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Case Report

Bilateral simultaneous quadriceps ruptures in an elite bodybuilder: A case report of treatment success

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ABSTRACT

Tendon injuries in weightlifters is known to be associated with steroid use. Bilateral simultaneous quadriceps tendon rupture (BSQTR) is extremely rare with few cases reported in literature in young athletes. Unlike patellar tendon ruptures, they are more common in older age individuals. These injuries can jeopardize an athlete's career. In this paper, we report a very rare case of BSQTR in an elite bodybuilder who sustained a high mechanism trauma while squatting heavyweights. He sustained bilateral anterior cruciate ligament (ACL) injury and a left ankle fracture. All injuries were treated surgically except for the left ACL as it was asymptomatic on follow-up. The challenge in this case was to treat his injuries and to regain his baseline functional status in the shortest period of time. Following treatment, the patient had a satisfactory clinical outcome with focused rehabilitation. Despite the devastating trauma, the patient was able to progress throughout the treatment plan and has regained his baseline functional status in less than 18 months and has resumed his competitive bodybuilding career. From the available literature, this is the first case to be reported with such combined injuries that was treated and showed a satisfactory outcome in a short period of time.

Introduction

QTR typically present in old age individuals with few presenting with bilateral injury simultaneously in contrast to patellar tendon ruptures which commonly present in younger age [1]. Several factors that can predispose patients to quadriceps tendon ruptures are described and can be divided in to local, or systemic factors. Local factors include, micro-tears following repetitive use, pre-existing tendinitis, or local use of steroids. Systemic factors includes; fluoroquinolones use, obesity, older age, rheumatological disorders, anabolic steroids use, or chronic renal failure [1]. BSQTR in young individuals have been reported, and most of them, a predisposing risk factor was present mainly, steroid use [2,3]. Some of the cases were associated with other injuries including; ankle fracture, ACL injury, and tibia fracture [2–5]. We present a rare case of a 32 years old male who is an elite bodybuilder and presented to us following a trauma sustained while doing heavy squat exercise. He was diagnosed with BSQTR, bilateral ACL injury, and a left lateral malleolus fracture that were treated accordingly and showed a desirable outcome on follow up over 30 months period.

Abbreviations: QTR, quadriceps tendon ruptures; BSQTR, bilateral simultaneous quadriceps tendon rupture; ACL, anterior cruciate ligament; AP, anteroposterior; MRI, magnetic resonance imaging; CTA, computed tomography with angiogram.

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Fig. 1. Legend: Anteroposterior and lateral radiographs of the left ankle showing lateral malleolus fracture.

Case report

A 32 years old male who is an elite bodybuilder with no known chronic medical illnesses was presented to our emergency department unable to bear weight on both lower limbs following a fall while squatting 585 lb. The injury was recorded and was presented to us by the patient. He acknowledged receiving human growth hormones, as well as anabolic steroids as enhancing agents for competitive bodybuilding chronically. Ankle films revealed a short oblique fibula fracture (Fig. 1). CTA of bilateral lower limbs were requested and were negative for vascular injury. Later, MRI scan revealed BSQTR, and bilateral ACL injuries (Figs. 2, 3). After stabilization, the patient was operated for the QTRs utilizing an open approach and transosseus repair to the patellae and open reduction and internal fixation of the lateral malleolus fracture. At 6-months postoperatively, he was operated for the right ACL tear only since clinically and on imaging studies, the left side was unremarkable (Fig. 4). He was progressed through rehabilitation and started competing at 18 months post-injury. He has been followed up for 30 months and as of the last follow-up, he has competed in 4 different bodybuilding shows and reported an excellent self-rated satisfaction and recovery back to his normal baseline (Fig. 5).

Discussion

BSQTRs are associated with anabolic steroids use in young athletes. Dhillon MS et al. found seven cases in his literature review with BSQTRs in weight-lifting athletes, five of them (71.42 %) had a history of anabolic steroids use and more than half of the reported case in his review were weight-lifting related in young athletes [2]. QTR have been reported as a result of a resisted eccentric contraction of the muscle with the knee in flexion or landing on a flexed knee [2]. Knee wraps are commonly used in heavy-lifting athletes, it can prevent patellar movement cephalad with knee flexion and could be a potential factor leading to this injury instead of patellar tendon ruptures.

