

Incidental MRI changes

N Engl J Med 359;11: 1108

- **Results**

- The prevalence of a meniscal tear or of meniscal destruction in the right knee as detected on MRI ranged from 19% among women 50 to 59 years of age to 56% among men 70 to 90 years of age;

Among persons with radiographic evidence of osteoarthritis, the prevalence of a meniscal

- tear was 63% among those with knee pain, aching, or stiffness on most days and
- 60% among those without these symptoms.

The corresponding prevalences among persons without radiographic evidence of osteoarthritis were 32% and 23%.

61% of the subjects who had meniscal tears in their knees had not had any

- pain, aching, or stiffness during the previous month.

- **Conclusions**

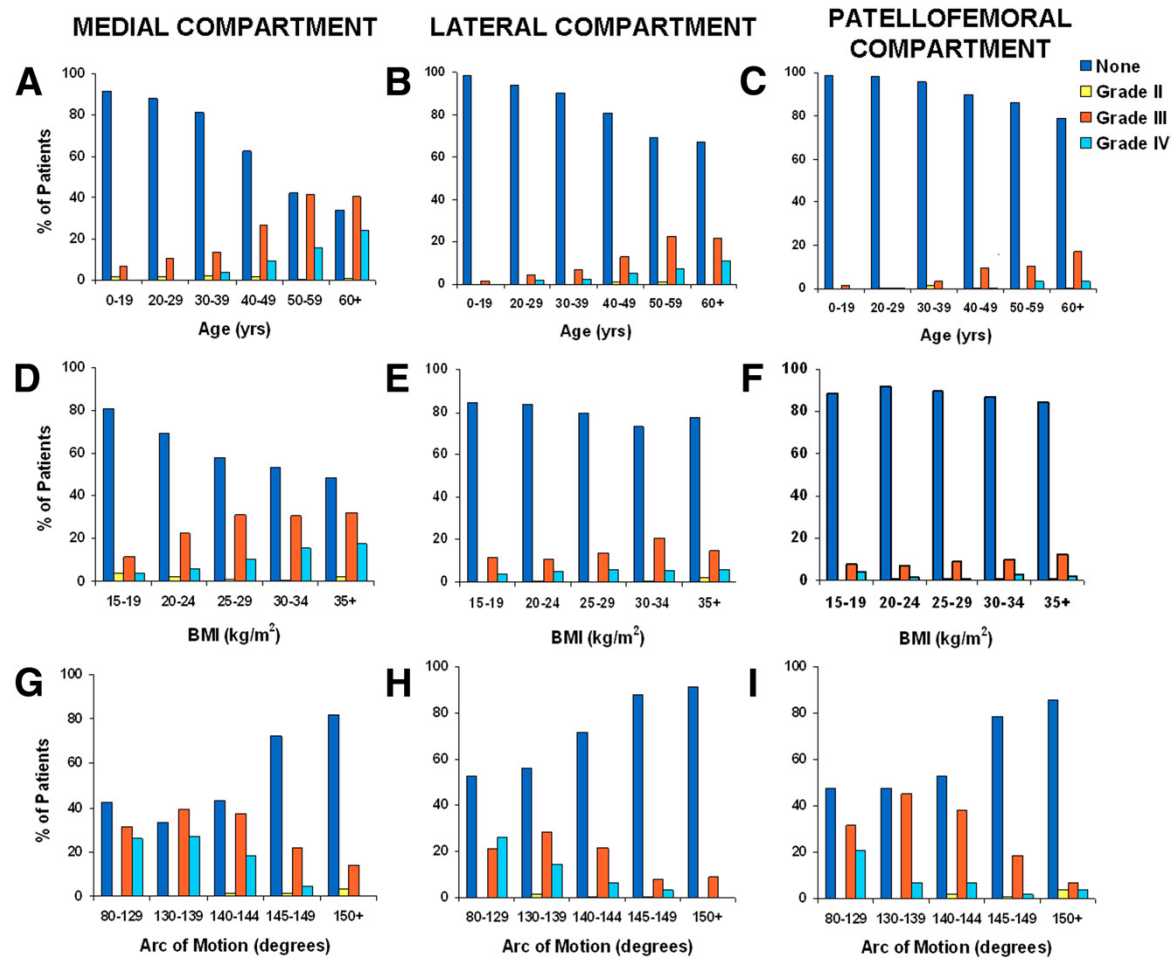
- Incidental meniscal findings on MRI of the knee are common in the general population
- and increase with increasing age.

