Meniscal Tears and Discoid Meniscus in Children: Diagnosis and Treatment

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Abstract

The incidence of traumatic meniscal tears in children is on the rise, likely because of increased sports participation and more accurate diagnostic modalities. The increased vascularity of the developing meniscus is believed to enable greater healing potential. Meniscal tears in children are often amenable to repair, and excellent clinical results have been reported. Knee size must be considered when determining the optimal method of repair. Discoid menisci represent a spectrum of morphologic abnormalities and instability of the lateral meniscus. Highly unstable variants often present with the classic "snapping knee syndrome," whereas stable variants may remain asymptomatic until a tear develops. Asymptomatic discoid menisci should be observed, whereas symptomatic discoid menisci are best treated with sauceration and repair. Early to midterm reports on sauceration and repair of discoid lateral meniscus in children are promising.

The reported incidence of meniscal tears in skeletally immature children has increased in recent years. Factors that have contributed to this increase include an overall increase in sports participation, better clinician awareness and recognition of the signs and symptoms of meniscal tear, and the expanded role of MRI in the diagnosis of intra-articular knee pathology. Traumatic meniscal tears in children aged <10 years usually occur in the setting of a discoid meniscus. Most nondiscoid meniscal tears are the result of sports injuries in older children and adolescents.

Nondiscoid Meniscal Tear

Anatomy

The microvasculature of the adult meniscus has been well described. A perimeniscal capillary plexus in the synovium feeds branching vessels that penetrate and supply the peripheral 10% to 25% of the meniscus. The peripheral one third of the meniscus has been termed the "red-red zone" to emphasize its direct vascular supply. The inner two thirds of the adult meniscus receives nutrition via synovial diffusion. The meniscus is completely vascular at birth, with the central third avascular by age 9 months. Meniscal vascularity gradually diminishes to the peripheral 10% to 30% by age 10 years, at which time it resembles the adult meniscus. It has been postulated that the greater blood supply of the developing meniscus affords it better reparative potential than that of the mature meniscus.

Diagnosis

Nondiscoid meniscal tears in children are usually the result of a trauma...
matic twisting injury to the knee during sports activities. Meniscal tears have been noted in 47% of preadolescents (aged 7 to 12 years) and in 45% of adolescents (aged 13 to 18 years) with acute traumatic knee hemarthrosis. In this series, the medial meniscus was more commonly torn in both groups (70% to 88%), and in the adolescent group, a concurrent anterior cruciate ligament (ACL) tear was noted in 36% of cases. Other diagnoses that may mimic the presentation of meniscal tear in children include osteochondritis dissecans (OCD), patellofemoral instability, unstable Wrisberg variant discoid meniscus, pathologic plica, loose body, and osteochondral injury.

Physical examination can be difficult because many children with acute knee injury do not allow the examiner to flex the knee to 90° for provocative maneuvers. In children, joint line tenderness and pain with provocative knee flexion to 30° to 40° with rotational varus or valgus stress (i.e., modified McMurray maneuver) can indicate meniscal pathology. An effusion is a strong indicator of intra-articular knee injury. The Lachman test is reliable for ACL evaluation in children, and the results should be carefully examined in all skeletally immature patients with suspected meniscal tear. Whereas the Lachman test is a reliable indicator of ACL integrity, KT-1000 (MEDmetric, San Diego, CA) measurements of tibial translation are known to be increased in younger patients. Thus, it is important to compare laxity on the Lachman test in both the injured and the contralateral knee. When performed by an experienced examiner, the physical examination can be used to reliably diagnose medial meniscal tears (62.1% sensitivity, 80.7% specificity) and lateral meniscal tears (50.0% sensitivity, 89.2% specificity).

