



# Concurrent medial and lateral bucket handle meniscal tear repair in a chronic anterior cruciate ligament-deficient knee: a case report

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**Abstract:** Bucket handle meniscus tears (BHMTs) are seen in the active population, especially young athletes. They often occur with anterior cruciate ligament (ACL) injury, causing significant knee symptoms and affecting the patients' quality of life. All-inside meniscus repair can be effective in the treatment for BHMT to improve symptoms and to preserve the native meniscus. We report a case of a 25-year-old female retired soccer player who presented with a three-year history of right knee pain, swelling and instability. She was diagnosed with BHMT of medial and lateral menisci and complete tear of the ACL on magnetic resonance imaging (MRI). She underwent arthroscopic medial and lateral meniscus repair with concomitant ACL reconstruction. Both the medial and lateral BHMT were reduced and repaired using an all-inside meniscus repair. We present her examination findings, functional outcomes and radiological imaging pre-operatively and 6 years post-operatively, which show an intact and stable ACL graft and repaired medial and lateral menisci with minimal progression to knee osteoarthritis. This shows that with good reduction and fixation, all-inside meniscus repair can achieve good mid-term results for the repair of bicompartamental chronic bucket handle tears.

**Keywords:** Bucket handle meniscus tear (BHMT); all-inside meniscus repair; anterior cruciate ligament (ACL) reconstruction

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## Introduction

Bucket handle meniscus tear (BHMT) can cause symptoms such as knee pain, locking, instability, joint swelling and reduced range of motion (1-3). The incidence of meniscus injuries in patients with anterior cruciate ligament (ACL) tears is as high as 63%, with higher incidence rates in the young, active population (4,5). The evidence suggests that acute ACL tears are associated with lateral meniscus injury, while chronic ACL tears are associated with medial meniscal injury (5). The goal of meniscus repair is to improve symptoms and restore the

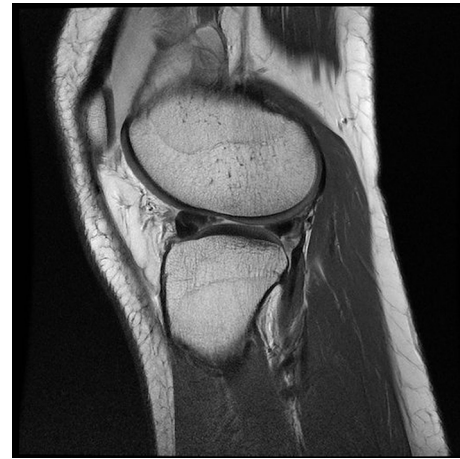
biomechanics of the knee joint with preservation of the native meniscus (6). As BHMTs tend to occur in young athletes, it is imperative that meniscus repair should be attempted for joint preservation.

We report a case of a young, retired competitive soccer player who had undergone all-inside repair of bicompartamental BHMT and concomitant ACL reconstruction. We show her radiological imaging pre-operatively and 6 years post-operatively. We present the following case in accordance with the CARE reporting checklist (available at <https://aoj.amegroups.com/article/view/10.21037/aoj-21-20/rc>).

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**Figure 1** Preoperative MRI of right knee (sagittal T1-weighted proton density turbo spin echo) showing displaced fragment of medial meniscus. MRI, magnetic resonance imaging.



**Figure 2** Preoperative MRI of right knee (sagittal T1-weighted proton density turbo spin echo) showing anterior flipped fragment sign of lateral meniscus bucket handle tear. MRI, magnetic resonance imaging.

### Case presentation

A 25-year-old female retired soccer player initially presented with right knee pain, swelling and instability. The patient mentioned that her right knee had multiple episodes of giving way and locking over three years but she had not sought treatment and continued playing soccer. Her symptoms worsened with increasing frequency of knee pain and instability over the previous few months.

On physical examination, she had full knee extension. The Lachman test and anterior drawer test were grade 2+ and there was an explosive pivot shift, indicating significant knee laxity (7,8). The examination of the knee collateral ligaments was normal. The pre-surgery Lysholm score was 45 and the subjective IKDC was 40.2.

The pre-operative magnetic resonance imaging (MRI) of the right knee revealed bucket handle tears of both menisci. The extensive medial meniscus tear was displaced in the intercondylar notch. The lateral meniscus body and posterior horn tear yielded a displaced meniscus fragment that flipped over its anterior horn. There was an associated complete tear of the ACL (*Figures 1,2*).

