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# Simultaneous Bilateral Quadriceps Tendon Rupture Following a Low - Energy Trauma in a Male Body Builder with the History of Anabolic - Androgenic Steroids Consumption

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## Abstract

**Introduction:** Consumption of anabolic - androgenic steroids (AAS) is described as a major factor in tendon weakening process. The reports of bilateral quadriceps tendon rupture (QTR) following the AAS consumption are very rare. The current study described a case of simultaneous bilateral QTR following a low - energy trauma in a body builder with the history of ASS consumption.
**Case Presentation:** A 32 - year - old male body builder was referred to under study center with a history of falling down from the stairs nearly 2 weeks earlier. Magnetic resonance imaging (MRI) showed QTR in both knees from superior pole of patella. He denied any major trauma to explain the recent problem. Thus, the QTR was attributed to a low - energy trauma. While ruling out the tendon weakening conditions promptly, the history of oral and intramuscular consumption of AAS was noted. The patient was operated to repair QTR. At the last follow-up session, he was able to actively straighten his legs. The consumption of AAS was discontinued afterward.
**Conclusions:** Consumption of AAS by athletes has considerably increased during the last few decades. An appropriate warning of orthopedic surgeons regarding AAS side effects is necessary in order to recognize the predisposing factor of tendon rupture in similar circumstances and address the case properly.

*Keywords:* Quadriceps Tendon Rupture, Anabolic - Androgenic Steroids, Athletes

## 1. Introduction

Quadriceps tendon rupture (QTR) is a common extensor mechanism injury, which in young adults usually occurs after a major trauma. By contrast, simultaneous bilateral QTR is a very rare injury, and in young patients is associated with tendon weakening conditions such as obesity, chronic renal failure, gout, and hyperparathyroidism (1-3).

Since long time ago, consumption of anabolic-androgenic steroids (AAS) is described as a predisposing factor for tendon weakening and this association is well supported in animal models (4); even though, the reports of tendon failure following the AAS use or abuse are very scarce in the literature.

The current study aimed at presenting a case of simultaneous bilateral QTR following a low - energy trauma in a 32 - year - old male body builder with the history of ASS consumption.

## 2. Case Presentation

A 32 - year - old male body builder was referred to the emergency department of under study center, complaining of pain, swelling, and ecchymosis in both knees since 2 weeks earlier due to falling down from the stairs. He also mentioned a history of falling, nearly 10 months ago, leading to an ecchymosis and bulging around superomedial aspect of right elbow extending to the arm.

During physical examination of the knees, he was unable to actively perform straight leg raise (SLR) test, but the passive SLR test was normal. Moreover, bulging and defect in the examination of quadriceps tendon continuity was found in both knees. Neurovascular examination of lower extremities was normal.

Through physical examination of right elbow, a defect in the continuity of medial head of triceps was noticed; even though he could normally extend the elbow against

the gravity.

Radiography of both knees illustrated a low riding of patella and evidence of hemarthrosis (Figure 1 A, B). Magnetic resonance imaging (MRI) revealed a quadriceps tendon rupture (QTR) in both knees from superior pole of patella (Figure 2 A, B) and partial rupture of triceps tendon as well.

Based on the patient's description of the accident, a cause of low - energy trauma for QTR was considered (5). Thus, it was started to rule out the predisposing factors of tendon weakening. By means of laboratory investigation, diabetes mellitus, hyperparathyroidism, liver, and kidney disorders were excluded. Furthermore, rheumatoid arthritis - associated tests including complete blood count, erythrocyte sedimentation rate, C - reactive protein, antinuclear antibody, rheumatoid factor, and anti - cyclic citrullinated peptide were all normal.

When the patient was asked about intake of any specific medication, he mentioned the consumption of AAS both orally and intramuscularly, in addition to anti - estrogen diet in his routine body - building regimen. Oral AAS consisted of a dianabol (50 mg/day). Intramuscular AAS included nandrolone decanoate (200 mg/week), testosterone depot (500 mg/week), trenbolone acetate (200 mg/twice a week), and boldenone (200 mg/3 times a week). These drugs were consumed simultaneously for 12 weeks. After this time, he had started the anti - estrogen diet composed of a daily dose of 500 IU human chorionic gonadotropin for 10 days and then, Nolvadex tablet (40 mg/day) for 6 weeks. After this cycle of AAS intake, he had taken another cycle. He expressed a constant consumption of these drugs even without any exercise for 6 months after triceps injury.

The patient was operated to repair QTR. In this respect, under general anesthesia and following the prep and drape of both lower limbs, the ruptured side of quadriceps tendon from the superior pole of patella was exposed through a midline incision. Subsequently, 2 non - absorbable Ethibond No.5 sutures were placed at distal end of ruptured quadriceps tendon using the Krackow technique and created 4 free strands. Furthermore, a groove of 2 mm depth in addition to 3 transosseous tunnels was made on the superior pole of the patella. Then, the 4 free strands were passed through the tunnels and firmly tied on the inferior pole of the patella. The retinaculum was repaired afterward. A strip of rectus femoris still attached to the superior pole of the patella was fixed into the repaired quadriceps tendon using the Pulvertaft technique.

At the end of surgery, a cylinder cast was used to immobilize the knees for the first 6 weeks after the procedure. Quadriceps muscle reinforcement was started as isometric contractions, at the end of 3rd week and continued as active straight leg raise (SLR) when the cylindrical cast was removed. After 12 weeks, post - operative active extension was suggested. Partial weight bearing by crutches was encouraged in the 3rd week following surgery and progressed to full weight bearing in the 8th week. Flexion up to 60° using hinged knee brace was ordered for the 1st week after the removal of cylinder cast, and continued as a weekly increase of 15° with the aid of physiotherapy.

