

Case Report

Post COVID-19 Anterior Cruciate Ligament (ACL) Tear in Twin Sisters After Re-starting Professional Futsal Exercises: A Case Report



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ABSTRACT

Awareness of the long-term COVID-19 complications is of significant importance in reducing its morbidity through the implementation of timely interventional programs. In this study, we report an anterior cruciate ligament (ACL) tear in athlete identical twin sisters almost 2 months after the COVID-19 infection. The patients had 15 years of professional futsal experience and showed no obvious risk factors for an ACL tear, such as familial history, abnormal menstruation, oral contraceptive consumption, reduced intercondylar notch, or increased tibial slope. However, they experienced a non-contact complete ACL tear within 1 month of re-participation in professional exercise after the COVID-19 infection. Both patients reported a sense of muscle weakness during the COVID-19 recovery period, and ligamentous laxity was obvious according to the clinical examination and the Beighton criteria. This report shows persistent muscle weakness after the COVID-19 infection that could increase the risk of ACL injury in female athletes and suggests taking a prophylactic rehabilitating program to prevent its catastrophic consequences.

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1. Introduction

Although coronavirus disease 2019 (COVID-19) is mainly a respiratory illness, its symptoms are not limited to the respiratory system. It is well acknowledged that COVID-19 infection is associated with multiple organ involvement and a variety of symptoms, including neuromuscular problems [1]. Some of these symptoms are long-lasting and may prolong up to 3 months after the disease onset [2]. Persistent fatigue and musculoskeletal weakness are among the most common long-term symptoms of COVID-19 [3].

An Anterior Cruciate Ligament (ACL) tear is one of the most frequent and debilitating sport-related injuries, particularly in young and active female athletes. The higher prevalence of ACL tear in females is attributable to a variety of factors, such as anatomical and hormonal differences [4]. In the context of such susceptibility, poor neuromuscular control during the COVID-19 recovery period may also increase the risk of an ACL tear in the female population [5].

In this report, we present an ACL tear in futsal player identical twin sisters after restarting the exercises almost 2 months after the COVID-19 infection.

2. Case Presentation

A 28-year-old athletic girl who was a professional futsal player with 15 years of experience was referred to our center with a left knee injury. In the history-taking session, the patient reported a 15-day quarantine period because of the COVID-19 infection, which started on August 30, 2021, and ended on September 14, 2021. The patient had a sense of muscle weakness during the COVID-19 recovery period. The patient's father died of COVID-19 on September 16, 2021. She restarted her futsal exercise on October 15, 2021. The injury occurred on November 1, 2021, during a sudden twisting movement in the air. The patient was single and in her luteal phase of the menstrual cycle. She had a normal 28- to 30-day menstrual cycle, and was not using oral contraceptive pills. The patient had no familial history of an ACL tear. The body mass index (BMI) of the patient was 21.95 kg/m².

In the physical examination, the patient had a marked reduction in the knee range of motion (ROM) (120°), while the knee ROM was full before the injury. In addition, the patient had a positive anterior drawer test, a positive pivot shift test (+3), and a positive Lachman test

(+3) performed by an orthopedic surgeon with a knee subspecialty. In the imaging evaluation, the intercondylar notch width index was 0.323 in the involved leg and 0.26 in the non-involved leg. The tibial slope was 7.8°. The involved knee had obvious genu recurvatum, while the valgus stress test was negative in the contralateral knee. Meanwhile, the Beighton score was 3. According to the physical symptoms along with the magnetic resonance imaging (MRI) findings (Figure 1a), a complete ACL tear was diagnosed and the patient underwent ACL reconstruction surgery with hamstring autograft.

After 11 days, the twin sister of the patient, who was also a professional futsal player, was referred with the same symptoms in the left leg (non-dominant leg), and an ACL tear was detected in the knee MRI (Figure 1B). The characteristic features of the twin sister were completely similar to her sister in terms of BMI, menstrual status, history of COVID-19 infection, and so on. The physical and radiographic characteristics, including the anterior drawer test, pivot shift test, the Lachman test, intercondylar notch width index, tibial slope, and the Beighton score were similar, as well (Table 1). Akin to her sister, the patient underwent ACL reconstruction surgery with hamstring autograft.

Nearly 3 months of follow-up of the patients was event-free. The patients were receiving a rehabilitation program, and no complication was recorded during the follow-up period. The patients provided written consent to use their medical data for publication.

3. Discussion

In this study, we reported a complete ACL tear in athlete twin sisters, 10 days apart, almost 2 months after the COVID-19 infection. The patients had no familial history of an ACL tear. Their menstrual cycle was normal and both ruptures occurred in the luteal phase of menstruation. The tibial slope and the intercondylar notch width index were in the normal range. However, the patients had obvious ligamentous laxity based on the Beighton criteria. Also, the patients reported a sense of severe muscle weakness (3/5) during the COVID-19 recovery period that almost regained (5/5) in the last follow-up, as the patients were athletes and had good cooperation in the postoperative rehabilitation.