AP, lateral, tunnel, and sunrise knee radiographic views should be obtained in all children with acute knee injury. Tunnel views are necessary to rule out OCD lesions as the source of knee pain. Acute patellar dislocation frequently causes both an acute knee hemarthrosis and a subchondral contusion of the distal lateral femur, which can mimic meniscal pathology. The presence of lateral joint pain and knee swelling after a traumatic injury in a pediatric patient may lead the examiner to suspect a lateral meniscal tear. In addition, patellar dislocation may cause a chondral loose body to displace from the lateral trochlea, which can result in mechanical symptoms that mimic meniscal tear. Associated findings such as patellar subluxation and osteochondral loose bodies may be seen on a sunrise radiograph.

When meniscal tear is suspected based on history and physical examination, an MRI scan of the knee is often obtained. However, MRI has lower sensitivity and specificity in the evaluation of the meniscus in skeletally immature patients than in adults. A high number of false-positive MRI findings of meniscal pathology has been documented in the pediatric population. This is because of the high vascularity of the meniscus in the skeletally immature child, which can cause intrameniscal signal changes that mimic meniscal tear (Figure 1). The sensitivity and specificity of MRI in diagnosing meniscal tear are worse in children aged <12 years than in those aged 12 to 16 years (sensitivity, 61.7% versus 78.2%, respectively; specificity, 90.2% versus 95.5%, respectively).

Management

The developing meniscus in the skeletally immature person has unique vascularity, histologic structure, and biomechanical composition, all of which are likely responsible for its increased healing potential. In children, most meniscal tears are longitudinal peripheral tears in the red-red zone; these are thought to be the best type for repair. In contrast, many meniscal tears in adults are degenerative cleavage tears, which are less amenable to repair. Whereas most meniscal tears in children are large and require repair, stable longitudinal tears in the red-red zone measuring ≤10 mm that are manually displaceable by <3 mm...
may heal without repair. Initial nonsurgical management may be warranted in these cases and can be continued if the patient remains asymptomatic.

Horizontal cleavage tear of the medial meniscus rarely occurs in children. Meniscal repair is often unsuccessful in these cases. The rarity of cleavage tears of the medial meniscus in children leads us to believe that they may be the result of a genetic or structural weakness of the meniscal tissue; however, there is no evidence in the literature to support this belief.

Meniscectomy
Symptomatic meniscal tears in children are usually treated surgically, with meniscal repair favored over partial meniscectomy. The consequences of meniscectomy may be greater in children than in adults. Cadaver studies performed on adult specimens show that removal of a small bucket-handle medial meniscus tear increases contact stresses by 65%, and débridement of the posterior horn of the medial meniscus increases contact stresses to levels near that of total meniscectomy. Total meniscectomy increases contact stresses by 235% and is rarely indicated in the pediatric population. Manzione et al. analyzed long-term results in 20 children and adolescents (mean age, 15 years) treated with partial or total meniscectomy. At an average 5.5-year follow-up, 75% of patients remained asymptomatic, 80% had radiographic changes consistent with early osteoarthritis (OA), and 60% were dissatisfied with their results. A recent review noted that 50% of patients who underwent total meniscectomy had radiographic changes, symptoms, and functional loss consistent with OA at 10- to 20-year follow-up. No study has yet demonstrated whether meniscal preservation through repair will reduce the long-term rate of development of OA in this population.

Repair
We recommend repair for most meniscal tears in skeletally immature patients. Repairable tears include longitudinal tears in the red-red zone or the red-white zone (middle third of the meniscus), bucket-handle tears in which the bucket-handle fragment has not been significantly damaged, and most tears of the posterior horn of the lateral meniscus near its root, given the rich vascular supply of this area. Horizontal and radial tears extending into the red-white zone are uncommon in children. We generally manage these with débridement of the unstable portion of the tear in the central avascular region (i.e., white-white zone), followed by repair of the portion of the tear extending into the red-white zone. Many children with meniscal tears also undergo ACL reconstruction, which increases meniscal repair healing rates. For complex degenerative tears, radial tears, and horizontal cleavage tears in the white-white zone, a limited partial meniscectomy is done, with removal of obviously damaged and unstable meniscal tissue.

