Discoid Lateral Meniscus: Clinical Manifestations and Arthroscopic Treatment

Hongsen Chiang and Ching-Chuan Jiang

Background and Purpose: Discoid lateral menisci are rare in western races but not uncommon among oriental people. This study correlated the clinical manifestations and imaging characteristics of discoid lateral menisci with arthroscopic findings in Taiwanese subjects.

Methods: Cases of lateral discoid menisci including 58 knees of 56 patients were retrospectively analyzed. Standard arthroscopic surgery had been performed in 42 knees of 40 patients to confirm the diagnosis. In 41 knees, anomalous menisci were considered to be the cause of symptoms and partial meniscectomies were performed by removing the redundant central portion to fashion a common semi-lunar pattern. Arthroscopic findings were investigated and correlated with the clinical manifestations and findings of magnetic resonance images.

Results: Pain was most frequently the chief complaint but did not necessarily occur in association with a tear of the meniscus. The pain usually began with a minor trauma on the affected knee. Other symptoms included clicking, snapping, locking, and a “tightness”, “catching” or “intra-articular foreign body” sensation during motion of the joint. These symptoms were relieved after surgical reshaping of the meniscus of patients. Magnetic resonance imaging identified the anomaly and the existence of a tear, and was especially diagnostic when the tear was confined to the interior. These intra-substance tears were masked by intact external features and overlooked during arthroscopy. The surgical outcomes were followed up using the Ikeuchi scale, yielding results of excellent in 34, good in three, fair in two, and poor in two knees.

Conclusions: Unlike a normal meniscus, pain may exist with an intact discoid meniscus. The symptoms of a discoid meniscus can be relieved effectively by arthroscopic partial meniscectomy.

Key words: Discoid meniscus; Arthroscopy

Although rare among Caucasian people, discoid meniscus of the knee is not uncommon in oriental races. It affects the lateral meniscus more often than the medial meniscus.1,2 The incidence might be higher than is reported, since it is sometimes silent in the joint and found incidentally while the knee is being evaluated or treated for another reason. Compared with normal meniscus, discoid meniscus seems more susceptible to tear,3 that may result in pain, popping, or locking during motion of the knee joint. However, these symptoms may also exist in the absence of tear. Intra-substantial tear had been difficult to diagnose until the wide utilization of magnetic resonance imaging (MRI).4,5 Arthroscopic partial excision to reshape the meniscus to its ordinary semi-lunar pattern is the preferred method of treatment by most orthopedic surgeons for symptomatic patients.6,7 A follow-up study indicated that it yields results superior to total meniscectomy.8

This retrospective study compared clinical and imaging characteristics with arthroscopic findings in Taiwanese patients with lateral discoid meniscus.

Methods

We retrospectively reviewed the clinical characteristics of 58 knees of 56 patients that were noted to have lateral discoid meniscus by MRI, arthroscopy, or arthrotomy from January 1997 through June 2000 in our clinic. All of these patients visited the hospital in the outpatient setting. All surgeries were performed by the corresponding author of this study. The diagnosis was confirmed by arthroscopy in 42 knees of 40 patients, who comprised the study group. These patients ranged in age from 11 to 63 (mean 24) years, and included 14 males and 26 females.
Clinical manifestations
Pain was usually the chief complaint that occurred in 23 knees of 21 patients. Among these patients the pain was experienced either on weight bearing (20 knees, 87%), or during motion of the knee joint without loading (18 knees, 78%). Most of these patients suffered from long-standing gradually progressive symptoms, starting without a specific injury or following a minor trauma. Only two knees presented with acute pain resulting from a major antecedent injury.

Other symptoms in the 42 patients included clicking, snapping, and locking (Table 1). Patients commonly described a sensation of “interior fullness” of the joint. They described the sensation that the joint was stuffed with something that interfered with free motion, although this was usually not their major concern.

Physical findings were generally non-specific, while McMurray’s test was positive in 24 knees (57%). MRI was performed in 32 knees of 30 patients, and revealed an abnormal shape of the meniscus in all of them. Tear of the anomalous meniscus was noted on 8 of the 32 knees (25%), 3 of which were regarded as horizontal lesions.

