Rapid Meniscal Degeneration after Arthroscopic Saucerization for Discoid Lateral Meniscus without Tear: A Case Report

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Abstract
We present a case of rapid meniscal degeneration after arthroscopic saucerization for discoid lateral meniscus in a 17-year-old baseball player. He was diagnosed posterior cruciate ligament injury and discoid lateral meniscus (DLM) without degeneration or tear by magnetic resonance imaging (MRI). We performed arthroscopic saucerization with the aim to preserve as much meniscal function as possible before it injures. Two and a half months after saucerization, he sprained his right knee and presented with knee pain. MRI and arthroscopy revealed a radial tear of the middle segment of the remaining lateral meniscus, meniscal degeneration and horizontal cleavage around the tear site. These findings were not seen at the initial operation. Subtotal meniscectomy was performed and 3 mm of the peripheral rim was preserved. MRI of three months after re-operation showed subchondral bone marrow edema in the lateral tibial condyle. Six months after re-operation, he was unable to resume satisfactory sports activity because of persistent knee pain during training. We do not recommend saucerization for asymptomatic DLM without tear. It may not have an effect preventing subsequent meniscal injury.

ABBREVIATIONS
DLM: Discoid Lateral Meniscus; LM: Lateral Meniscus; PCL: Posterior Cruciate Ligament; MRI: Magnetic Resonance Imaging

INTRODUCTION
Discoid lateral meniscus (DLM) is a relatively rare morphologic abnormality of the lateral meniscus (LM). The true incidence of DLM remains undefined because symptoms are often absent. Watanabe et al. [1], classified discoid meniscus into three types according to the arthroscopic appearance: type I for complete discoid meniscus, type II for incomplete discoid meniscus, and type III for unstable discoid meniscus caused by absence of the posterior meniscotibial ligament (Wrisberg-ligament type). It is thought that abnormal shape and thickness, disorganized collagen fibers and abnormal meniscal motion of the discoid meniscus are associated with the increased incidence of meniscus tears [2,3].

The importance of meniscal functions such as shock absorber and load distributors of the knee joint is well accepted [4,5]. Some authors have reported more frequent arthritic changes after subtotal meniscectomy for DLM than after partial meniscectomy [6,7]. Therefore, recent literature promotes meniscal preservation with arthroscopic saucerization, which is resection of the central portion of the discoid meniscus, leaving behind a peripheral rim of 6 to 8 mm of the meniscus, in conjunction with stabilization of the remnant rim by suture repair when peripheral tear is present [6,8-10]. However, DLM can be susceptible to severe degeneration or complex tears with degenerative horizontal tear or radial tear [2,3,11], and total or subtotal meniscectomy is inevitable in some menisci. Hence, DLM without tear should probably be reshaped in the form of a normal meniscus before DLM injury to preserve as much function as possible. We report a case of a patient who developed a radial tear with degeneration in the middle segment of LM only two months after arthroscopic saucerization.

CASE PRESENTATION
In June 2015, a 17-year-old boy presented with right knee pain after his knee hit on the ground while he was playing baseball. A few days later, an orthopedist at an unaffiliated practice diagnosed posterior cruciate ligament (PCL) injury and DLM by magnetic resonance imaging (MRI). The orthopedist informed him that DLM often leads to meniscal injury, and recommended him arthroscopic saucerization before injury. Thus, he was referred to our hospital for having an operation in July.
On physical examination during his first visit, he had no hemarthrosis and limited range of motion in his right knee, 0° to 105°. Posterior drawer test was 2+ positive with firm end point. There was no tenderness of the lateral joint space. The McMurray test could not be performed because of his knee pain. MRI showed the midsubstance tear of the PCL and incomplete discoid lateral meniscus without tear (Figure 1a, b). He hoped to reshape the DLM and we decided to proceed with knee arthroscopy in August.

Although arthroscopy revealed a midsubstance tear of the PCL, the anterolateral bundle remained partially intact (Figure 2a), and incomplete lateral discoid meniscus without degeneration or tear (Figure 2b). The LM was resected the central portion leaving 8 mm of the peripheral rim (Figure 2c). The remaining meniscus could not be pulled to the center of the tibial plateau by probing, so we assessed it stable. One day after surgery, isometric muscle exercise, range-of-motion exercise, and weight bearing were started. One week after surgery, closed kinetic chain exercise was started, and we allowed playing baseball at two months after surgery.

