



Case report

Both medial and lateral bucket-handle meniscus tears associated with chronic ACL injury: A rare presentation of triple-PCL sign

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ABSTRACT

Background: Several types of meniscal tear could be presented in both acute and chronic anterior cruciate ligament injury. The incidence of bucket-handle meniscus tears can be up to 30% of the overall meniscus tears cases. The case of both compartment (medial and lateral) bucket-handle meniscus is rarely occurred.

Case: A case of both medial and lateral bucket-handle meniscus tears was reported in a male of 21 years old. The patient also had a chronic anterior cruciate ligament injury. The magnetic resonance imaging also showed a rare presentation of the triple-PCL sign with the sagittal view. Arthroscopic surgery with a meniscus repair and anterior cruciate ligament reconstruction was performed on the patient.

Conclusions: Several specific imaging signs including triple-PCL sign could be presented in a rare case of both medial and lateral bucket-handle meniscus tears. Recognition of this sign is important to have accurate preoperative diagnosis and proper treatment plan.

1. Introduction

Meniscus tears occurred in association with knee ligamentous injury such as an anterior cruciate ligament (ACL) [1]. Several types of meniscal tears are presented in acute or chronic anterior cruciate ligament injury, which ranged from simple to complex bucket-handle tear [1,2]. Bucket-handle occurred when a vertical longitudinal tear in the meniscus displaced evenly into the respective medial or lateral compartment and caused symptoms such as pain, perceived instability, and mechanical locking [3].

The incidence of bucket-handle meniscus tears is approximately 30% of the overall cases [4]. It can be associated with or without cruciate ligament injury [5,6]. Specific findings on magnetic resonance images such as the double- and triple-PCL sign, as well as triple- and quadruple-cruciate signs could be presented in this case [7,8,9]. In this paper, a simultaneous medial and lateral bucket-handle meniscus tear case associated with an anterior cruciate ligament injury and a rare triple-PCL sign on magnetic resonance imaging were reported. The patient has been informed before this publication. The work has been reported in line with the SCARE criteria [10].

2. Case report

A 21 years-old male came to the clinic with a major complaint of right knee pain which had occurred 1 year ago. The pain was severe when the patient walked and performed deep knee flexion. He also had several histories of catching and locking. The patients walked without an assistive device but have difficulty when performing jogging and running. Physical examination revealed positive tenderness on the medial and lateral joints, which was also shown with the McMurray tests. The knee joint had difficulty obtaining full flexion due to pain at the posterior site, while stability tests revealed a positive Lachman and anterior drawer. In this case, pivot-shift test and stability test for another ligament were negative. Plain knee radiograph showed no abnormality in the bone structure.

Magnetic resonance imaging (MRI) revealed several signs of meniscus tears. The sagittal view of T2-weighted MRI showed signs of tears at the anterior and posterior horn of medial and lateral that support the bucket-handle meniscus tears. Furthermore, the view on the midline showed an absence of anterior cruciate ligament structure as well as the double and triple-PCL signs (Fig. 1A, B). The coronal view also showed

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the displaced medial and lateral meniscus together with the normal PCL and absence of ACL structure with the triple-cruciate sign (Fig. 1C).

The patient had an arthroscopic surgery after being informed and was positioned supine under spinal anesthesia and tourniquet with knee joint on the table. The arthroscopy procedure was performed with standard anterolateral and accessory anteromedial portals. During the first view of arthroscopy diagnostic, it was shown that the displaced medial and lateral meniscus bucket-handle tear together with the tibial site anterior cruciate ligament remnant (Fig. 2A-D), while no cartilage tear was encountered. Furthermore, the reposition of the medial and lateral meniscus, as well as repairs, were performed, while the anterior cruciate ligament reconstruction was carried out with the use of a 9 mm semi-tendinous graft. Graft fixation was performed with an adjustable juxtacortical suspension device (PULLUP®, Sciences & Bio Material (SBM), France) on the femoral and tibial tunnel (All-inside technique).

3. Discussion

The most common both compartment bucket-handle meniscus tears cases that have been reported were in association with an ACL injury [6–8,12–15], however, it also occurred in an intact anterior cruciate-ligaments in some cases [5,9,11]. In this study, the bucket-handle meniscus tears were associated with a chronic ACL injury, and the patient also had a history of knee injury 1 year ago. An initial MRI examination was not performed. Therefore, it could not be determined whether the meniscus tears occurred at the initial knee injury or involving a chronic process.

