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Case Report

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Bilateral symptomatic ring-shaped meniscus: a case report

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ABSTRACT

Discoid meniscus is the most common meniscal anatomical variant, affecting almost exclusively the lateral meniscus. Ring-shaped meniscus is an extremely rare meniscal variant in which there is an intermeniscal bridge between the anterior and posterior horns, forming a complete ring. Ring-shaped meniscus is generally asymptomatic and found incidentally. We present the case of a 16-year-old male who presented with bilateral mechanic knee pain associated with positive meniscal tests. Arthroscopic surgery was performed and ring-shaped lateral meniscus with complex tears were identified in both knees. Partial lateral meniscectomies were performed on both knees and hay-bale mattress sutures were used to preserve the remnant lateral meniscus of the left knee. After surgery, the patient obtained good outcomes with regards to pain and mechanical symptom relief. To our knowledge this is the first reported case of bilateral symptomatic ring-shaped meniscus. The reported case demonstrates that complex ring-shaped lateral meniscus tears can be successfully addressed with arthroscopic surgery.

Keywords: Arthroscopy, Anatomical variant, Discoid meniscus, Ring meniscus, Meniscus

INTRODUCTION

Discoid meniscus is the most common meniscal anatomical variant, affecting almost exclusively the lateral meniscus.[1] Watanabe described three types of discoid meniscus: complete, incomplete and the Wrisberg-ligament variant.[2] Ring-shaped meniscus is an extremely rare meniscal variant with an estimated prevalence of 0.9% and can be defined as a meniscus in which there is an intermeniscal bridge between the anterior and posterior horns, forming a complete ring.[3-5] The first report of a congenital ring meniscus was reported by Noble in 1975, found by chance in an autopsy and associated with a congenital absence of the anterior cruciate ligament.[6] Monllau et al reported the first case of a ring-shaped meniscus without other associated malformations and described it as a forth type of discoid meniscus.[3] Ring-shaped meniscus is generally asymptomatic and found incidentally, although there have been some reports of symptomatic ring-shaped meniscus.[7,8] Despite mostly described as a congenital abnormality, some authors consider that the etiology of this meniscal variant can also be posttraumatic and/or iatrogenic.[9,10]

CASE REPORT

We report the case of a previously healthy 16-year-old male who presented with bilateral symptomatic ring-shaped meniscus tears, successfully addressed through arthroscopic surgery. The patient initially reported bilateral mechanical knee pain for a period of five months. There was no sprain or direct trauma associated with the beginning of the pain. The pain intensified during activities such as climbing stairs, running, and particularly when squatting. Clinical examination showed bilateral quadriceps muscle atrophy, moderate joint effusion and meniscal tests were painful in the lateral joint line. Furthermore, a mass was palpable in the proximal medial

tibia at the level of hamstring's insertion on the left knee. The signs and symptoms were more exuberant on the right knee. The Magnetic Resonance Imaging (MRI) revealed joint effusion associated with a complex lateral meniscal tear on both knees. In the left knee, a proximal tibia metaphysis posteromedial pedunculated osteochondroma in intimate relation with the gracilis tendon was identified. The lateral meniscus complex tear was described as having a partial radial component between the body and anterior horn and a horizontal tear in the anterior horn with an associated anterolateral parameniscal cyst (Figure 1). The right knee MRI report made reference to a complex lateral meniscus tear with an image compatible with a flap tear in the posterior horn (Figure 2).