Arthroscopic surgery
Forty-one knees of 39 patients underwent arthroscopic partial meniscectomy in a piece-meal pattern to remove the central portion of the meniscus and fashion it into a peripheral semi-lunar rim about 4 mm wide. The remaining one knee showed an intact discoid meniscus by both MRI and arthroscopy. The symptom, anterior knee pain during squatting and climbing stairs, was attributed to an inflammatory supra-patellar synovial plica and the anomalous meniscus was left untreated. All patients with painless knees who had symptoms believed to be related to the discoid meniscus underwent partial meniscectomy.

Arthroscopic surgery was routinely carried out under spinal anesthesia after exsanguination of the operated limbs, using tourniquet throughout the surgery. The arthroscope was inserted through the lateral infrapatellar portal, and the instruments through a medial portal. The appearances of the lateral discoid menisci were first inspected and classified according to Watanabe’s atlas.9 Partial meniscectomy was then carried out in a piece-meal pattern, starting from the anterior portion of the meniscus (Fig. 1). The operated joints were allowed to move and bear body-weight freely immediately after the surgery.

Patients receiving arthroscopic partial meniscectomy were followed up by the corresponding author, who evaluated the outcomes on a self-reported questionnaire based on the Ikeuchi scale (Table 2). The presence of limitation of motion, click or noise with motion, and pain were recorded according to the subjective response of the patients. The overall result was rated as excellent, good, fair or poor based on the worst response among these three parameters. For example, a noiseless knee with full range-of-motion but painful in both rest and motion was rated as poor. Each operated knee was evaluated separately.

Non-arthroscopy patients
For the other 16 knees of 16 patients who did not undergo arthroscopic confirmation of this anomaly,

Table 1. Clinical manifestations of discoid menisci (in 42 knees).

<table>
<thead>
<tr>
<th>Number of knees</th>
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<tbody>
<tr>
<td>Pain</td>
</tr>
<tr>
<td>Clicking</td>
</tr>
<tr>
<td>Snapping</td>
</tr>
<tr>
<td>Locking</td>
</tr>
<tr>
<td>Sensation of fullness</td>
</tr>
</tbody>
</table>

Table 2. The Ikeuchi scale.10

<table>
<thead>
<tr>
<th>Limitation of motion</th>
<th>Click or noise with motion</th>
<th>Pain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excellent</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Good</td>
<td>-</td>
<td>Slight, occasional with motion</td>
</tr>
<tr>
<td>Fair</td>
<td>-</td>
<td>Slight, with motion</td>
</tr>
<tr>
<td>Poor</td>
<td>+</td>
<td>+/</td>
</tr>
</tbody>
</table>

+ = present; - = absent.

Fig. 1. Surgical technique for arthroscopic partial meniscectomy of discoid lateral meniscus. The cutting starts from the anterior portion of a virtual line drawn to separate the meniscus into a medial redundant part and an ordinary semi-lunar outer rim. Once a breach of about 10 mm long is created, the central redundant segment retracts posteriorly, and is thus more easily accessible to excision via an anterior portal.
Discoid Lateral Meniscus

the discoid menisci were found on MRI in nine, and noted incidentally during other knee-surgeries in seven [one anterior cruciate ligament (ACL) reconstruction and six total knee prosthetic arthroplasties for osteoarthritis]. Tear of the anomalous meniscus was noted on the images of three of the nine MRI-diagnosed patients, who decided not to take arthroscopic surgery because the symptoms produced minor interference with normal activities.

Results

Classified by their arthroscopic appearance, these 42 anomalous menisci comprised 15 complete, 22 incomplete, and 5 Wrisberg type.

Although pain was the most common chief complaint, it was not necessarily indicative of a tear. Only 12 torn discoid menisci were noted among the 23 painful knees (52%); the others remained intact either on MRI or under arthroscopy. On the other hand, 3 knees with torn discoid menisci were not painful.