Six months later, the patient was able to perform active SLR associated with 130° flexion and no extension lag. The consumption of AAS was discontinued afterward.

## 3. Discussion

AAS are synthetic substances that mimic the effects of natural male hormone testosterone and increase masculine characteristics. Consumption of AAS by top sportsmen and athletes has considerably increased during the last few decades (6). AAS consumption is often associated with various dose - dependent adverse effects including reduced fertility, hypertension and atherosclerosis, blood clotting, jaundice, hepatic neoplasms and carcinoma, and psychiatric and behavioral disorders (7).

Marqueti et al., studied tendon remodeling in rats treated with subcutaneous AAS (5 mg/kg) combined with an exercise program. They evaluated the activity of matrix metallopeptidases, a marker for tendon remodeling. According to their results, AAS treatment can impair tissue remodeling in animals undergoing physical exercises through down - regulating matrix metallopeptidase activity, hence increasing the potential for tendon injury (8).

The dose - dependent effect of AAS on tendon weakening is also well supported. Michna examined the effect of anabolic steroid hormones and exercise training on skeletal tendons of experimental mice. He observed ultrastructural abnormalities of collagen fibrils in mice tendons associated with the duration of treatment (4). Similar adverse effects of AAS on tendon weakening were reported by Inhofe et al. (9).

Kanayama et al., performed a controlled study evaluating the history of tendon rupture in a large cohort of AAS users in comparison with nonusers. According to their report, 19 (22%) AAS users, but only 3 (6%) of the non - users, reported at least 1 lifetime tendon rupture (10).

Simultaneous bilateral QTR following the AAS consumption is very rare and only a few cases are available in the literature. Liow et al., reported the 1st case of bilateral QTR associated with anabolic steroids (11). Fenelon et al., reported the 2nd case of bilateral QTR in a weightlifter associated with anabolic steroid use as well (12). To the best of authors' knowledge, the current study is the 3rd report of bilateral QTR associated with AAS consumption.


**Figure 1.** Lateral Radiography of (A) Right and (B) Left Knee Showing Low Riding of Patella and Sign of Hemarthrosis in Both Knees

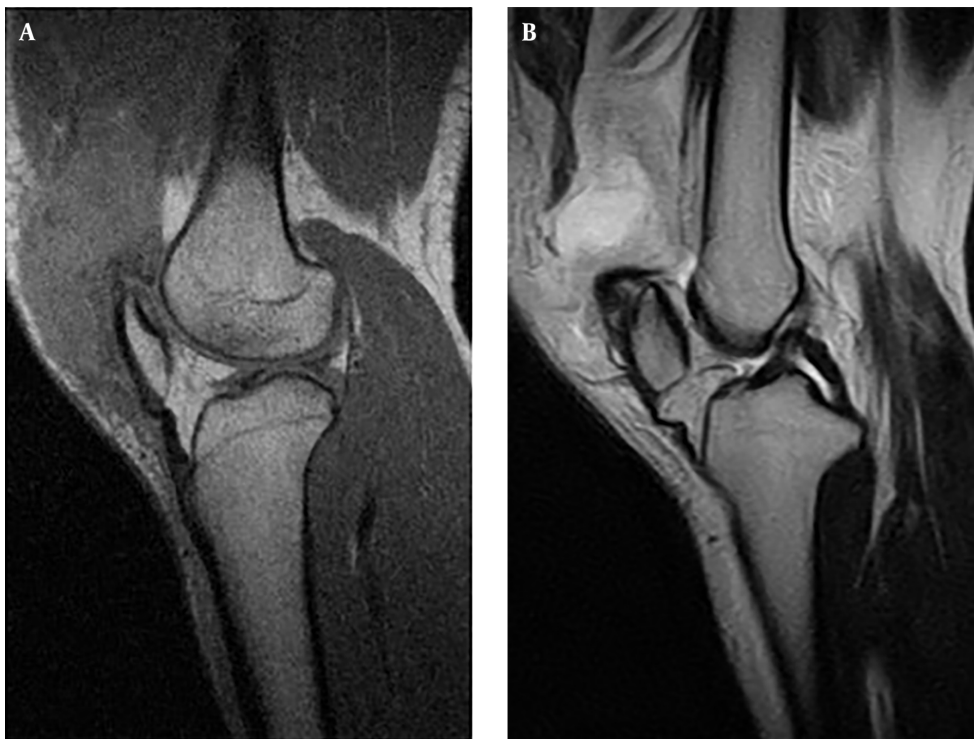


**Figure 2.** Sagittal T2 - Weighted MRI of (A) Right and (B) Left Knee Showing the Rupture of Quadriceps Tendons of Both Knees from Superior Pole of Patella

Although conclusive cause - effect cannot be established in the presented case report, the experiments on laboratory models support the adverse effects of AAS on tendon structure, especially in athletes. Partial rupture of triceps tendon in current case may further support the fact that the ruptures were caused by a predisposing factor other than trauma, most probably AAS consumption. Many of the reported AAS - associated cases involved rupture of the triceps tendon following a low - energy trauma (10).

With the recent increased consumption of AAS and since most athletes, including the clients of the current study center, use more than 1 steroid at a time, counseling is of great value to control AAS consumption by athletes. AAS users should be aware of the adverse effects of AAS such as tendon weakening that might occur with no obvious warning signs. Appropriate knowledge of AAS side effects is also necessary for physicians and pharmacists to adequately educate and guide athletes to stay away from such drugs. The information also helps the orthopaedists to identify the predisposing factor of tendon rupture in similar cases and address the case properly.

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