Prevalence of Cartilage Changes [Arthroscopy for meniscal surgery]

- A significant relation was found between age and the development of articular cartilage changes in each of the 3 compartments. BMI was also significantly related to articular cartilage changes in the medial and patellofemoral compartments but not the lateral compartment ($P = .08$).

Conclusions: This study shows a high prevalence of articular cartilage damage as defined by the Outerbridge classification in patients undergoing arthroscopic surgery for meniscal pathology. Risk factors that correlate with articular cartilage damage include increasing age, elevated BMI, medial compartment pathology, and knee contractures.

- *The Journal of Arthroscopic and Related Surgery, Vol 28, No 10 (October), 2012: pp 1437-1444*



- The greatest increase in prevalence (21%) occurred between the fourth and fifth decades of life, most likely because of the incidence of primary OA that starts to appear in this age group.

POST MENISCECTOMY

Outcome of meniscal surgeries

- *Am J Sports Med* 2010 38: 1907
- 2 prospective cohorts, and 23 retrospective
- Follow-up of 5 years or more was required.
- Poor clinical or radiographic outcomes
 - 1.Total meniscectomy
 2. Removal of the peripheral meniscal rim,
 3. Lateral meniscectomy,
 4. Degenerative meniscal tears
 5. Presence of chondral damage
 6. Presence of hand osteoarthritis suggestive of genetic predisposition, and increased body mass index.
- While an intact meniscus or meniscal repair was generally favorable in the ACL-reconstructed knees, meniscal repair of degenerative meniscal tissue was not favorable.

Many biomechanical and clinical studies have shown increased stress and degeneration of the articular cartilage after a meniscectomy.

More recently, there has been a push to spare the meniscus as its potential to heal has been recognized.

Total Vs Partial

- 4 of the 5 studies that compare partial to total meniscectomy show a significantly increased risk of developing radiographic knee OA in the total meniscectomy Vs Partial
- Hede : Int Orthop. 1992;16:122-125.25-27] in the only randomized controlled trial on the subject, found no significant difference in radiographic outcomes between patients randomly assigned to undergo partial or total meniscectomy at any of the time points from 2 months up to the final 7.8 years
- **Englund found subtotal meniscectomy patients with degenerative tears** to have significantly worse Knee
- score, increased stiffness (P 5 .009), and decreased knee function (P 5 .007) compared with those with partial meniscectomy.

Meniscectomy Versus Repair

- Shelbourne and Dersam⁵⁵ compared partial meniscectomy to meniscal repair for bucket-handle meniscal tears in ACL-reconstructed knees. They reported no significant difference in the development of radiographic OA between the 2 groups (P 5 .7731).
- Subjective outcomes as measured by the Noyes rating system showed no significant difference between the 2 treatment groups (P 5 .2014).
- Shelbourne and Carr⁵⁴ reported no significant difference in overall IKDC scores between meniscectomy and meniscal repair

OA after Menisectomy.

The American Journal of
Sports Medicine, Vol. 38, No. 9. 2007

Tear Characteristics

- Chatain et al¹⁰ reported a significantly increased risk of developing radiographic evidence of OA with nonvertical tears as compared with vertical tears after a medial meniscectomy

In both the lateral and medial group, involvement of the meniscal rim was significantly associated with the development of radiographic OA.

This association was also reported by Higuchi et al,²⁹ who found that retention of half of the meniscal rim led to significantly less progressive OA when compared with patients who *retained less than half of the meniscal rim (35% and 63%, respectively).*

Bolano and Grana⁷ found degenerative, horizontal cleavage, and complex tears to have an increased association with radiographic OA. These findings are not surprising as the types of tears described are more commonly seen in the older knee and are usually due to overall knee degeneration that includes some chondral change.

The factors predisposing to a poor radiological result

- 1. Age above 35 years
- 2. The presence of medial compartment cartilage degeneration at the time of the first arthroscopy
- 3. Resection of the posterior one-third of the meniscus, and meniscal rim resection.
- 4. Preoperative participation in sport was a predictor of a better outcome.

