Nonoperative Treatment of Partial-Thickness Meniscal Tears Identified During Anterior Cruciate Ligament Reconstruction

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Abstract

The reported incidence and treatment of partial-thickness meniscal tears seen at anterior cruciate ligament (ACL) reconstruction varies widely. The success of nonoperative treatment of partial meniscal tears identified during ACL reconstruction at our institution was reviewed. All incomplete meniscal tears were treated with observation, all full-thickness tears were treated with repair or partial meniscectomy. Partial tears of the lateral meniscus were noted three times more commonly than in the medial meniscus and were seen more acutely after ACL injury than full-thickness tears. At 2-year follow-up, excellent knee function was noted when these tears were treated nonoperatively.

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nterior cruciate ligament (ACL) tears often are associated with injury to the menisci. Numerous studies have illustrated that lateral meniscus tears predominate with acute ACL tears whereas chronic ACL-deficient knees tend to have more medial meniscus lesions.1,6 Partial-thickness tears of the menisci associated with ACL injury, although relatively common, have been much less frequently studied (Figure 1).7,8 The treatment of partial-thickness tears has not been standardized, with different authors advocating parameniscal synovial abrasion, fibrin clot application, trephination, and simple observation.9-14

This study reviewed the incidence of partial-thickness meniscal tears noted at ACL reconstruction and the success of nonoperative treatment.

Materials and Methods

Over 2 years, 101 consecutive patients undergoing arthroscopically assisted ACL reconstruction performed by the senior authors (D.R.M. and S.L.H) were prospectively followed. Patients were excluded from the final analysis if they also had a concomitant posterior cruciate ligament (PCL) injury, tibial plateau fracture, prior ACL reconstruction, or prior meniscectomy. Therefore, 90 (35 females and 55 males) patients with an average age of 28 years (range: 14-54 years) were included in the final evaluation. Patients underwent ACL reconstruction an average of 18 months after injury (range: 21 days to 15 years) and were followed for an average of 24.6 months postoperatively (range: 12-38 months).

At ACL reconstruction, both menisci were arthroscopically examined and probed. Meniscal tears were characterized by location, type, and depth. Tears determined to be irreparable were treated with partial meniscectomy; full-thickness tears found to be amenable to repair were fixed using suture or bioabsorbable implants. All partial-thickness tears were left in situ, without any attempts at repair.

Postoperatively, all patients were immediately started on a standardized post-ACL reconstruction rehabilitation protocol, regardless of any meniscal pathology noted. This included immediate mobilization of the knee and early
weight bearing as tolerated on the reconstructed knee. The rehabilitation was aggressively advanced to include increased range of motion and strengthening exercises.

All patients were followed clinically for the development of meniscal symptoms. At average 2-year follow-up, all patients with partial-thickness meniscal tears were contacted by telephone whereby modified Lysholm scores and Tegner activity scores were calculated.

Statistical analysis consisted of using the Student t test to compare patients with full-thickness and partial-thickness meniscal tears. Statistical significance was defined as \( P \leq 0.05 \).

RESULTS

At surgery, all 90 patients had a complete ACL tear. Meniscal pathology was noted in 55 (61%) patients. Lateral meniscal tears accounted for 59% (43 tears) and medial meniscus tears accounted for 41% (30 tears) of the 73 total meniscal tears (Table). Thirteen patients had isolated medial meniscal tears, 27 had isolated lateral tears, and 15 had tears involving both menisci. Associated injuries at ACL reconstruction were: medial collateral ligament (MCL) sprain, type I \((n=18)\); type III MCL tear, requiring repair or reconstruction \((n=3)\); lateral collateral ligament sprain \((n=3)\); and PCL injury \((n=1)\). Three patients had prior open reduction and internal fixation of tibial plateau fractures, 2 had a prior partial meniscectomy, and 5 had a prior ACL reconstruction.