In previous studies, several signs were presented on MRI of the knee in a case of both compartment bucket-handle meniscus tears. The classic double-PCL sign was most commonly presented in the previous cases [5–7,13,15]. The triple-PCL sign was rarely presented in this particular case. To the best of our knowledge, it has only reported in three previous cases [8,16,17]. The triple-PCL sign was first reported in 2010 by Kakel *et al* [8] on a 16 years old male knee MRI that had both compartment bucket-handle meniscus tears with the acute ACL injury. Furthermore, Sales *et al* [17] reported a triple-PCL sign on MRI of a 16 years-old male with both compartment bucket-handle meniscus tears associated with an acute ACL injury. Guillaume *et al* [16] also reported a triple-PCL sign on a knee CT-arthrography of a female 37 years old with a chronic ACL

injury and both compartment bucket-handle meniscus tears. The triple-PCL sign will show when there was an overlapped medial and lateral meniscus bucket-handle tears in the intercondylar notch. The comparisons between the cases are presented in Table 1.

Another rare finding on the case of both compartment bucket-handle meniscus tears cases were the triple-cruciate sign and the quadruple-cruciate sign [7,17]. In this study, the meniscus tears were associated with a chronic ACL injury, therefore, the presented finding in coronal MRI was the triple-cruciate sign. The sign has also been reported in a case of both compartment bucket-handle meniscus tears by Sales *et al*. [17] The sign consists of the structure of displaced medial and lateral meniscus with the normal PCL on coronal notch view of knee MRI. In the other hand, the quadruple-cruciate sign comprises the structure of displaced medial and lateral meniscus along with the normal/remnant of ACL and PCL on knee MRI coronal notch view. The sign has been previously reported by Bugnone *et al* on coronal knee MRI of the patient with both compartment bucket-handle meniscus tears [7].

4. Conclusions

Several specific imaging signs including triple-PCL sign could be presented in a rare case of both medial and lateral bucket-handle meniscus tears. Recognition of this sign is important to have accurate preoperative diagnosis and proper treatment plan.

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None to disclose.

Ethical approval

The paper has been approved by Hospital Ethical committee.

Consent

Informed consent to the patient has been performed prior to this publication.

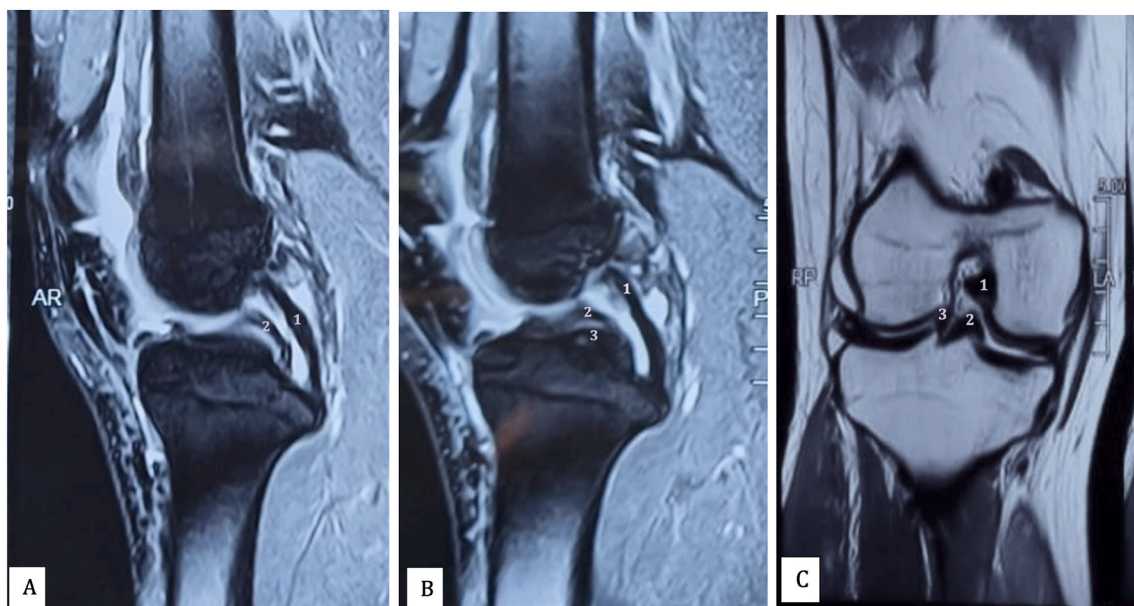


Fig. 1. Magnetic resonance image (MRI) findings. A. Sagittal T-2 weighted showed the “Double-PCL sign” B. T-2 weighted showed the “Triple-PCL sign” on another sagittal slice, C. Coronal view of T-2 weighted showed the femoral notch with displaced meniscus (Triple-cruciate sign). (1 = normal PCL, 2 = flipped medial meniscus, 3 = flipped lateral meniscus).