Arthroscopic Options
Surgical repair of posterior horn and midbody meniscal tears in adolescents can be accomplished using arthroscopic inside-out, open, and arthroscopic all-inside repair techniques. For all techniques, the first step is to prepare the meniscus by meticulous débridement of loose tear edges and rasping of the perimeniscal synovium.

Arthroscopic inside-out repair uses double-armed absorbable or nonabsorbable repair sutures linking long flexible needles. The flexible needles are placed through curved canulas and across the meniscal tear in a horizontal or vertical mattress fashion. The suture must be tied down to the capsule through a separate incision. Suture placement risks injury to the posterior neurovascular structures. During inside-out repair of posterior horn tears, an open posteromedial or posterolateral approach is necessary to position a retractor so as to protect the neurovascular structures.

Open meniscal repair may be accomplished through similar posteromedial or posterolateral incisions. This type of repair is most useful for peripheral tears, especially in the posterior horn meniscal tears in patients with tight medial compartments.

Numerous arthroscopic all-inside repair systems have been developed. Early techniques incorporated a 70° arthroscope placed into the intercondylar notch, accessory posteromedial or posterolateral portals for suture placement, and arthroscopic knot-tying for repair. With later methods, rigid bioabsorbable devices such as arrows, screws, and darts were placed through standard anterior portals to anchor the meniscal tear to its peripheral portion or to the capsule. Disadvantages of these implants included the inability to compress across the repair site and the risk of injury to adjacent cartilage. More recent meniscal repair systems such as the Fast-Fix (Smith & Nephew Endoscopy, Andover, MA) and RapidLoc (DePuy Mitek, Raynham, MA) are suture-based, flexible, and low-profile to allow compression across the tear site and minimize the risk of adjacent chondral injury.

Special Considerations in Children
For most posterior horn and easily accessible midbody tears in all pediatric patients with large knees, we generally perform an all-inside technique using the Fast-Fix meniscal repair system. We prefer to trim the depth penetrator at the 1-cm line to prevent overpenetration of the posterior capsule. An inside-out tech-
nique with zone-specific cannulas is used for tears extending into the anterior portion of the midbody of the meniscus and for very unstable tears (eg, displaced bucket-handle tear). In younger children and smaller knees, all-inside repair places the posterior neurovascular structures at risk because of instrument size and overpenetration of the posterior capsule. For these cases, an inside-out technique, which protects the neurovascular structures, is safest.

Tears that extend into the anterior horn of the meniscus may be repaired using either an arthroscopic outside-in approach or an open approach. An arthroscopic all-inside technique has been recently described. For these tears, we generally perform an outside-in technique using an 18-gauge spinal needle for passage of a 2-0 polydioxanone suture across the tear site. A second suture is passed through an adjacent needle, and both sutures are pulled out through an anterior portal. The sutures are tied to each other, and the knot is pulled back into the joint against the meniscus (ie, Mulberry knot technique). The sutures are then tied to the capsule anteriorly through a separate incision.

For horizontal cleavage tears, unstable or degenerated portions of the meniscus are débrided, and vertical mattress sutures are placed at each end of the tear to prevent tear propagation (Figure 2). When vascularity of the repair is a concern, trephination can be done to create vascular access channels into the tear site. In this technique, a spinal needle is used to puncture the meniscus across the tear site and into the peripheral capsular area, which has better vascularity.

Postoperative Care

Postoperative regimens following meniscal repair differ among orthopaedic surgeons. The amount of weight bearing and knee flexion allowed may vary depending on the tear location and pattern. Most surgeons favor limited weight bearing following repair of large bucket-handle tears. Our standard postoperative regimen following repair of most meniscal tears is to make the patient partial weight bearing in a hinged knee brace. Range of motion (ROM) is initially restricted to 0° to 40° and is gradually increased to 0° to 90° by 6 weeks postoperatively, after which physical therapy for knee ROM and strengthening is instituted. Return to sports is allowed at 3 to 4 months postoperatively.