Two and a half months after surgery, he sprained his right knee while running to catch a fly ball and presented with right knee pain. He consulted the local clinic and was diagnosed with a radial tear of LM by MRI. He was referred to our clinic one week after re-injury. On physical examination, he had knee effusion and limited range of motion in his right knee, -10° to 50°. There was tenderness in the lateral joint space. The McMurray test could not be performed because of his knee pain. MRI showed radial tear of the middle segment of LM with degeneration and a horizontal cleavage tear (Figure 3a, b).

We performed arthroscopy two weeks after re-injury. Arthroscopy revealed radial tear of the middle segment of LM, and meniscal degeneration and horizontal cleavage around the tear site, which was not seen at initial operation (Figure 4a). Subtotal meniscectomy was performed and 3 mm of the peripheral rim was preserved (Figure 4b). The postoperative rehabilitation was performed the same as after the first operation. Three months after re-operation, right knee pain developed after running 15 km and he consulted our hospital. He had no knee effusion and full range of motion in his right knee. He presented lateral compartment pain and there was tenderness at the lateral joint.
DISCUSSION

Non operative management for DLM can preserve inherent meniscal function as shock absorber and load distributors of the joint. However, DLM is susceptible to severe degeneration or complex tears because it has abnormal shape and thickness, disorganized collagen fibers and abnormal meniscal motion [2,3,11-15]. If it leads to severe degeneration or complex tears, total or subtotal meniscectomy may be the only treatment option [7,16-21]. Therefore, saucerization before injury may be one of the treatments of choice to preserve as much function as possible for stable complete or incomplete discoid meniscus [10]. In our case, as lateral incomplete discoid meniscus had no degeneration, tear or hypermobility at the first operation, saucerization was performed. However, only two months after surgery, the remaining meniscus was injured with a radial tear of the middle segment. MRI and second arthroscopy revealed degeneration and a horizontal cleavage tear around the radial tear site. This suggested that the meniscus degeneration rapidly progressed after saucerization, leading to the meniscal tear. Sugawara et al. [12], reported high incidence of repeated arthroscopic surgery in knees with DLM without tear treated by partial meniscectomy and that the primary reason for repeated surgery was horizontal tear of the remaining meniscus. However, they did not state the period from initial surgery to repeated arthroscopic surgery. In our case, the remaining meniscus degenerated within only two and a half months after surgery. Our patient was male, high-level high-school baseball player and excessive training in the early postoperative period may have caused the meniscal degeneration. However, as his incomplete discoid meniscus was not injured through intensive sports activity before the initial operation, it suggested that our surgical intervention accelerated the degeneration of the meniscus. The incongruity between meniscus after saucerization and articular surface which grew corresponding to the incomplete DLM may have caused concentration of abnormal vertical and share forces on the resected surface. The lack of normal collagen orientation and the decrease in the number of the collagen fibers in DLM may contribute to rapid degeneration after surgery [3]. Furthermore, PCL injury may be related to the meniscal degeneration because it causes changes in biomechanical properties of LM during knee flexion [13]. The incidence of bone marrow signal changes on MRI following meniscectomy has been reported to be correlated with the extent of meniscectomy, and it is suggested that the excessive load to articular cartilage and subchondral bone is caused by abnormal stress distribution after meniscectomy [14]. Several studies have demonstrated a greater incidence of arthrosis after lateral meniscectomy when compared with medial meniscectomy [15,16]. Meniscectomy alters stress distribution, decreases the contact area with an increase of contact pressure affected compartment, and these alterations are more prominent in the lateral than in the medial compartment of the knee [17]. Furthermore, some authors have reported athletes developing severe chondrolysis following lateral meniscectomy [18,19]. Orthopedic surgeons should keep in mind that lateral meniscectomy may reduce an athlete’s sports activity. Our patient was unable to resume satisfactory sports activity because of persistent knee pain during training and postoperative MRI revealed subchondral bone marrow edema in the lateral tibial condyle. We do not recommend saucerization without a DLM tear. It may not have an effect preventing subsequent meniscal injury. We reported a case of a patient who developed a radial tear with degeneration in the remaining meniscus only two months after arthroscopic saucerization for DLM without tear. The meniscus should not be ejected in asymptomatic DLM without tear.

REFERENCES

11. Bin SI, Kim JC, Kim JM, Park SS, Han YK. Correlation between type of...


