The information regarding isolated tears of the meniscus in stable knees (ie, without cruciate ligament tears), specifically in a younger population, is scarce. Although surgical treatment is preferred for young patients with meniscal tears, the diagnosis at this age may be misled by other sources of knee pain. The purpose of this study was to report on the prevalence and sex variance of isolated meniscal tears in a younger population based on arthroscopic findings. From a database of 2425 arthroscopic knee surgeries performed over a period of 6 years, 591 patients (480 males and 111 females) younger than 40 years were included. Patients were divided into 5 age groups and subdivided according to their surgical findings. Measures included the prevalence of meniscal tears according to sex and age groups and also odds ratio calculations for the presence of meniscal tears. Of 591 arthroscopic surgeries in young patients with stable knees, only 6 females (vs 87 males) younger than 30 years had isolated medial meniscus tears. The number of stable knees without meniscal tear at arthroscopy in all age groups was relatively high. The odds ratio for having a medial meniscal tear was significantly higher in males. The results suggest a protective mechanism for isolated medial meniscal tears in younger females as opposed to other injuries of the knee. Isolated medial meniscus tears in stable knees are uncommon in females younger than 30 years; thus, young females with suspected tears should be reevaluated and treated conservatively before considering surgical solutions. [Orthopedics. 2015; 38(3):e196-e199.]
Arthroscopic surgery for meniscal tears is one of the most common procedures performed annually in the United States. In general, meniscal tears are less common in females than in males; however, information regarding isolated tears of the meniscus in stable knees (ie, without cruciate ligament tears), specifically in a younger population, is scarce. Terzidis et al reported 81 (21.4%) of 378 young female athletes with isolated meniscal tears at arthroscopy, with most of the tears involving the medial meniscus. Metcalf and Barrett studied 1485 meniscal tear patterns in stable knees; in a group of patients younger than 40 years, 20% were females, and 62% of the tears involved the medial meniscus.

In young and active patients, meniscal tears are usually related to trauma or overuse injuries. Surgical treatment is preferred for these patients to gain quick recovery with early return to work and sports. However, at this age, the diagnosis of meniscal tear may be misled by other sources of knee pain, such as patellofemoral pain, or by anatomical variants or imaging artifacts that may appear as meniscal tears on magnetic resonance imaging (MRI). Common examples of increased intrameniscal signal that are not actual meniscus tears can be found in asymptomatic children that presumed to reflect normal vascularity and also in a meniscal contusion after acute trauma. Therefore, it may be that some of the patients referred to arthroscopy actually have unremarkable menisci.

The goal of this study was to report the prevalence and sex variance of isolated meniscal tears in a younger population based on arthroscopic findings. The hypothesis was that the prevalence of isolated tears of the meniscus in young females is low.

**Materials and Methods**

Institutional review board approval was obtained before beginning this study. To report the prevalence of meniscal tears in stable knees, the study included young patients who had undergone knee arthroscopy with intact cruciate ligaments at surgery. Patients who had concurrent osteotomy, patellar realignment, surgery for synovial disease (eg, rheumatoid arthritis, pigmented villonodular synovitis), or ipsilateral knee surgery were excluded. Information was retrieved from patients’ charts and surgical reports.

All preoperative evaluations and operations were undertaken and reported by 3 senior orthopedic surgeons (B.H., S.B., R.T.) who are experienced in knee arthroscopy and who work together at the same unit. The unit is a regional referral center for arthroscopic knee surgery. In the case of diagnosed meniscal tear, the indication for knee arthroscopy was an active patient with unresolved knee pain and activity limitation for at least 6 weeks. Arthroscopy for the treatment of painful knee with no meniscal tear that was suspected for chondral lesion was performed if a long period of activity limitation and physical therapy had failed (at least 6 months). All candidates underwent plain radiography and MRI of the knee preoperatively.

A total of 2425 arthroscopic and arthroscopic-assisted knee surgeries were performed at the authors’ institution between January 2007 and January 2013. Of these, 1146 were performed in patients younger than 40 years. Of these, 443 were excluded because of ligamentous injuries, 64 because of previous knee surgery, 20 because of patellar realignment, 3 because of osteotomy, and 25 because of synovial disease. Overall, 591 patients (480 males and 111 females) were included in this study. Mean patient age was 28.1 years (range, 13.1-39.9 years). Males and females were each divided into 5 age groups: 20 years or younger, 21 to 25 years, 26 to 30 years, 31 to 35 years, and 36 to 40 years.

Each age group was subdivided according to the following types of surgical findings: medial meniscal tear, lateral meniscus tear, both menisci tears, and no meniscal tear.

Measures included the prevalence of meniscal tears according to sex and age groups from the database of knee arthroscopies. Odds ratios were calculated to compare the presence of meniscal tears between sexes.

**Results**

Of the 591 young patients with stable knees (ie, without ligamental injury) who underwent arthroscopic surgery, 445 (75.3%) had meniscal tears and 147 (24.7%) had none (Table 1). There were 383 (64.8%) meniscal tears observed in males and 62 (10.5%) observed in females. There were 254 (43%) tears of the medial meniscus, 175 (29.6%) tears of the lateral meniscus, and 16 (2.7%) tears of both menisci.

In males, the number of medial meniscal tears increased with age (Table 1). The number of lateral meniscal tears was higher than that of medial meniscal tears in patients younger than 25 years (84 lateral vs 51 medial) and decreased thereafter.