Clinical Results and Complications

Although younger age has been associated with higher success rates for meniscal repair, few studies have specifically analyzed the results of meniscal repair in children. In the first report on meniscal repair in an exclusively adolescent population, 29 meniscal repairs (12 medial, 17 lateral) were performed in 26 patients (mean age, 15.3 years; range, 11 to 17 years), with 15 patients undergoing simultaneous ACL reconstruction. Mean time from injury to surgery was 6.7 months (range, 3 days to 27 months). All tears occurred in the posterior horn, with 22 in the red-red zone, 6 in the red-white zone, and 1 in the white-white zone. All repairs were performed arthroscopically, 25 with an inside-out technique and 4 with an all-inside technique. At an average 5-year follow-up, no meniscal symptoms were noted, all meniscal repairs were believed to have healed, and 24 of 26 patients had returned to preinjury level sports activity.

Another series reported results on 71 meniscal repairs in children and adolescents (mean age, 16 years; range, 9 to 19 years) with meniscal tears extending into the white-white zone. All tear types (ie, radial, flap, complex) were repaired, unless degenerative changes were noted and the tear edges could not be approximated. An inside-out arthroscopic technique was employed using multiple vertical divergent sutures. At a mean 51-month follow-up, 53 of 71 repairs (75%) were clinically healed. The remaining 18 repairs were associated with joint line pain or a failed meniscal repair at arthroscopic follow-up. Although objective data (ie,
follow-up arthroscopy or MRI) on meniscal healing are lacking in many patients with such injury, this high rate of clinical healing is remarkable given the nature of the tears being repaired. Notably, an 87% healing rate was achieved in patients who underwent simultaneous ACL reconstruction (39 of 45 patients).23

Retrospective results of 12 arthroscopic meniscal repairs in a younger age group (mean age, 13 years; range, 8 to 16 years) have recently been reported.24 At average 37-month follow-up, three patients required revision for partial meniscectomy, seven were asymptomatic, and two had occasional pain without mechanical symptoms. Although these results are encouraging, long-term data are lacking, and it remains to be seen whether meniscal preservation through repair will translate into lower rates of OA in the future for these young, active patients.

Complications of meniscal repair in children are rare but can include neurovascular injury, arthrofibrosis, complex regional pain syndrome, and chondral injury from a protruding implant. Of the studies noted above, only Mintzer et al.12 reported knee stiffness (two cases) and painful neuroma of the infrapatellar branch of the saphenous nerve (one case) following inside-out repair.

**Discoid Meniscus**

Discoid meniscus is a diagnosis that encompasses a spectrum of meniscal disorders of shape and stability. Young,25 in 1887, was the first to describe a discoid lateral meniscus following cadaver dissection. Discoid morphology occurs most commonly in the lateral meniscus. Discoid lateral menisci are most common in the Japanese population (~15% prevalence) and have been noted in only 3% to 5% of the United States population.26 The true incidence and prevalence are unknown, given that many asymptomatic discoid menisci are incidentally noted at time of surgery.

Morphology varies, but typically a discoid meniscus occupies a greater than normal amount of the lateral tibial plateau and appears uniformly thickened or block-shaped (Figure 3). Discoid menisci can be stable or may lack peripheral attachments, leading to instability and the classic presentation of “snapping knee syndrome.”27 Normally, menisci are not discoid-shaped during development; thus, discoid menisci likely represent a congenital anomaly.27 Discoid morphologic changes (ie, increased meniscal thickness and width) may also occur in compensation for an abnormally unstable meniscus during development.