In conclusion

- 1. Arthroscopic meniscectomy predisposes to degenerative change.
- 2. The truly traumatic meniscal tear does better
- 3. The prognosis is better for an isolated medial meniscal tear if he is young,, participates in sports, has no cartilage damage, and has an intact meniscal rim at the end of the meniscectomy.
- 4. Anterior and medial third lesions also have a more favourable outcome.
- 5. The clinical outcome at 11 years is better, 91% of patients considering their knee to be “normal” or “nearly normal”, than the radiological results where there is a 22% excess rate of joint space narrowing.

Biomechanical study

The American Journal of Sports Medicine, Vol. 41, No.

173

- Conclusion: Partial medial meniscectomy with 46% resection of the original width of the posterior horn significantly altered the AP position of the medial femoral condyle and also increased laxity.
- They found a significant increase in anterior tibial translation of 1.4 mm after the two-thirds resection and an increase of 4.1 mm after the 100% resection.

NATURAL HISTORY OF MENISCECTOMY

VOL. 63-A,115 [LOTKE]

- 100; >45 Y; 90% EG At 10 y [good cartilage] and 20% with degenerative changes

Knee Surg, Sports Traumatol, Arthrosc (2001) 9 :15–18 [Chatain]

The natural history of arthroscopic medial meniscectomy in knees with an isolated meniscal injury by reviewing 317 of 894 cases following medial meniscectomy.

At 11.5 years (range 10–15). The knee was considered “normal” or “nearly normal” by 91% of patients.

Radiology showed 22.4% greater excess prevalence of joint space narrowing in the operated compared to the control knee.

- **DEGENERATIVE
MENISCAL TEAR**

Arthroscopy in OA

Table 1

Prognostic Factors for Arthroscopic Treatment of Degenerative Arthritis of the Knee

Factor	Good Prognosis	Poor Prognosis
History / symptoms	Increased pain of acute onset, specific twisting mechanism, mechanical symptoms	Pending litigation / work injury, chronic symptoms
Physical examination	Recent effusion	Varus / valgus alignment, ligamentous instability
Radiographic findings	Loose bodies, normal mechanical alignment	Complete loss of joint space, chondrocalcinosis, varus / valgus alignment
Surgical findings	Isolated chondral flap / fracture, isolated unicompartamental disease, meniscal tears	Diffuse disease, degenerative meniscal tears, severe chondromalacia

Meniscectomy in OA

- Jackson 1982 Partial meniscectomy in >40; 80% E-G;
- Bonamo 1992 79% of patients with Outerbridge III and IV grades 3 and 4 chondromalacia
- McBride 1984 *The results of traumatic tears to degenerative tears and noted a 95%
• at 3-year with traumatic tears versus 65% with degenerative tears.*
- In patients with degenerative tears, the presence of advanced osteoarthritis was associated
• with a less favorable outcome.
- Lotke Patients with normal preoperative radiographs had a greater chance of
excellent or good outcomes (90%) than did patients with moderate
degenerative changes (21%).

- Evaluate the prevalence of articular cartilage changes in the knee joint and to analyze predictive factors for these changes in patients undergoing arthroscopy for meniscal pathology.

1,010 patients underwent arthroscopic meniscectomy or meniscal repair

The presence, location, size, and Outerbridge grade of changes to the articular surfaces of the knee joint.

48% of patients showed changes to the medial compartment, 25% to the lateral compartment, and 45% to the

- patellofemoral compartment.

Eighty-five percent of patients aged 50 to 59 years and 86% of patients aged 60 years or older showed articular cartilage changes to at least 1 knee compartment. In contrast, only 13% of patients aged younger than 20 years and 32% of patients aged 20 to 29 years showed changes to at least 1 compartment.

False negative MRI: Radiographics

13:492

Sensitivity and specificity of MR imaging findings were, respectively, 95% and 74% for the medial meniscus ; 86% and 90% for the lateral meniscus.

As the classification grade increased, the likelihood of meniscal tear also increased.

Medial meniscal tears tended to occur in a predictable pattern, extending from the posterior to the anterior horn.

Degenerative tear: *Arthroscopy: The* Journal

of Arthroscopic and Related Surgery, Vol 21, No 11 2005: pp 1366-1369

- Complex and horizontal cleavage meniscal tears are highly associated with an increased incidence and severity of cartilage degeneration compared with other types of meniscal tears.
- Degenerative meniscus tears are not as benign as was previously thought.
- New age-related categories of chondral damage are emerging.