In two of those “intact but symptomatic” menisci, the patients suffered from painful squatting and snapping of the affected knees. Tear of the pathological lateral meniscus was neither reported on MRI nor noted during the subsequent arthroscopy. We noticed the pathological menisci to be hyper-mobile during arthroscopy so that their central part crumpled with flexion of the knee. It seemed that the posterior part of the meniscus was squeezed and pushed anteriorly by the lateral posterior femoral condyle while the knee was flexing. After reshaping the menisci to its normal semilunar shape, the formed posterior horn fell behind the femoral condyle, leaving no tissue in the central area to wrinkle (Fig. 2). The operation relieved the patients’ symptoms effectively.

Horizontal tears were noted on MRI of three knees, and were quite compatible with the arthroscope view. These menisci seemed intact from the appearance, but horizontal cleavage that split the meniscal substance into upper and lower layers became evident once partial meniscectomy was done to reveal the interior (Fig. 3). Two of these knees were painful while the other one was not.

The 41 partial-meniscectomized knees were followed up and rated by Ikeuchi scale. Among them, 34 knees were rated excellent, three good, two fair, and two poor. The average duration of follow-up was 22 months (range 6 to 33 months). Two cases were noted to have concomitant partial tear of the ACL in the same knee and were both rated poor. They suffered from frequent pain after the surgery, yet we could not decide whether the abnormal meniscus or the laxity of the joint should be responsible for this. Another two cases were noted to have horizontal tear of the anomalous menisci that extended into their peripheral third. Since only partial meniscectomy was performed, a cleavage remained in the residual substance. They were both rated fair due to frequent clicking during knee motion after the surgery. Two of the three good-rated knees were Wrisberg type.
Hyper-mobility of these menisci was found during the arthroscopy and was probably the reason for pain with knee motion. Although 19 patients experienced locking before the operation and all the cases responded positively when asked for the feeling of a click, all the patients were free of both clicking and locking after meniscectomy. All but the two poor-rated patients could participate in recreational sports, fitness, or even more vigorous activities. None of the 42 knees demonstrated limitation of motion postoperatively.

Nine patients (9 knees) who had their lateral discoid menisci noted on MRI but did not receive arthroscopy were also followed up for an average of 16 months (range 13 to 24 months). All achieved normal levels of activity, with tolerable frequency of symptom occurrence. Their problems included pain in six, clicking in four, and giving-way in three cases. All of these symptoms were intermittent and tolerated well. All three patients whose meniscus was found to be torn on imaging still had tolerable pain of variable degrees.

**Discussion**

Discoid lateral meniscus is more common among Asians than Caucasians. The reported incidence was 10.5% for Koreans and 16.6% for Japanese, but was less than 5% in Caucasians. The actual incidence may be higher than reported because this anomaly is sometimes silent in the knee joint and thus remains undiagnosed.

The pathogenesis of discoid meniscus is still unclear. Smillie first made the suggestion that the normal meniscus is derived from a cartilaginous disk in the embryonic stage, and a discoid meniscus is simply an arrest of this process. Soren echoed this theory by microscopic examination of tissue sections through the knee joint of human embryos. He found that the meniscus develops from an intermediate mesodermal blastema, which is a thick plate in the early embryonic period. Kaplan, however, rejected embryonic origin based on observation that the meniscus never assumed a disc form through different stages of the fetus. On the contrary, he postulated that a discoid meniscus is derived pathologically from a normal shape by the influence of mechanical factors such as a hypermobile posterior segment.

A discoid meniscus may be the chief problem in the internal derangement of a knee joint. In the clinical setting it characteristically presents with persistent pain after a minor knee injury. Although pain is the most frequent complaint, it is not necessarily indicative of a meniscal tear. The finding that reshaping surgery eliminates the pain suggests that it originates from the anomalous meniscus. Hyper-mobility is probably one of the explanations for the pain. The displaced meniscus pulls the posterior structure to which it is attached in tension, inducing pain from the latter.