**Anatomy and Classification**

The medial meniscus is crescent-shaped and shares 50% of the articular contact of the medial joint space. It is firmly anchored by meniscofemoral and meniscotibial (ie, coronary) ligaments. The meniscofemoral ligament is attached to the deep portion of the medial collateral ligament (MCL), which allows the medial meniscus approximately 2 to 5 mm of excursion on knee ROM. The lateral meniscus is more nearly circular in shape and covers up to 70% of the lateral tibial plateau. Its average thickness is 4 to 5 mm, and its average width is 10 to 12 mm at its periphery.28 The lateral meniscofemoral ligament is attached to the lateral joint capsule only, and there are no meniscal attachments at the popliteus hiatus. Accessory meniscofemoral ligaments are variable, arising in 70% to 100% of cases at the posterior horn and inserting anterior (ie, ligament of Humphry) or posterior (ie, ligament of Wrisberg) to the ACL.29 (Figure 4). This configuration imparts less stability to the lateral meniscus, which has 9 to 11 mm of excursion on knee ROM.

Currently, discoid menisci are most commonly classified according to arthroscopic morphology (complete or incomplete discoid) and stability (stable or unstable). The Watanabe classification notes three types of lateral discoid variant:29 (Figure 5). Type I and II discoid menisci are block-shaped as the result of increased meniscal thickness (8 to 10 mm). They generally have normal peripheral attachments and are stable to probing. In type I (stable, complete), the block-shaped lateral meniscus covers the entire lateral tibial plateau, whereas in type II (stable, partial), the lateral meniscus covers ≤80% of the tibial plateau. Type III discoid menisci (unstable, ligament of Wrisberg) appear to be normal except for a thickened posterior horn, but they lack posterior meniscal attachments, including the meniscotibial (ie, coronary) ligament. The type III discoid meniscus is stabilized only by the meniscofemoral ligament of Wrisberg. This results in hypermobility of the lateral meniscus at the posterior horn, which pulls into the intercondylar notch with knee extension, resulting in snapping knee syndrome.
Peripheral rim instability patterns in discoid menisci have been recently described. In a series of 128 discoid lateral menisci, 62.1% were complete discoid and 37.9% were incomplete. Peripheral rim instability was noted in 28.1% of cases. Instability most commonly occurred in the anterior horn of the meniscus (47.2%), followed by the posterior third (38.9%) and the middle third (11.1%). Peripheral rim instability was significantly more common in younger patients (mean age, 8.2 years; \( P = 0.002 \)) and in patients with complete discoid lateral menisci (\( P = 0.043 \)).

**Diagnosis**

Young children with unstable discoid menisci often present with snapping knee syndrome, which manifests with intermittent dramatic snapping and popping in the knee. These snaps occur spontaneously, usually as the knee moves from flexion to extension, and may cause momentary pain and apprehension. In very young children (aged 3 to 4 years), the snapping is often asymptomatic, whereas older children (aged 8 to 10 years) more commonly experience pain with activity. On physical examination, a lateral joint line bulge may be present, and a dramatic clunk may be appreciated with McMurray testing as a result of subluxation of the unstable lateral meniscus. When a discoid meniscus is suspected, careful evaluation of the contralateral knee is important because, in some persons, discoid meniscus is present bilaterally.

Stable discoid menisci have a more variable presentation and usually are first noted in older children who present with mechanical knee symptoms suggestive of a meniscal tear. These menisci are more prone to tear because of increased thickness and abnormal vascularity. An ultrastructural study that used transmission electron microscopy noted that discoid menisci have a decreased number of collagen fibers with a more disorganized course compared with normal menisci. Up to 70% of discoid menisci noted at arthroscopy have tears. In the pediatric patient with a normal meniscus, the peripheral longitudinal tear pattern is the most common tear pattern following an acute traumatic event; in the patient with type I or II discoid meniscus, horizontal cleavage tear is the most common following such injury. Tear pathology often shows mucoid fibrinous degeneration within the discoid meniscus. Repetitive microtrauma to the abnormal collagen arrangement is thought to cause delamination of the discoid meniscus, which leads to cleavage tears. Type III discoid menisci often do not have tears, although com-
plex degenerative tears may be seen in the bulbous posterior horn. Radiographs are normal in most children with a discoid meniscus. Less common radiographic findings that are indicative of severe discoid menisci include squaring of the lateral femoral condyle, cupping of the lateral tibial plateau, and widening of the lateral joint line. MRI criteria for discoid menisci include a transverse meniscal diameter >15 mm or 20% of the tibial width on coronal views, or continuity between the anterior and posterior horns of the meniscus (ie, bow tie sign) noted on at least three consecutive 3-mm thick sagittal slices (Figure 6). Incomplete discoid menisci (type II) and the Wrisberg variant (type III) often appear to be normal on MRI scans. In the Wrisberg variant, the MRI scan may show subtle anterior subluxation of the posterior horn of the lateral meniscus or high T2-weighted signal interposed between the lateral meniscus and the joint capsule, simulating peripheral tear. MRI has a low sensitivity compared with physical examination for the diagnosis of discoid lateral meniscus in children (38.9% versus 88.9%, respectively). Preoperative diagnosis by the surgeon has been shown to be better than formal interpretation of MRI scans by a radiologist.