High index of suspicion for vascular injury lead us to request bilateral CTA due to the significant mechanism of injury sustained potentially leading to knee dislocations. Up-to 50 % of traumatic knee dislocation cases could be relocated spontaneously prior to presentation [6]. Fenelon C et al. reported a similar case to ours as their patient sustained a unilateral ACL injury which was diagnosed 5 months following the indexed tendons repair and did not require surgical treatment after rehabilitation [3]. Staged treatment was decided in the management of the ACL as we were worried that the rehabilitation of the repaired tendons might affect the outcome of the reconstructed ligaments if done in the same setting. Following six-months, reassessment was done and showed a right knee instability and normal exam of the left knee. MRI was repeated and showed an intact left ACL signifying a sprain at time of injury. Bikkina RS et al. reported a case with an associated ankle fracture consistent with a similar injury pattern to ours according to Lauge-Hansen's supination external rotation [5,7]. Another case was reported by Grenier R et al. as their patient sustained a spiral fracture to the distal tibia and proximal fibula signifying an external rotation causing trauma [4]. Squatting with hips in external rotation improve the lumbar lordotic position and increase the activity of the gluteus maximus while decreasing the activity of back muscles [8]. This is probably the reason why our patient and the previously reported cases were associated with external rotation caused fractures as a result of squatting with both limbs in external rotation.

Suture anchor fixation was found to be mechanically advantageous compared to the classic transosseus patellar fixation of the repaired quadriceps tendon in a cadaveric study, with less dissection needed to expose the entire patella [9]. Plessner S et al. found no difference in-terms of re-rupture rates when the two techniques were compared [10]. Classic transosseus patellar fixation was

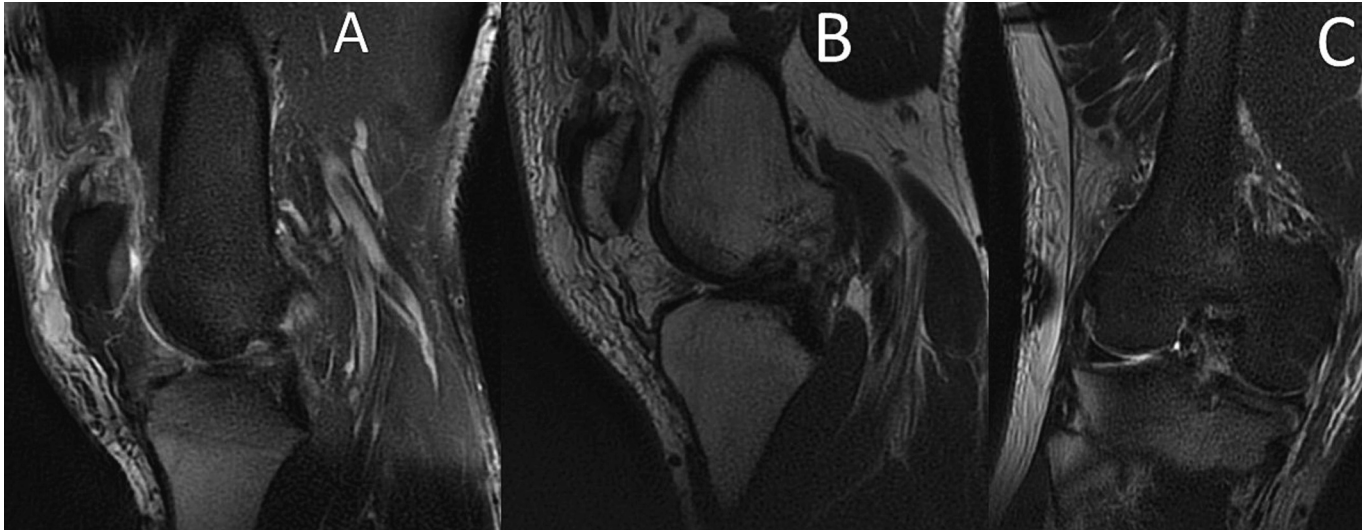


Fig. 2. Legend: (A) sagittal proton density (PD) of the right knee showing complete quadriceps tendon injury, (B) a sagittal T2 cut showing ACL injury, (C) a coronal T2 cut showing an empty notch sign and signal intensity around the medial meniscus.