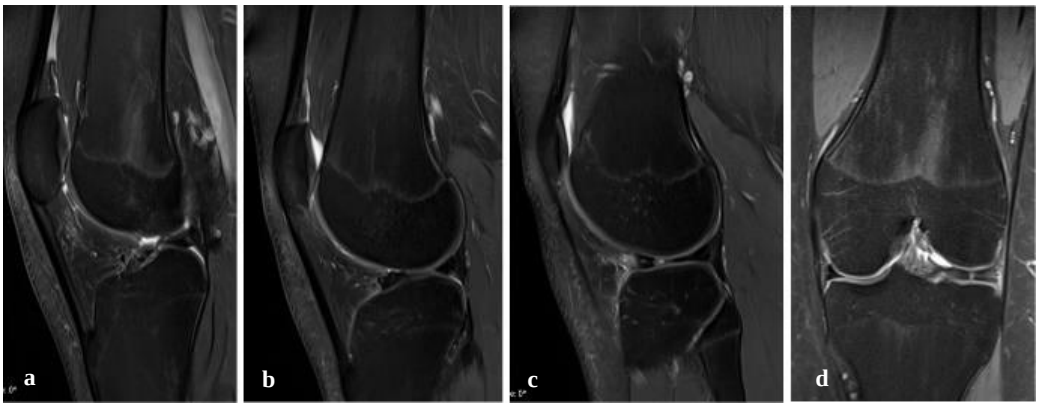

Figure 1 (a-d): Left knee magnetic resonance imaging.

Figure 2 (a-d): Right knee magnetic resonance imaging.

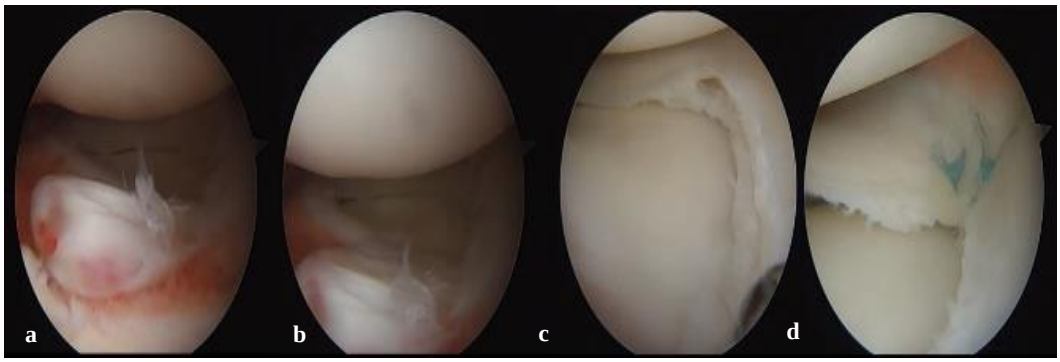

Figure 3 (a-d): Left knee arthroscopy.

Bilateral surgical treatment was performed, beginning with the left knee. A direct medial approach under fluoroscopic control was used to excise the osteochondroma. Subsequent bilateral arthroscopy unveiled synovitis and ring-shaped lateral meniscus with complex unstable tears in both knees (Figures 3 and 4). On the left knee the complex meniscal tear with a horizontal component was observed and a partial meniscectomy was performed, preserving the peripheral meniscus which was stabilized with an all-inside “hay bale” suture after meniscal rasping (Figure 3).

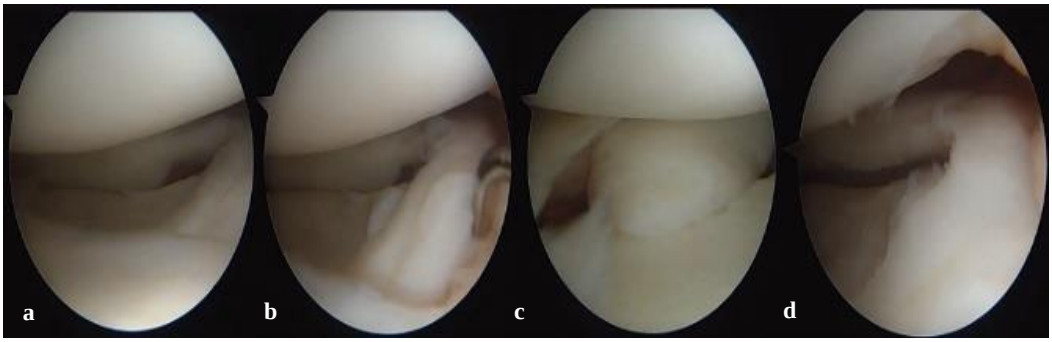

Figure 4 (a-d): Right knee arthroscopy.