Management
Most authors recommend observation for an asymptomatic discoid meniscus noted incidentally during arthroscopy because the knee may have adapted to the discoid anatomy and may continue to function well. We agree with a course of observation in these cases because although discoid menisci are prone to tear, it is unclear whether saucерization decreases this risk.

Surgical intervention is indicated for symptomatic discoid menisci. Currently, most authors recommend meniscal preservation using arthroscopic saucération. Associated meniscal tears are treated with partial meniscectomy or repair; peripheral stabilization is added for unstable discoid variants. Total meniscectomy is generally avoided in children except for the rare case in which the entire meniscus is deemed to be unsalvageable.

Arthroscopic Saucération and Repair
Although institutional treatment guidelines vary, we prefer to perform arthroscopic saucération and repair of a discoid lateral meniscus under general anesthesia as a day surgery. In the patient with bilateral symptomatic discoid menisci, both knees may be treated at the same procedure; however, we prefer to perform staged unilateral procedures for older children and adolescents. When possible, a 3.5-mm arthroscope is used, but smaller knees may require a 2.7-mm arthroscope. Low-profile arthroscopic shavers, small shavers, and meniscal baskets, small shavers, and meniscal knives are used for meniscal contouring. Inside-out meniscal repair equipment must be available.

The goal of saucération is to create a stable and functional remaining meniscus that will provide adequate shock absorption without re-tearing. To accomplish this, most authors recommend leaving intact a 6- to 8-mm peripheral rim of meniscal tissue. Larger meniscal remnants following saucération have been associated with increased re-tear rates. When knee size and patient age vary from the norm, an indentation on the lateral femoral condyle or the size of the medial meniscus can be used to guide the proper depth of resection.

Technique
Saucération can be challenging given the limited visualization resulting from small knee size and thickened discoid meniscus. It is often easiest to begin saucération with the knee flexed to 90° and with a varus stress applied. Once ample room has been generated in the lateral compartment, the leg can be placed in the figure-of-4 position. We start the saucération by using a low-profile straight basket punch to start a path through the central portion of the discoid meniscus (Figure 7). We then proceed to excise the posterior portion of the discoid meniscus. For the midbody, a side-basket punch can be useful for trimming. For the
Saucerization of a discoid lateral meniscus in a 12-year-old girl. A, Arthroscopic view of a discoid lateral meniscus (D). B, Saucerization is begun with a low-profile straight basket punch guided through the central portion of the meniscus. C, A side-basket punch can be used to trim the midbody. D, Final appearance after saucerization.

Anterior horn, a back basket punch or meniscal knife can be used to contour the inner rim. The oscillating shaver is used intermittently to gently smooth the remaining inner rim. Discoid meniscal tears central to the 6- to 8-mm peripheral rim are excised. When a horizontal cleavage tear remains in the posterior remnant, the leaflets are probed for stability and the unstable leaflet is excised.