Of the 73 meniscal tears, 31 (42%) were stable partial-thickness tears. Twenty-three were found in the lateral meniscus and 8 in the medial meniscus (Table). One patient had 2 partial-thickness tears (both in the lateral meniscus) and 1 patient had 3 partial-thickness tears (2 in the lateral meniscus and 1 in the medial meniscus); all other patients had only 1 partial-thickness tear. Six patients with partial-thickness tears also had concomitant full-thickness tears (1 in the ipsilateral meniscus, 5 in the contralateral compartment). Partial-thickness tears were noted in the superior surface of the meniscus in 25 (81%) cases and in the inferior surface in 6 (19%) cases.

Partial-thickness tears were noted at an average injury-to-surgery interval of 28 weeks (range: 3 weeks to 8 years) whereas full-thickness tears were noted at an average of 120 weeks (range: 4 weeks to 12 years) (Figure 2). This difference was statistically significant \( (P=0.02) \).

Clinical follow-up was performed via a telephone questionnaire at average 2 years postoperatively. With 24 (86%) of 28 patients with partial-thickness meniscal tears reporting, the average modified Lysholm score was 92.1 and the average Tegner activity score was 5.

DISCUSSION

Meniscal pathology in association with ACL injury has been reported in 41%-100% of cases. Lateral meniscus tears predominated around the time of ACL injury, whereas medial meniscal tears become more common in the chronically ACL-deficient knee. In this study, we found meniscal pathology in 61% of patients undergoing ACL reconstruction. Of these injuries, 59% of the tears were in the lateral meniscus and 41% were medial. These results are similar to those noted elsewhere in the literature. However, the association of ACL injury and partial-thickness tears of the menisci is less commonly described in the literature.

Longitudinal partial-thickness tears of the menisci accounted for 43% of all meniscal tears noted at ACL reconstruction. Partial tears were three times more common in the lateral meniscus than in the medial meniscus, whereas full-thickness tears were more evenly distributed (Table). These results are in accordance with those currently found in the literature. Irvine and Glasgow and Paletta et al reported that 37%-40% of meniscal tears seen with ACL disruption are partial-thickness tears of the lateral meniscus; Noyes et al noted that 30% of all tears seen with ACL disruption were partial thickness, predominantly located in the lateral meniscus.

Although the partial-thickness tears in our study were found on both the superior and inferior surfaces of the menisci, the superior surface was involved in 81% of cases. This trend is in agreement with Weiss et al, who noted that 70% of all partial tears were in the femoral surface of the meniscus. Irvine and Glasgow, on the
contrary, noted that the majority (78%) of partial thickness tears were located on the undersurface of the menisci. One possible explanation is the longer injury-to-surgery interval in their study; they arthroscopically examined their patients an average of 3 years after injury, whereas our patients with partial tears averaged only 6.5 months between injury and surgery. Perhaps superior surface partial-thickness tears occur more acutely, whereas undersurface tears are caused by more chronic knee instability.

The distribution of meniscal tears at ACL reconstruction may have a biomechanical basis. Lateral tears occur acutely secondary to the anterolateral rotatory translation that occurs at the time of injury. With this rotation, the lateral meniscus becomes trapped between the postero-lateral aspect of the tibial plateau and lateral femoral condyle. When the tibia reduces, the meniscus is torn. The medial meniscus is more commonly injured in the chronically unstable knee. In an ACL-deficient knee, the medial meniscus acts as a restraint to anterior translation of the tibia by wedging against the posterior aspect of the medial femoral condyle. This repetitive sheer force is thought to lead to an increased number of meniscal tears over time.