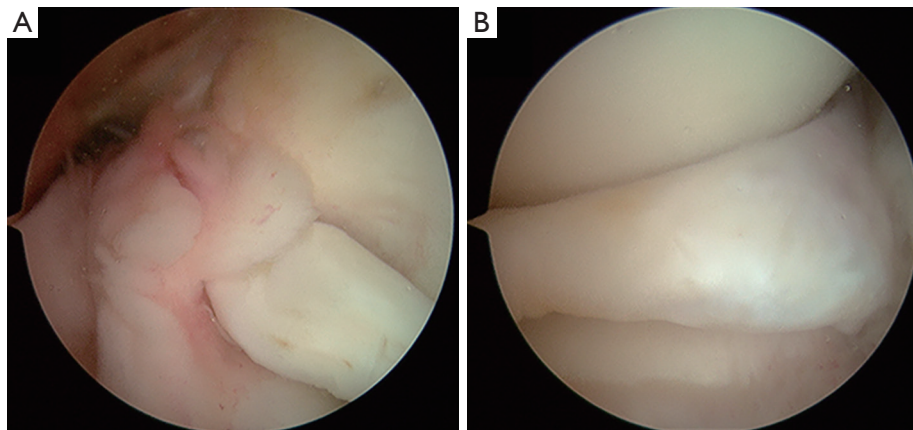
The patient underwent medial and lateral meniscus repair with concomitant ACL reconstruction. The complete ACL tear and displaced medial and lateral bucket handle tears was confirmed on arthroscopy (*Figure 3*). The medial and lateral meniscus tears had features of chronicity with rolled up meniscus edges. There was scar tissue present in the gutter between the displaced fragment and the

peripheral capsular tissue that prevented reduction of the meniscus fragment. This scar tissue required release prior to reduction. The quality of both menisci tissue was good and amenable to repair sutures.

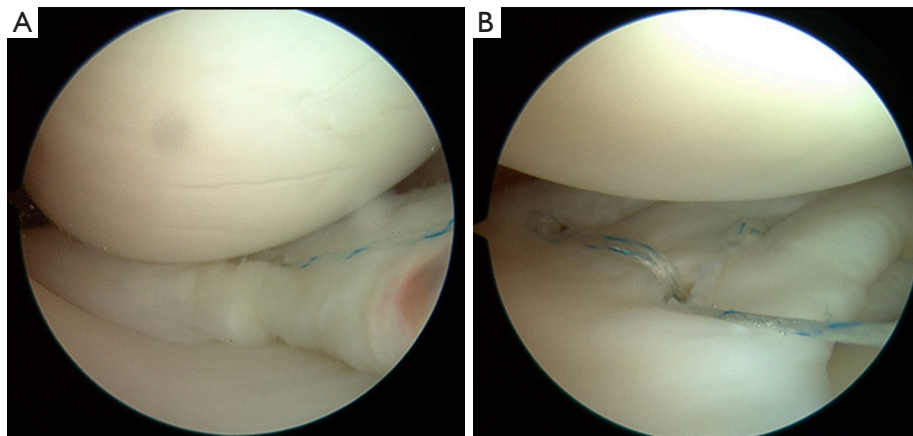
Both medial and lateral BHMT were reduced and repaired using an all-inside repair with FAST-FIX 360 (Smith & Nephew, London, UK) (*Figure 4*). Six all-inside devices were used to repair the medial meniscus and another six all-inside devices were used to repair the lateral meniscus. The ACL was a four-strand hamstring ACL reconstruction with transportal femoral tunnel drilling. The graft was fixed on a femoral cortical button and a tibia interference screw and backed up with a washer screw.

After surgery, the patient was placed on non-weight bearing for 3 weeks, then touch down weight bearing for 3–6 weeks. She was allowed full weight bearing after 6 weeks. The patient was placed in a knee brace that limited the knee range of motion from 0–90 degrees for 6 weeks postoperatively. She was allowed full range of knee motion after 6 weeks. Stationary bicycle and elliptical machine exercises were commenced after 8 weeks from surgery. Jogging was allowed only 6 months after the surgery when strength symmetry was recovered. She was followed up in our outpatient clinic with good recovery of range of motion and lower limb strength. The patient was able to return to playing soccer at a recreational level after 18 months.

At 2 years post-operatively, follow-up MRI showed an



**Figure 3** Arthroscopic picture of right knee, viewing from anterolateral portal, showing displaced chronic bucket handle tears with rolled-up edges of (A) medial meniscus, and (B) lateral meniscus.



**Figure 4** Arthroscopic picture of right knee, viewing from anterolateral portal, showing repair with all-inside technique of (A) medial meniscus, and (B) lateral meniscus.

intact ACL graft as well as stable repair with no interval displaced re-tear of the medial and lateral menisci. The patient was asymptomatic and able to continue recreational soccer. The 2-year postoperative Lysholm score was 88 and the subjective IKDC score was 92.

At 6 years after surgery, on physical examination, the patient had full range of knee motion. Her knee anterior drawer test, Lachman test and pivot shift test were negative. The 6-year postoperative Lysholm score was 85 and subjective IKDC score was 88.

The MRI of the right knee at 6 years shows that the ACL graft was intact, and the repaired medial and lateral menisci were stable (*Figures 5-7*). The meniscus fissures

and post-surgical scarring in the menisci were noted, with no re-displacement of the repaired fragment. The cartilage surfaces in both compartments of the knee were preserved. The 6-year repeat knee radiograph also showed minimal progression to knee osteoarthritis (*Figure 8*).

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee(s) and with the Helsinki Declaration (as revised in 2013). Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the editorial office of this journal.





**Figure 5** Six-year postoperative MRI of right knee (sagittal T1-weighted proton density turbo spin echo) showing stable reconstruction of the ACL. MRI, magnetic resonance imaging; ACL, anterior cruciate ligament.