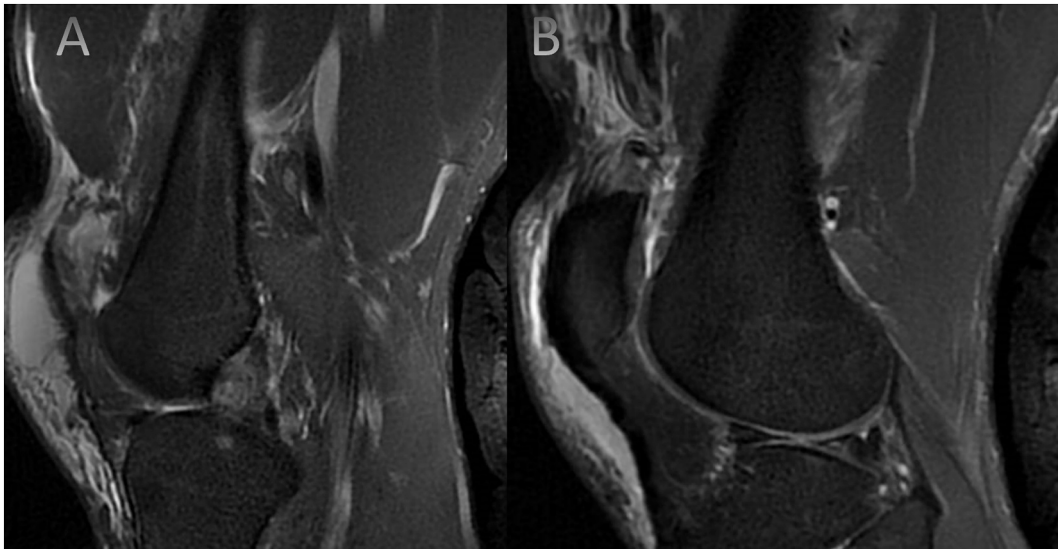


Fig. 3. Legend: (A) PD cut of the left knee showing high grade quadriceps tendon injury at musculotendinous junction, (B) another cut showing the extent of the injury with an associated ACL injury.

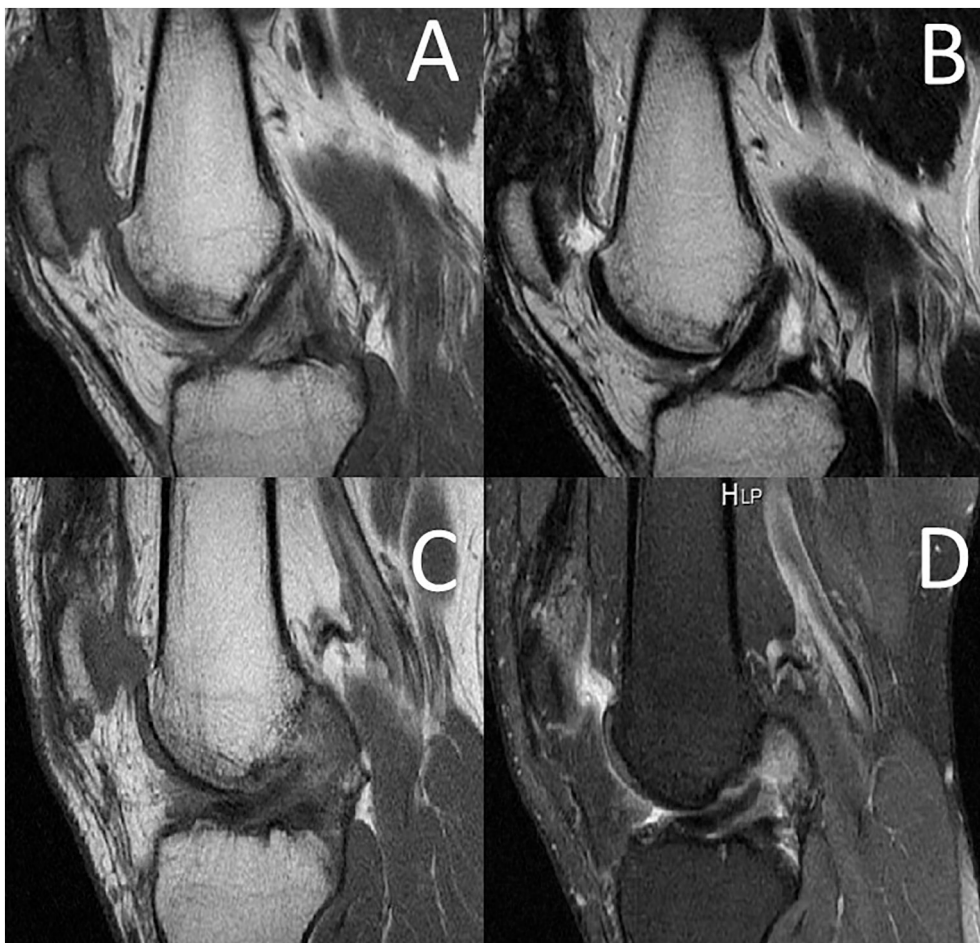


Fig. 4. Legend: Left knee sagittal MRI T1 (A), and T2 sequence (B) demonstrating a normally appearing left ACL. Right knee sagittal MRI T1 (C), and PD sequences (D) showing an injured ACL.