Finally, intercondylar notch microfractures were made in order to enhance healing. The arthroscopic approach of the right knee revealed a complex lateral meniscus tear with an inverted flap associated with a lateral tibial plateau chondral lesion (grade II-III Outerbridge) (Figure 4). A partial lateral meniscectomy with regularization of the preserved meniscus and shaving of the chondral lesion were performed.

After the surgery the patient had a favorable evolution, with full range of motion and residual effusion and pain at the 6 weeks postoperative visit. At three and a half months of follow-up the patient was asymptomatic, had resumed normal life with normal gait, no effusion and with negative meniscal tests. No complications were observed with more than 1 year of follow-up.

T2 images from Magnetic Resonance of the left knee (from left to right), Interhorneal bridge visible in sagital image, altered signal of anterior horn of lateral meniscus on sagittal image, complex lateral meniscus tears visible on sagital and coronal images.

T2 images from Magnetic Resonance of the right knee, from left to right, Coronal image showing posterior horn meniscal tear; interhorneal bridge visible in sagital image, the last two images show tear with an inverted flap.

From left to right, first two images showing the ring-shaped lateral meniscus, Complex lateral meniscus tear with horizontal component, Lateral meniscus after partial meniscectomy and all-inside circumferencial compression suture.

From left to right, first two images depict the ring-shaped lateral meniscus with evident bridge between anterior and posterior horns, Complex lateral meniscus tear with posterior flap, Lateral ring-shaped meniscus after partial meniscectomy.

DISCUSSION

To our knowledge this is the first reported case of bilateral symptomatic ring-shaped meniscus. Given the very low prevalence of this anatomical variant we believe the reported case can give further information about the ring-shaped meniscus and help to recognized this rare entity.

We found four other cases of symptomatic ring-shaped meniscus in the literature, all in the pediatric population and without associated trauma.[7,8,11,12] In three of those cases a meniscal cyst was the main cause of the symptoms and the patients were treated with arthroscopic partial lateral meniscectomy and intra-articular cyst debridement.[7,8,12] In the fourth case, the arthroscopy revealed a double-layered lateral meniscus and the accessory meniscus was a ring-shaped meniscus which was excised.[11] In the four reported cases the patients experienced full functional recovery and resolution of symptoms.

As we are aware of the long term expected consequences of the reduction of meniscal tissue in the lateral compartment, we aimed to preserve the maximal amount of lateral meniscus tissue by repairing the lateral meniscus of the left knee. The degenerative changes of the meniscus associated with the structural alterations of this anatomical variant motivated the decision to perform contained partial meniscectomies, preserving the peripheral two thirds of the lateral meniscus on both knees.

It is important to recognize and distinguish the ring-shaped meniscus variant from other malformations and meniscal tears. In the differential diagnosis it is important to distinguish a ring-shaped meniscus from a bucket handle tear. The clinical history and examination give some valuable information. MRI is an important tool to distinguish the two entities, and should be careful examined by the orthopedic surgeon and an experienced radiologist. The “mirror sign” and the “central bow tie sign” have been described in the diagnosis of ring-shaped meniscus and should be distinguished from the typical bucket handle tear signs.[5] Arthroscopy is the gold standard for the ring-shaped meniscus diagnosis, where a fixed inter-horn meniscus tissue bridge close to the notch can be seen, distinctively from a displaced bucket handle tear which is generally mobile.

The age of the patient, the absence of trauma and the bilateral meniscal variant support the congenital etiology for the ring-shaped meniscus. The degenerative changes

and the occurrence of complex bilateral atraumatic lateral meniscus tears in a young patient support the inclusion of the ring-shaped meniscus in the discoid meniscus classification. In fact, the ring-shaped meniscus probably exhibits similar structural and histologic differences as seen in the other types of discoid meniscus which make this anatomical variant more susceptible to tears.[1,13]

Ring-shaped meniscus is a rare and usually asymptomatic anatomic variant. To our knowledge this is the first reported case of bilateral symptomatic ring-shaped meniscus. It is important to recognize and distinguish this variant from other malformations and meniscal tears. The reported case demonstrates that complex ring-shaped lateral meniscus tears can successfully be treated with an arthroscopic partial meniscectomy with or without associated suture.

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