In females, the number of meniscal tears was low in all age groups. Specifically, a low prevalence of isolated medial meniscal tears (6 of 591; 1.0%) was found in females younger than 30 years compared with males (87 of 591; 14.7%).

Noteworthy is the relatively high number of stable knees without meniscal tear at arthroscopy in all age groups. The pathologies documented in knees without meniscal tear were low-grade chondral lesions (International Cartilage Repair Society classification 1 to 2; n=90), medial plica (n=10), and osteochondral defects (n=30). There were 16 knee arthroscopies with no remarkable pathology.

The odds ratio for having a meniscal tear, particularly of the medial meniscus, was significantly higher in males compared with females (Table 2).

**Discussion**

The most clinically significant finding of the current study is the low prevalence of isolated meniscal tears among
females younger than 30 years. Of 2425 arthroscopic and arthroscopic-assisted knee surgeries performed over a period of 6 years, only 6 females (compared with 87 males) younger than 30 years had an isolated medial meniscal tear. The odds ratio for having a medial meniscal tear in this young population was significantly higher in males vs females. The results suggest a protective mechanism for isolated medial meniscal tears in younger females as opposed to other injuries of the knee, such as anterior cruciate ligament (ACL) tears. The prevalence of medial meniscal tears increased with age.

Studies that analyzed the outcome of partial meniscectomies showed a low prevalence of meniscal tears in females compared with males, but few have shown the overall prevalence of isolated medial meniscal tears, specifically in younger patients with stable knees.

Studies on male and female athletes have highlighted sex differences in activity level, anatomy, neuromuscular control, and hormonal effects. These sex-based disparities were focused on noncontact ACL tears and anterior knee pain with females sustaining these injuries more frequently than males. The same concepts behind the etiology of ACL tear and anterior knee pain in females may support the scarcity of medial meniscal tears. Theories on ACL injuries that compare females with males include baseline level of conditioning, lower extremitiy alignment, physiological laxity, pelvis width, tibial rotation, and foot alignment. It has been demonstrated that female patients landing from a drop jump have increased knee valgus and ankle pronation; therefore, the extreme forces that act on the knee during an acute injury in a young female are more likely to cause ligamental failure prior to medial meniscal tear. Many researchers believe that females have a higher prevalence of patellofemoral pain because they display biomechanical risk factors such as increased static measures of Q-angle and increased dynamic measures of knee valgus angle, hip internal rotation angle, hip adduction moment, and knee valgus moment. In addition, females’ strength has been reported to be significantly weaker than males’ on measures of quadriceps, hip external rotation, hip extension, and hip abductor strength.

Another important observation from the current study of knee arthroscopies was a considerable number of patients with no apparent cruciate ligament or meniscal tear at surgery (146 of 591) in whom at least 6 months of nonoperative treatment failed. Most of these patients were diagnosed with different grades of chondral lesions at arthroscopy, and 16 were unremarkable. Thus, the pain mechanism is not completely understood and may sometimes be attributed to extra-articular sources. Specifically in young

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Prevalence of Meniscal Tears in Stable Knees</th>
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<tbody>
<tr>
<td>Age, y</td>
<td>MMT</td>
</tr>
<tr>
<td>≤20</td>
<td>15 (2.5)</td>
</tr>
<tr>
<td>21-25</td>
<td>36 (6.1)</td>
</tr>
<tr>
<td>26-30</td>
<td>36 (6.1)</td>
</tr>
<tr>
<td>31-35</td>
<td>54 (9.1)</td>
</tr>
<tr>
<td>36-40</td>
<td>85 (14.4)</td>
</tr>
<tr>
<td>Total</td>
<td>226 (38.2)</td>
</tr>
</tbody>
</table>

Abbreviations: F, female; LMT, lateral meniscal tear; M, male; MMT, medial meniscal tear; Non-MT, non-meniscal tear.

<table>
<thead>
<tr>
<th>Table 2</th>
<th>Odds Ratios for Meniscal Tears in Young Patients With Stable Knees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td>MMT</td>
</tr>
<tr>
<td>Male</td>
<td>3.95 (1.63-9.56)</td>
</tr>
<tr>
<td>Female</td>
<td>0.25 (0.1-0.61)</td>
</tr>
<tr>
<td>P</td>
<td>.002</td>
</tr>
</tbody>
</table>

Abbreviations: CI, confidence interval; LMT, lateral meniscal tear; MMT, medial meniscal tear; Non-MT, non-meniscal tear; OR, odds ratio.
patients with mild arthroscopic findings, it is possible that the pathophysiology of pain is somewhat analogous to that of patellofemoral syndrome, which is ascribed to misalignment and hyperlaxity together with overload or overuse as a triggering factor; it may also be explained by a neural model.

There are several limitations to this study. First is its retrospective design. Second is its heterogenic population. The authors’ aim was to evaluate the prevalence of isolated meniscal tears in young females from a general database, but results may differ in specific populations, such as professional athletes. Although this study lacks long-term follow-up outcome measures, it highlights some important observations that the authors believe are useful for clinical decision making. Future investigations should assess the source of chronic knee pain in young females.

CONCLUSION

Isolated medial meniscal tears in stable knees are uncommon in females younger than 30 years; thus, young females with suspected tears should be reevaluated and treated conservatively before considering surgical solutions.

REFERENCES