The exact mechanism for the creation of partial-thickness tears has not yet been elucidated. It is possible that partial-thickness tears are caused by the same mechanism as full-thickness tears, with abnormal motion between the tibia and femur placing an excessive distorting force on the meniscus. However, it is also possible that partial-thickness tears are actually full-thickness tears observed at various stages of healing. Fitzgibbons and Shellbourne postulated that the decreased incidence of lateral meniscus tears in chronic ACL injury compared to acute injury is secondary to spontaneous healing of many lateral meniscus tears. Ihara et al. noted that 69% of lateral meniscus tears associated with acute ACL injury were completely healed and 18% were partially healed after only 3 months of protective immobilization. As noted by McAllister and Motamedi, even previously displaced meniscal tears have been noted to spontaneously heal. Thus, it is possible that a full-thickness tear observed prior to complete healing could be described as a partial-thickness tear.

Our data indicate a significant temporal relationship with the type of meniscal pathology noted at ACL reconstruction. Partial-thickness tears were seen when the ACL reconstruction was performed at an average of 28 weeks after injury, whereas full-thickness tears were noted at an average age of 120 weeks after injury. This statistically significant difference suggests that partial-thickness tears occur much more acutely and full-thickness tears become more predominant with chronic instability. A similar trend was noted by Irvine and Glasgow who noted partial-thickness tears appearing earlier and full-thickness tears increasing with chronic ACL deficiency. This may indicate a propagation of partial-thickness tears to become full thickness over time, or a healing of the partial-thickness tears and de novo creation of full-thickness tears with chronic knee instability.

What is already known on this topic
- Partial-thickness tears of the menisci are commonly seen at ACL reconstruction.
- Numerous treatment methods, including trephination, synovial abrasion, fibrin clot application, and observation, have been recommended for the treatment of partial meniscal tears.

What this article adds
- Partial tears of the lateral meniscus occur three times more frequently than in the medial meniscus.
- Partial meniscal tears are observed more acutely after ACL injury than full-thickness tears.
- Partial-thickness meniscus tears seen at ACL reconstruction can be treated with simple observation.
The treatment of partial-thickness tears, although generally more conservative than full-thickness tears, is not entirely uniform. Talley and Grana treated all stable partial-thickness tears at ACL reconstruction with abrasion of both the meniscus and parameniscal synovium. The authors noted a symptomatic failure in 21% of medial meniscus tears and 4% of lateral meniscus tears with this method. Others have advocated a nonoperative approach to the treatment of partial-thickness tears. Fitzgibbons and Shelbourne treated partial-thickness tears depending on their location in the meniscus. They have advocated abrasion and trephination for stable lateral tears extending anterior to the popliteus, whereas those tears located posterior to the popliteus are left in situ.

In this study, a strict noninterventional approach was adopted, and no attempts at parameniscal abrasion or repair of partial-thickness tears were made. At average 2-year follow-up, no patient required repeat surgery on his or her knee. The average Lysholm score was 92.1 and the average Tegner activity score was 5. These objective scores are similar to those results in the literature for short-term follow-up of ACL reconstruction with intact menisci and isolated meniscal repair. This indicates that nonoperative treatment of partial-thickness meniscal tears seen during ACL reconstruction can result in excellent knee function.

The authors acknowledge a few valid limitations of this study. The lack of “second-look” arthroscopy or postoperative magnetic resonance imaging to determine the healing ability of the partial-thickness meniscus tears limits the conclusions that can be drawn from our work. However, the postoperative modified Lysholm and Tegner activity scores indicate that, irrespective of meniscal healing, excellent knee function was obtained. The relatively short 2-year follow-up and telephone interview for follow-up are additional weaknesses that will hopefully be remedied with future studies.

**CONCLUSION**

This study indicates that partial-thickness tears of the menisci are commonly seen at ACL reconstruction, with the lateral meniscus being involved three times as often as the medial meniscus. Partial-thickness tears are seen more acutely after ACL injury, whereas full-thickness tears predominate in the more delayed ACL reconstruction. Finally, the data indicate that excellent knee function scores can be anticipated when partial-thickness tears seen at ACL reconstruction are treated nonoperatively.

**REFERENCES**