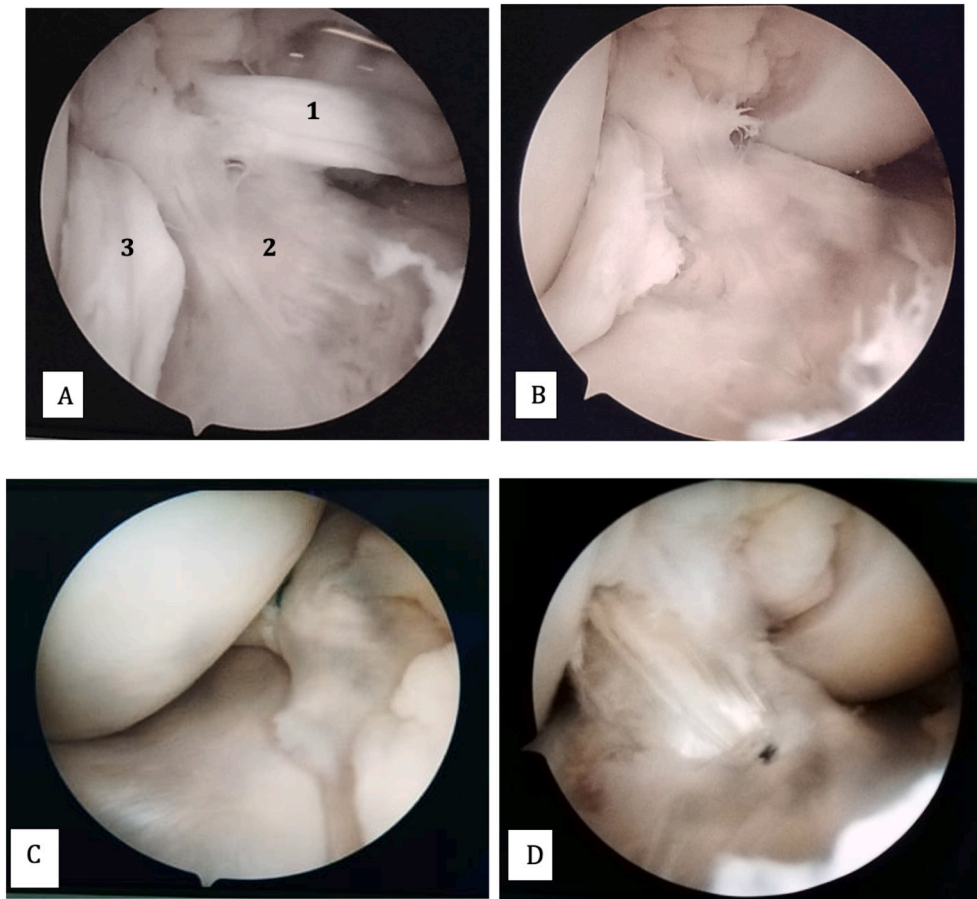


Fig. 2. Intraoperative findings. **A.** Displaced both medial and lateral bucket-handle meniscus tears (1 = flipped medial meniscus, 2 = ACL remnant, 3 = flipped lateral meniscus, **B.** After medial meniscus reposition (Lateral meniscus still displaced), **C.** After Repair of medial meniscus, **D.** After completed procedure with ACL-reconstruction.

Table 1
Presentation of the Triple-PCL sign in the previous case reports.

No	Authors	Gender/age (years)	Initial injury	Associated injury	Imaging/specific signs
1	Kakel et al (2010) [8]	Male/ 16	8 weeks	ACL tear	MRI/Triple-PCL sign, Quadruple-cruciate sign
2	Guillaume et al (2021) [16]	Female/ 37	unknown	ACL tear	CT Arthrography/ Triple-PCL sign
3	Sales et al (2021) [17]	Male/ 16	10 months	ACL tear, Femoral condyle chondromalacia	MRI/Triple-PCL Sign, Triple-cruciate sign
4	Present case	Male/ 21	12 months	ACL tear	MRI/Double-PCL sign, Triple-PCL Sign, Triple-cruciate sign

Research registration

None.

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CRediT authorship contribution statement

Asep Santoso: Perform surgery, concept, and writing the paper.
 Cakradenta Yudha Poetera: writing the paper, English checking.
 Hasmeinda Marindratama: Data collection and clinical evaluation.
 Jiva Yori Anugrah: Data collection, and clinical evaluation.
 Iwan Budiwan Anwar: Manuscript review.
 Tangkas SMHS Sibarani: Manuscript review.

Declaration of competing interest

None to disclose.

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