Degenerative Versus Nondegenerative Menisci

- In comparing degenerative and nondegenerative bucket handle medial meniscal tears that were repaired in ACL-reconstructed knees, **subjective Noyes scores were significantly higher in patients with non degenerative** repaired tears compared with patients with repaired degenerative tears
- In comparing meniscal repair and meniscectomy in this same cohort, they found no significant difference in objective IKDC evaluation (P 5 .58) or radiographic IKDC scores (P 5 .46) between meniscectomy or repair.

DISCUSSION

The meniscus is an important structure in knee function and plays a crucial role in shock absorption, lubrication, proprioception, load transmission, and stability.

There is often poor correlation between objective data and subjective complaints, making studies on outcomes difficult to perform.

By systematically reviewing the available literature :

- Degenerative-type tears of the meniscus are significantly associated with a negative postoperative outcome.
- Degenerative tears may result because of this tissue's decreased ability to withstand load and abnormal force transmission during knee joint movement due to decreased water content.
- This may lead to a tear developing spontaneously or in conjunction with minor knee trauma.

- Tear pattern did not correlate strongly with postoperative outcomes.
- Subjective results were also mixed based on tear pattern with 2 of the 4 studies reporting that certain types of tears (posterior horn of medial meniscus, horizontal cleavages, degenerative, and complex tears) led to a worse outcome, while the other 2 studies found no difference.
- Based on the available data, there are no clear and consistent data to suggest that tear pattern is a significant predictor of postoperative outcomes.
- The recent New England Journal of Medicine article that showed knee arthroscopy for arthritic conditions may not lead to optimal outcomes.
- No study was able to demonstrate increased radiographic OA of the lateral compartment in the setting meniscal surgery and valgus alignment.

- Meniscectomy Vs Sex: no difference in incidence of OA
- Both total medial and lateral meniscectomy are significantly associated with negative postoperative outcomes compared with partial meniscectomy.
- Biomechanically, the peak local contact pressures increase, and there is a decrease in contact area after meniscectomy. With a partial meniscectomy, peak local contact pressure is increased by 65%, and the contact area is decreased by 10%. In the setting of a total meniscectomy, peak contact pressure is 235% of normal, and the contact area decreases by 75%.
- A medial meniscectomy decreases contact area by 50% to 70% and increases contact stress by 100%, while lateral meniscectomy decreases contact area by 40% to 50% but increases contact stress by 200% to 300% secondary to the relative convex surface of the lateral tibial plateau. A few studies found no difference in the development of OA between lateral and medial meniscectomy
- Overall outcomes for meniscectomy surgery in the ACLdeficient patient group were noted to be inferior to those in the ACL intact.

Predictors of degenerative meniscus extrusion

- Knee Surg Sports Traumatol Arthrosc. 2011 Feb;19(2):222-9. Epub 2010 Oct 2.
- 102 knees with medial meniscus posterior horn tears
- Tears were classified as root (n = 17) and non-root (n = 85) tears, or as radial (n = 46) and non-radial (n = 56) tears. Groups were compared in terms of absolute and relative meniscal extrusion, and the proportion of knees with major (> 3 mm) extrusion.

Meniscal extrusion was greater and more severe in knees with a radial tear component than in knees without a radial component.

- A radial component and knee osteoarthritis severity were similarly predictive of absolute and relative extrusion.
- Meniscal extrusion in osteoarthritic knees was associated not only with degenerative meniscal tear but also with osteoarthritis severity.

Meniscal Extrusion; *AJR*

2004;183:17-23



- > 2mm
- >3 mm severe extrusion
- Associated with oblique, complex and radial tear in the presence of OA

- Kenny concluded that these abnormalities could develop in knees with radial displacement (i.e., extrusion) of the medial meniscus and loss of meniscal function.
- In our population, the degree of medial meniscus degeneration was significantly associated with the extent of meniscal extrusion.
- Tears involving the meniscal root (central attachment) are also significantly related to the severity of meniscal extrusion, seen in 3% with minor extrusion and 42% with major extrusion.
- Furthermore, meniscal root attachments present one of the primary factors in maintaining resistance to hoop strain during load bearing,

The meniscus in knee osteoarthritis.

