRP specif-

ically for acute quadriceps tears are lacking. Nevertheless, comparable research on PRP usage in combination with physiotherapy in acute grade 2 hamstring injuries reports favourable outcomes in terms of shorter duration to achieve full recovery, lesser time taken to return to play, and significantly lower pain intensity scores in comparison to conservative treatment with only physiotherapy.¹⁷ In our case, we successfully rehabilitated the patient with conservative management and physiotherapy within 6 weeks post-injury. We remained vigilant to patient's clinical progression as well as utilizing serial ultrasound during the acute phase. We have considered administering PRP to augment the healing process should the progress not meet expectations of appropriate healing within the period of time.

Conclusions

This is a case of an ultrasound-confirmed grade 2 vastus intermedius tear in a 57-year-old gentleman. Non-operative management with adequate physiotherapy remains the mainstay of treatment, as demonstrated in this case. However, intramuscular platelet-rich plasma injections should be considered to augment the natural healing process in cases where poor clinical progress is correlated with poor sonogram evidence of diminishing tear. In this perspective, PRP is considered as potential adjunct to rehabilitation and physical therapy as it may play a key role both in the healing of the lesion and recovery of functions. In the future, a randomized controlled trial on the treatment of vastus intermedius tears with platelet-rich plasma injection would be beneficial by providing us with more insight on evidence-based management of such injuries.

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