**Figure 7** Six-year postoperative MRI of right knee (sagittal T1-weighted proton density turbo spin echo) showing stable repair of the posterior horn lateral meniscus. MRI, magnetic resonance imaging.



**Figure 6** Six-year postoperative MRI of right knee (coronal T1-weighted proton density turbo spin echo) showing stable repair of medial meniscus. MRI, magnetic resonance imaging.



**Figure 8** Six-year postoperative right knee radiograph (anteroposterior view) showing stable implants with no osteoarthritic changes.

## Discussion

Simultaneous bicompartamental BHMTs were first described by Brammer *et al.* in 1999 as the “Jack and Jill lesion” (9). They remain a rare entity within the literature (1-3,6,9-15). The average age of the patients was 27.6 years old.

The MRI plays a crucial role in pre-operative evaluation and diagnosis of BHMTs. Radiological signs of BHMTs include: absent bow tie sign (3), double posterior cruciate ligament (PCL) sign (1,3,12), fragment-in-notch sign (1,3,13,16), coronal truncation sign (3,13), anterior flipped fragment sign (17), double delta sign (1,3,12,16), quadruple cruciate sign (3,12,16,18). MRIs are accurate in diagnosing BHMTs when two or more of the first five signs are present (17). In nine previous bicompartamental BHMT reports with pre-operative MRIs performed (1-3,10,12), all cases demonstrated at least one established radiological sign of BHMT. Bugnone *et al.* defined the “quadruple cruciate sign” to describe the appearance of the ACL and PCL and the displaced medial and lateral BHMT fragments seen in the intercondylar notch on coronal images (1). The pre-operative MRIs of our patient were positive for fragment-in-notch sign and anterior flipped fragment sign (Figures 1,2).

To our knowledge, this case report is the first to report on mid-term results after bicompartamental BHMT repairs with clinical outcomes and a 6-year post-operative MRI. The follow-up for previous bicompartamental BHMT case reports were up to 2 years post-surgery, with results based on clinical symptoms (3,10,13-15). In our patient, there was a 47% improvement in Lysholm score and a 54% improvement in subjective IKDC score 6 years post-surgery.

In terms of the duration from injury to surgical treatment, Zabrzyński *et al.* and Shepherd *et al.* both reported patients with BHMT treated 2–3 years after their injuries (2,6). Our patient presented with a three-year history of occasional knee instability and locking. She had sustained the ACL injury and probably sustained the medial BHMT first. The rolled-up appearance of the medial BHMT displaced fragment suggests significant chronicity and made the reduction of the meniscus fragment challenging. A new injury a few months prior could have caused the lateral BHMT. Chronic BHMT results in difficulties in meniscus reduction due to tissue scarring and these have to be addressed prior to reduction. Anatomical reduction of the meniscus fragment has to be followed by

good and stable fixation with meniscus sutures, using inside-out, outside-in techniques or all-inside meniscus repair devices.

The meniscus repair in our case report was performed using FAST-FIX 360 (Smith & Nephew, London, UK), an all-inside meniscal repair device. Compared to current gold-standard inside-out meniscus repair, all-inside meniscus repair has the advantages of reduced surgical time, requires less assistance during surgery and lower risk to neurovascular structures (18). Various studies have concluded that all-inside meniscus repair is effective for meniscal repairs, with high success and low complication rates (16,18).

An important predictive criterion for successful repair of BHMT is the rim width. A rim width of 3 mm or less in the red-red zone has the highest healing rate after repair due to the greater vascularity (19). Other factors that can influence success include the location, length and chronicity of tear, fragment reducibility and age of the patient (18). Our patient was young, and tears in both menisci were in the peripheral vascular zones. Despite the chronicity of the injury, with adequate reduction and good fixation, a successful result was achieved.

The functions of the menisci are for load transmission, providing joint stability (both in anterior-posterior and rotational stability) and joint lubrication. These functions will be compromised after partial meniscectomy and can contribute to accelerated knee degeneration (20). The bicompartamental meniscus repair in our patient has helped to preserve the cartilage status in her knee at six years after surgery as seen on MRI and no knee osteoarthritis changes seen on radiograph. Another important learning point is that the finding of high-grade knee laxity on examination should raise the suspicion of BHMT in conjunction with an ACL injury. This has been shown where high grade knee laxity on physical examination is associated with large significant meniscus tears (7,8).

In conclusion, we report a case of a young retired soccer player who had undergone ACL reconstruction and all-inside repair of bicompartamental bucket handle meniscal tears. We present her functional outcomes and radiological imaging pre-operatively, at 2 years and 6 years post-operatively, which show intact and stable ACL graft and repaired menisci. This case report shows that with good reduction and fixation, all-inside meniscus repair can achieve good mid-term results for the repair of

bicompartmental chronic bucket handle tears.

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## Footnote

*Reporting Checklist:* The authors have completed the CARE reporting checklist. Available at <https://aoj.amegroups.com/article/view/10.21037/aoj-21-20/rc>

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*Ethical Statement:* The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee(s) and with the Helsinki Declaration (as revised in 2013). Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the editorial office of this journal.

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