The association of lower extremity muscle strength weakness with ACL tear has been reported in several studies. The study of Myer et al. observed a combination of decreased hamstring strength but not quadriceps strength in female athletes compared to males [6]. The

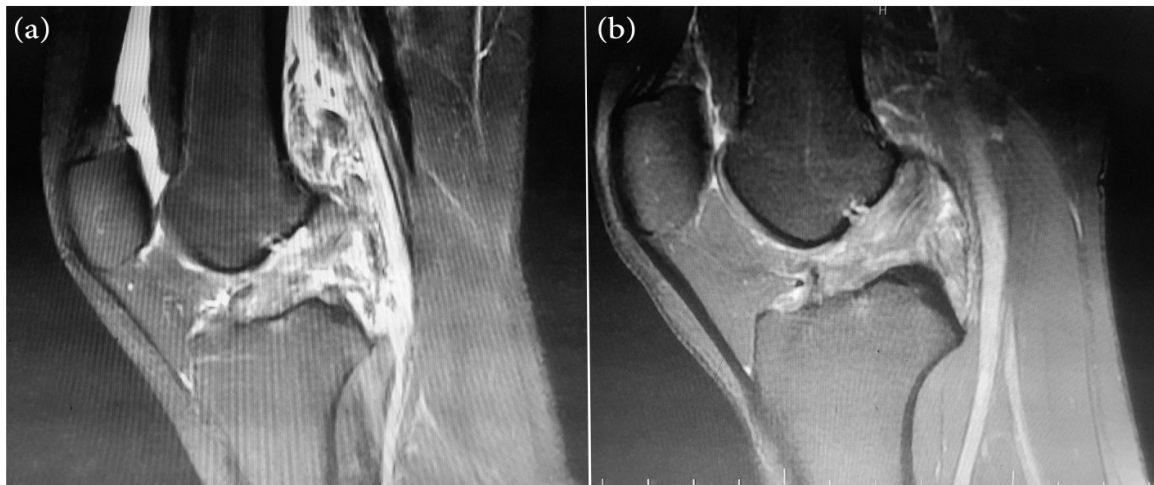


Figure 1. MRI of the Knee Showing the Rupture of ACL
A: in the first and B: the second twin sister

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study by Augustsson and Ageberg revealed that the odds of sustaining an ACL injury were 7 times higher in females with weak lower extremity muscle strength compared to males [7]. The study of Weinhandl et al. revealed a 36% increased ACL loading after fatigue-induced hamstring strength reduction [8].

Muscle weakness after COVID-19 has also been reported frequently [9-11]. Sire et al. investigated the neuromuscular impairment of knee stabilizer muscles after the COVID-19 infection. They evaluated thigh muscle activation, body composition, and physical performance after the COVID-19 infection in a series of 12 female volleyball players of the same team. Pre-activation time of thigh muscles was assessed before and after the COVID-19

infection using Bioelectrical Impedance Analysis (BIA) and jump tests. They found a significant delay in the activation time of rectus femoris, vastus medialis, biceps femoris, and medial hamstring. In addition, a significant reduction was observed in the body composition at BIA. They concluded that the neuromotor balance of the knee stabilizer muscle is impaired after the COVID-19 infection in female athletes, and this metabolic sequela should be considered to prevent musculoskeletal injuries, such as an ACL tear in high-risk patients. They also suggested designing specific neuromuscular rehabilitation protocols for this group of patients [5]. In the present report, both patients reported musculoskeletal weakness in the COVID-19 recovery period and afterward. In addition, they had obvious ligamentous laxity in the clinical

Table 1. Characteristic features of the two sisters presented with complete ACL tear almost 2 months after the COVID-19 infection

| Variable | First Sister | Second Sister |
|--------------------------------------|--------------|---------------|
| Age (year) | 28 | 28 |
| Body mass index (kg/m ²) | 21.95 | 22.6 |
| Leg dominance | Non-dominant | Non-dominant |
| Menstrual cycle (day) | 28 | 28 |
| Menstrual phase of injury | Luteal | Luteal |
| Anterior drawer test | Positive | Positive |
| Pivot shift test | 3+ | 3+ |
| Lachman test | 3+ | 3+ |
| Valgus stress test | Positive | Positive |
| Intercondylar notch width index | 0.323 | 0.3 |
| Tibial slope (°) | 7.8 | 9.4 |
| Beighton score | 3 | 3 |
| Meniscus injury | Negative | Negative |

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cal examination and according to the Beighton criteria. Therefore, the ACL tear in our patients could be attributed to persistent COVID-19 neuromuscular impairment.

Jafari-Nodoushan et al. investigated the prevalence of musculoskeletal disorders among faculty members of Yazd University before and after the COVID-19 pandemic. According to their report, after the spread of COVID-19, musculoskeletal disorders significantly increased in most organs. The majority of the musculoskeletal disorders during the COVID-19 outbreak were in the back, neck, and knees. The frequency of knee injuries for the 3 different campus members increased from 42%, 31%, and 37% to 54%, 44%, and 49%, respectively. Considering the lower participation of the population during the COVID-19 period, a reduced rate of musculoskeletal injuries could be expected. However, the rate of musculoskeletal injuries increased during this period, and this increase could be attributed to the detrimental effect of COVID-19 infection on the musculoskeletal system [12]. The present report also confirms the higher rate of ACL injury after the COVID-19 infection. Therefore, it is necessary to raise awareness regarding the long-term complications of COVID-19 to reduce its catastrophic consequence, particularly in female athletes.

Altogether, the results of the present study suggest an association between COVID-19 muscle weakness and increased risk of ACL injury in female athletes, even months after the infection. Therefore, prophylactic rehabilitating programs are recommended before re-participation in professional athletic activities after the COVID-19 infection.

Ethical Considerations

Compliance with ethical guidelines

There were no ethical considerations to be considered in this research.

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Authors' contributions

All authors equally contributed to preparing this article.

Conflict of interest

The authors declared no conflict of interest.

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