A sensation of “fullness”, “catching” or “foreign body” in the knee joint was also frequently reported by the patients. These symptoms were markedly relieved after the meniscal reshaping surgery in all patients. This effect may be explained by the elimination of the space-occupying effect of the bulky discoid meniscus.

Discoid meniscus may be silent in the knee joint. It may be found incidentally in knees evaluated for...
other problems. Six of the cases in this study were found to have a well-preserved discoid lateral meniscus (Fig. 4) during prosthetic arthroplasty for osteoarthritis of the joint. The medial compartment of these knees had undergone serious degenerative pathology in that the medial meniscus and cartilage had worn-out to expose the subchondral sclerotic bone. This indicates that discoid lateral meniscus may be asymptomatic and remain undiscovered over years or even a lifetime, sparing the lateral compartment from degenerative processes in other parts of the joint.

On the other hand, a discoid lateral meniscus that is externally intact on arthroscopic inspection may not be as it appears. Their excessive mass and relative thickness may increase the possibility of internal, or intra-substantial tear. As suggested by Hamada et al., we found MRI to be very useful in detecting such internal injuries of menisci. Internal tear of discoid menisci was diagnosed in 3 cases in the present series. Painful clicking while standing up from squatting was the common complaint in these patients. The discoid menisci seemed intact at first glance under arthroscopy. However, horizontal cleavage inside the menisci became evident when meniscal tissue of the central part was removed during partial meniscectomy.

Many reports have indicated that asymptomatic discoid menisci should be left untreated. As pain is frequently the only complaint in the affected knee of patients with discoid meniscus, however, it is difficult to decide whether the meniscus is responsible for pain symptoms when it appears intact during arthroscopy. MRI is thus a superior diagnostic tool for discoid meniscus compared with arthrogram. In this series, we found no false positive diagnosis by MRI, meaning that the findings of MRI were confirmed in all patients who received subsequent arthroscopy. Arthrogram is a less accurate method for identifying tears of the discoid menisci, especially those that occur interiorly. Trans-arthroscopic ultrasonography is currently under development and may offer an alternative to identify an internal damage of the meniscus.

Because the meniscus plays an important role in load transmission and stability of the knee, preservation of as much meniscal tissue as possible is recommended. Partial meniscectomy has been reported to produce better results than total excision in many reports, although some others have claimed that the latter gave better outcomes in follow-up studies. Various modalities of arthroscopic partial meniscectomy have been reported, including conventional piece-meal excision, morselization, one-piece technique, two-piece technique, and laser surgeries.

The conventional technique has the advantage that it can be readily performed as a part of a complete arthroscopy that necessitates no extra or special portals. In the present study it yielded satisfactory results. However, a skillful hand is mandatory to perform this procedure smoothly and quickly. Piece-meal partial meniscectomy by starting cutting on the anterior redundant discoid tissue is easier to perform, because the central discoid tissue retracts posteriorly by the anterior cut and is then easily accessible to basket forceps for removal. If the first cut is placed posteriorly, the redundant discoid tissue goes anteriorly and will be very difficult to remove through arthroscopy. The first anterior cut can be difficult in the case of a complete type discoid meniscus, because its medial border locates tightly close to the anterior cruciate ligament.

Lateral discoid meniscus is usually classified by its morphology based on arthroscopy, according to the system proposed by Watanabe, into three types: complete, incomplete, and Wrisberg ligament type. We found all of these three types among our patients. A fourth type, the ring-shaped lateral meniscus, was reported by Monllau et al., who verified the postulate of its existence in many previous reports. A subsequent report was also made. We also found this type of anomaly in one knee that was not included in the main subjects of this study (Fig. 5).
The suffering resulting from the discoid meniscus is subjective, as is the evaluation of post-meniscectomy outcome. A questionnaire is commonly used instead of a physical examination for the postoperative follow-up. The Ikeuchi scale is the most widely adopted assessment of outcome. We consider this scale very serviceable because it includes the major items of discoid meniscus-related problems: pain and motion disturbances.

Fig. 5. A ring-shaped lateral meniscus removed from a 73-year-old woman during prosthetic replacement arthroplasty for osteoarthritis.

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References