Following saucerization, the peripheral rim of the meniscus is probed at the anterior horn, midbody, and posterior horn, and an attempt is made to pull the meniscal remnant into the lateral compartment. Pathologic instability is treated with meniscal repair to the capsule. For older children, an all-inside meniscal repair technique may be safely employed. For younger patients with smaller knees, the proximity of the neurovascular structures to the posterior knee capsule makes all-inside repair technically difficult. In these cases we prefer an inside-out meniscal repair technique using a zona-specific cannula system to pass multiple vertical mattress nonabsorbable 2-0 sutures. With the peroneal nerve protected, these sutures are later retrieved through an open joint exposure and are tied down to the lateral capsule. Anterior horn instability is repaired using an outside-in technique, with a spinal needle used to pass nonabsorbable 2-0 sutures. The saucerized and repaired lateral meniscal remnant is probed to check stability. Finally, the knee is taken through a full ROM; persistent subluxation or popping indicates the need for further saucerization.

Although postoperative regimens vary by surgeon, our preference for children treated with saucerization alone is to allow immediate weight bearing. Physical therapy is instituted at 2 weeks postoperatively, and gradual return to sports is begun at approximately 8 weeks. Patients who undergo meniscal repair in addition to saucerization are allowed partial weight bearing and are placed into a hinged knee brace, with ROM gradually increased to 0° to 90° by week 6 postoperatively. Return to sports occurs at approximately 3 to 4 months after surgery. Children aged <6 years are prescribed a knee immobilizer for 4 weeks after surgery.

Clinical Results
Some authors maintain that total meniscectomy is more reliable than partial meniscectomy because residual discoid meniscal tissue is abnormal and will not function appropriately. Habata et al.17 and Okazaki et al.18 noted excellent functional scores and minimal radiographic changes following total meniscectomy at 14- to 16-year follow-up in patients who were children at the time of the procedure. Although these findings suggest that the younger patient adapts to increased stress on articular cartilage following meniscectomy, longer follow-up is needed to determine whether early degenerative changes will develop. Raber et al.19 reported on 17 knees in children (mean age, 9 years) treated with total meniscectomy. At a mean follow-up of 19.8 years, 10 knees had clinical symptoms and radiographic changes consistent with lateral compartment arthritis, and 2 knees developed OCD of the lateral femoral condyle.20 Other authors have noted similarly high rates of radiographic OA following total meniscectomy in children.14,15,49 In addition, Kim et al.50 retrospectively analyzed the long-term clinical and radiographic outcome of a series of 125 complete and incomplete discoid menisci managed with partial or total meniscectomy. The partial meniscectomy group had better radiographic results after a 5-year follow-up, and long-term prognosis was related to the volume of the meniscus removed.

Recent studies have shown encour-
Summary

The incidence of meniscal tears in children is increasing. Given its greater blood supply, the meniscus in skeletally immature children may have better reparative potential than the adult meniscus. Meniscal tears in children are commonly seen following a traumatic injury resulting in acute knee hemarthrosis. Often, these tears are associated with ACL pathology. A careful physical examination using a modified McMurray maneuver at 30° to 40° of knee flexion offers greater specificity in diagnosing meniscal tears in children than does MRI, which has a high rate of false-positive findings, especially in younger children. High rates of successful meniscal repair in children have been noted, especially when done in combination with ACL reconstruction.

Discoid meniscus represents a spectrum of meniscal disorders of varying degrees of block-shaped morphology and instability. Children with unstable discoid menisci typically present with snapping knee syndrome. Stable discoid menisci are often asymptomatic until a tear develops. MRI has a low sensitivity compared with physical examination for the diagnosis of discoid lateral meniscus in children. Asymptomatic discoid menisci noted incidentally during arthroscopy are best left alone. Most authors believe that symptomatic discoid menisci should be treated with saucerization and repair, although long-term data are lacking. Total meniscectomy is generally reserved for rare unsalvageable cases.

References

Evidence-based Medicine: Levels of evidence are described in the table of contents. Most references are retrospective case series, prospective cohort studies, reviews, and basic science studies. Citation numbers printed in bold type indicate references published within the past 5 years.

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