- Rheum Dis Clin North Am. 2009 Aug;35(3):579-90.
- Meniscal damage is a frequent finding on MRI of the osteoarthritis (OA) knee.
- The damage appears as horizontal, flap, or complex tears; meniscal maceration; or destruction.
- Asymptomatic meniscal lesions are common incidental findings on knee MRI of the middle-aged or older person. This challenges the health professional in choosing the best treatment.
- A meniscal tear can lead to knee OA, but knee OA can also lead to a spontaneous meniscal tear. A degenerative meniscal lesion often suggests early-stage knee OA.
- Surgical resection of nonobstructive degenerate lesions may merely remove evidence of the disorder while the OA and associated symptoms proceed

Arthroscopic Debridement in OA

Predictors of Outcome Following Arthroscopic Débridement for Knee Osteoarthritis

Variable	Likely to Benefit	Unlikely to Benefit
Age	<40 yr	>75 yr
Compartment	Medial, single compartment	Tricompartmental, lateral, tibial
Joint space preservation	>5 mm	<5 mm
Alignment	Neutral	Valgus
Duration of symptoms	<6 mo	>1 yr
Symptom location	Localized	Diffuse
Weight	Body mass index <30	Body mass index >30
Effusion	Present	Absent

- **MENISCAL CYSTS**

Meniscal cysts. Campbell Canale & Beaty: 11th ed●

- Causes
 - 1. Not known
 - 2. Myxoid degn of the menisci
 - 3. May develop from chronic medial or lateral degenerative **meniscal** tears;
- Pathology
 - 1. They most commonly involve the lateral meniscus.
 - 2. Probing the **meniscal** tear fragments and opening the horizontal split in the meniscus with a small curved curret
- RX
 - 1. The **cyst** is curetted, and external digital palpation of the **cyst** is used to free up the **cyst** and decompress it into the joint.

- 2. Suction may be used to remove the contents further.
- 3. The **meniscal** fragments are removed and are cleaned up to relatively stable healthy meniscus.:
- A partial arthroscopic meniscectomy was performed,
- Most required complete excision of the meniscus to bleeding peripheral tissue at the location of the **cyst**.
- Metcalf also recommended arthroscopic resection of the **meniscal** tear and noted that the resection usually requires removing most of the meniscus because of the fragmented, multiplaned nature of the tear.
- If the **cyst** does not spontaneously decompress, it can be percutaneously aspirated and does not require open excision.
- Glasgow et al. reported 89% good-to-excellent results with arthroscopic partial meniscectomy and **cyst** decompression.

Lantz.

Clin Sports Med. 1990 Jul;9(3):707-25

- Meniscal cysts are cysts that occur as a direct extension, or within the substance of the meniscus.
- The incidence varies in reports from 1% to 20% and are much more common laterally.
- They usually present as joint-line pain, swelling, or both in young adult men, and are often associated with meniscal tears.
- The exact etiology of meniscal cysts is unknown. A myxoid degenerative process is identified histologically.
- There is often a history of precedent trauma.
- Diagnosis is often suspected clinically and can be confirmed by arthrogram, CT, or MRI when necessary. Conservative treatment in the patient with few symptoms is recommended. Should the cyst become significantly symptomatic, it is necessary to treat the meniscal pathology to prevent a cyst recurrence.
- At the present time it is our recommendation that this be done by arthroscopically resecting the meniscus back to normal meniscus and either aspirating and injecting the cyst with steroid or local cyst excision if the aspiration and injection fails. If no meniscal tear is documented at arthroscopy, exploration and excision of the cyst are recommended.

Boston study

Knee. . 2008 Dec;15(6):423-38. Epub 2008 Jun 17.

- Cystic lesions around the knee are a diverse group of entities, frequently encountered during routine MRI of the knee.
- These lesions range from benign cysts to complications of underlying diseases such as infection, arthritis, and malignancy.
- MRI is the technique of choice in characterizing lesions around the knee: to confirm the cystic nature of the lesion, to evaluate the anatomical relationship to the joint and surrounding tissues, and to identify associated intra-articular disorders.
- We will discuss the etiology, clinical presentation, MRI findings, and differential diagnosis of various cystic lesions around the knee including meniscal and popliteal (Baker's) cysts,
- intra-articular and extra-articular ganglia, intra-osseous cysts at the insertion of the cruciate ligaments and meniscotibial attachments, proximal tibiofibular joint cysts, degenerative cystic lesions (subchondral cyst), cystic lesions arising from the bursae (pes anserine, prepatellar, superficial and deep infrapatellar, iliotibial, tibial collateral ligament, and suprapatellar), and lesions that may mimic cysts around the knee including normal anatomical recesses. Clinicians must be aware about the MRI features and the differential diagnosis of cystic lesions around the knee to avoid misdiagnosis.