Fig. 5. Legend: Clinical photographs taken at 10 months (A) and 30 months post-surgery (B) demonstrating excellent recovery and aesthetic looking thighs. The later was taken shortly before a bodybuilding competition.

convenient for the treating surgeon and was used accordingly. We believe that the presentation of our case is extremely rare given the involvement of both ACLs and the left ankle. Moreover, the outcome of our patient is satisfactory in a relatively short period of time with no residual functional or clinical limitation and has reached pre-injury competitive level.

Conclusion

Heavy squatting can lead to a devastating BSQR in a young elite bodybuilder. Care should be taken to rule other possible associated injuries in such cases. Functional status regain is possible, and rehabilitation should be individualized to each patient's injury and progress. Commitment to treatment and the desire to come back from such injury are really important factors for an individual's pathway to resumption of an athletic career. This case report illustrates an extremely rare injuries that were treated and showed an excellent recovery in a short period.

Ethical consideration

Appropriate consent for participation was obtained from the patient.

Funding

No funding was received.

Ethical approval

Appropriate ethical approval was obtained regarding patient data.

Informed consent

Informed consent was taken for reporting this case along with the materials needed from the patient.

CRediT authorship contribution statement

All authors have made substantial contributions to the conception and design of the study, acquisition, analysis and interpretation of data, drafting the article and revising it critically for important intellectual content, and have provided final approval of the version to be submitted.

Declaration of competing interest

None.

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References

- [1] S. Nori, Quadriceps tendon rupture, *J. Fam. Med. Prim Care* 7 (1) (2018) 257–260.
- [2] M.S. Dhillon, P. Kumar, R. John, A. Hooda, Bilateral quadriceps rupture in an elite weight lifter: a case report and review of literature, *Indian J. Orthop.* 54 (3) (2020) 339–347.
- [3] C. Fenelon, D.M. Dalton, J.G. Galbraith, E.L. Masterson, Synchronous quadriceps tendon rupture and unilateral ACL tear in a weightlifter, associated with anabolic steroid use, *BML Case Reports* 2016 (2016) bcr2015214310.
- [4] R. Grenier, A. Guimont, Simultaneous bilateral rupture of the quadriceps tendon and leg fractures in a weightlifter. A case report, *Am. J. Sports Med.* 11 (6) (1983) 451–453.
- [5] R.S. Bikkina, G. Chaljub, H. Singh, S.D. Allen, Magnetic resonance imaging of simultaneous bilateral quadriceps tendon rupture in a weightlifter: case report, *J. Trauma* 52 (3) (2002) 582–584.
- [6] S.T. Seroyer, V. Musahl, C.D. Harner, Management of the acute knee dislocation: the Pittsburgh experience, *Injury* 39 (7) (2008) 710–718.
- [7] J.Y. Kwon, I.L. Gitajn, P. Walton, T.J. Miller, P. Appleton, E.K. Rodriguez, A cadaver study revisiting the original methodology of Lauge-Hansen and a commentary on modern usage, *J. Bone Joint Surg. Am.* 97 (7) (2015) 604–609.
- [8] T. Oshikawa, Y. Morimoto, K. Kaneoka, Lumbar lordosis angle and trunk and lower-limb electromyographic activity comparison in hip neutral position and external rotation during back squats, *J. Phys. Ther. Sci.* 30 (3) (2018) 434–438.
- [9] S.L. Sherman, M.E. Copeland, J.L. Milles, D.A. Flood, F.M. Pfeiffer, Biomechanical evaluation of suture anchor versus Transosseous tunnel quadriceps tendon repair techniques, *Arthroscopy* 32 (6) (2016) 1117–1124.
- [10] S. Plessner, M. Keilani, G. Vekszler, et al., Clinical outcomes after treatment of quadriceps tendon ruptures show equal results independent of suture anchor or transosseous repair technique used - a pilot study, *PLoS One* 13 (3) (2018), e0194376.