New observations on meniscal cysts

- Skeletal Radiol. 2010 Jul 31.
- A total of 2,095 consecutive knee MR imaging reports from a 22 month period were retrospectively reviewed for the presence of meniscal cysts.
- Intrameniscal cyst or parameniscal cyst.
- **RESULTS:**
- f 167 cases (8.0%) of meniscal cysts were diagnosed
- 69 (41.3%) were located in the lateral meniscus and 98 (58.7%) in the medial meniscus.
- In 6 patients (3.7%), meniscal cysts were present in both menisci of the same knee.
- 7.2% meniscal cysts were associated with discoid menisci.
- 57.8% meniscal cysts were associated with meniscal tears.
- 62.3% had a parameniscal cyst.; An isolated intrameniscal cyst 37.7% cases.
- A tear extending to the articular surface of the meniscus was reported to be present in 74 of the 88 (84%) arthroscopic examinations.

Pisani's sign

- Knee Surg Sports Traumatol Arthrosc. 2009 Apr;17(4):402-4. Epub 2009 Jan 31.
- The typical presentation of lateral meniscal cysts usually makes their clinical diagnosis simple
- But a wide variation in size may sometimes lead to misdiagnosis.
- We evaluated the effect of leg rotations on the cystic swelling at 45 degrees of knee flexion.
- Eleven consecutive patients with positive Pisani's sign were evaluated prospectively. Lateral mid-third joint-line swelling was most prominent at 30-45 degrees of knee flexion. With the knee held at 45 degrees of flexion, the prominence was also inspected during internal and external rotation of the leg.
- The masses became noticeably more prominent with external rotation, and completely disappeared with internal rotation. With external rotation of the leg, even doubtful lateral meniscal cysts became apparent. Disappearance of the cystic mass with internal rotation further confirms the diagnosis.

MR imaging of meniscal cysts.

- AJR 2001 Aug;177(2):409-13.
- **MATERIALS AND METHODS:** A total of 2572 knee MR imaging reports were retrospectively reviewed for the presence of meniscal tears and cysts. Two musculoskeletal radiologists reviewed all images with reported cysts. The type and location of meniscal tear and the presence and location of meniscal cysts were recorded.
- **RESULTS:** A total of 1402 meniscal tears were reported in 2572 MR examinations (922 [66%] of 1402 in the medial compartment; 480 [34%] of 1402 in the lateral compartment). **Meniscal cysts were present in 109 (4%) of 2572 knees. Of the 109 cysts, 72 (66%) were in the medial compartment, and 37 (34%) were in the lateral compartment.**
- **Meniscal cysts were found in association with 72 (7.8%) of the 922 medial meniscal tears and 37 (7.7%) of the 480 lateral meniscal tears.** Meniscal cysts showed direct contact with an adjacent meniscal tear in 107 (98%) of 109 cases, with the tear showing a horizontal component in 96 (90%) of 107 cases.
- **CONCLUSION:** Meniscal cysts occur almost twice as often in the medial compartment as in the lateral compartment. Medial and lateral tears occur with the same frequency. These findings, when viewed in the context of the historical literature on meniscal cysts, suggest that MR imaging detects a greater number of medial meniscal cysts than physical examination or arthroscopy, and that MR imaging can have an important impact on surgical treatment of patients.
-
-

Skeletal Radiol. 2010 Jul 31

- **CONCLUSIONS:** Knowledge of the spectrum of findings and the relative frequency of various MR imaging characteristics as well as common potential pitfalls is important to the accurate diagnosis and management of meniscal cysts. In particular, controversy exists as to the incidence of articular surface tears in association with meniscal cysts, with some authors reporting greater than 98% correlation with tears. Only 58% of cysts were associated with an articular surface tear. Ninety six percent of the parameniscal signal was isointense to fluid, only 8% of the intrameniscal signal was isointense to fluid