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Convergent adaptation to a marginal habitat by homoploid hybrids and polyploid ecads in the seaweed genus *Fucus*

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Meniscus repair in the anterior cruciate deficient knee*

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ABSTRACT

From 1979 to 1986, isolated repair of a peripheral vascular zone meniscal tear was performed in 22 patients (23 menisci) who had ACL insufficiency. For various reasons none of these patients underwent repair or reconstruction of their ACL. The meniscus repair was done by open arthrotomy in 12 cases and by arthroscopic techniques in 11 cases. The purpose of this study was to evaluate the success rate of a meniscal repair in an anterior cruciate deficient knee. The average age of the patients at the time of surgery was 25 years and the average followup was 56 months. Six patients (26%) had mild occasional pain not requiring medication and one patient had moderate pain requiring nonnarcotic pain medication. Eight patients (26%) had occasional giving way episodes and one of them underwent ACL reconstruction 5 years later because of frequent giving way. One patient required a postoperative manipulation for inadequate range of motion, but there were no neurovascular injuries or infections. There were three patients (13%) who had failed repairs or a retear and required subsequent subtotal meniscectomies. None of the other patients had any clinical symptoms or signs of a meniscal tear. There were no significant differences between the results of open or arthroscopic repair. Even though the failure rate of meniscus repair may be greater in an unstable knee, we conclude that meniscus repair is not contraindicated in an anterior cruciate deficient knee.

Many authors have shown an increased incidence of degenerative arthritis following meniscectomy.[6, 9, 10, 15, 16, 23, 24, 27, 39] Several techniques for both open and arthroscopic meniscal repairs have been developed, and the early results of these techniques are very encouraging (Refs. 4, 7, 12, 14, 17, 19–21, 29, 30, 32–37, 40, 41; G. A. Hanks et al., unpublished data, 1989). There are many articles describing and evaluating the various techniques, but few authors[12, 35] have specifically studied a group of patients with both anterior cruciate insufficiency and a meniscal tear who undergo meniscal repair alone. Also, to our knowledge, no one has compared the open and arthroscopic techniques in this selected subset of patients.

When meniscal tears occur in conjunction with ACL injuries, most authors, including us, advocate concurrent meniscal repair and repair or reconstruction of the torn ACL. However, some patients elect to have a meniscal repair and not to have the ACL reconstruction procedure. This study was undertaken to evaluate the results of meniscal repair in knees lacking a functional ACL and to compare the open and arthroscopic repair techniques.

MATERIALS AND METHODS

From 1979 to 1986, we performed 25 repairs of peripheral vascular zone meniscal tears in 24 patients who had anterior cruciate insufficiency. For various reasons, none of these patients underwent repair or reconstruction of their ACL. Two patients were lost to followup, thus, 23 menisci in 22 patients compose this study (Table 1). Sixteen of the patients (with 17 meniscal repairs) returned for an interview and physical examination. The remaining six patients were contacted by telephone, but each of these had been examined by one of us (AK or GH) at least 2 years postoperatively. None of the patients contacted by telephone alone stated that they had any change in their symptoms since their last office visit. The meniscal repair was done by open arthrotomy in 12 cases and by arthroscopic techniques in 11.

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Open meniscal repair

Twelve patients underwent an open repair of peripheral meniscal tears using a posteromedial arthrotomy. There were 10 males and 2 females (average age, 22). All of the tears involved the peripheral attachment of the medial meniscus. Seven tears were restricted to the posterior third of the meniscus while the remaining five extended from the posterior third into the middle third. Four patients were recreational athletes, one was a high school basketball player, four were collegiate football players, one a collegiate basketball player, and one was a professional steer rider. The remaining patient did not participate in athletics.

The open repair was performed using the technique described by DeHaven.[12, 14] A diagnostic arthroscopy was performed as well as any necessary associated arthroscopic procedures. A partial lateral meniscectomy was done in four cases and a debridement of the torn ACL in three, two in conjunction with a partial lateral meniscectomy. Two patients had shaving of the articular cartilage lesions. The suture material used for the open meniscus repairs was Ethibond (Ethicon, Sommerville, NJ) in seven knees, chromic gut in four (Ethicon), and Vicryl (Ethicon) in one. The meniscal repair bed was prepared by rasping or abrading the edges of the meniscal tear and the meniscosynovial junction followed by placement of vertical mattress sutures as described by DeHaven.[12, 14]

Closed arthroscopic technique

An arthroscopic repair was completed in 11 patients using the double lumen cannula system (Acufex Microsurgical Co., Norwood, MA) developed by Clancy and Graf.[8] There were nine males and two females; average age was 25 (range, 16 to 42). Four patients were recreational athletes, three played high school basketball, one was a high school gymnast, and two played college football. The remaining patient did not participate in any sports. The tears involved the peripheral vascular third of the meniscus but were not limited to peripheral detached tears. Nine tears involved the medial meniscus; three in the posterior third, one in the middle third, and five involving both the posterior and the middle third of the meniscus. Two tears involved the lateral meniscus, one in the posterior third only and the other originating in the posterior third and extending into the middle third. Two of the knees that had a medial meniscal repair underwent a partial lateral meniscectomy. One of them also had debridement of the tibial chondromalacia and removal of loose bodies. A medial collateral ligament repair was carried out in two. One of the knees with a lateral meniscal repair also had a partial medial meniscectomy.

The double lumen cannula system has straight as well as curved cannula that can be used from an ipsilateral or contralateral portal.[8] Prior to suture placement, the meniscosynovial junction was prepared by rasping or abrading the edges of the tear using a motorized shaver or arthroplasty burr.

The majority of the tears were located in the posterior horn or near the junction of the middle and posterior thirds of the meniscus. In order to assure safe passage of the meniscal sutures, a limited posteromedial or posterolateral exposure was made for retraction of the neurovascular structures and direct retrieval of the needles as they emerged through the capsule. For repair of medial meniscal tears, the leg was flexed approximately 80° and a 1 inch vertical incision was made at the posterior medial corner of the joint line to identify the posteromedial capsular structures. To protect the neurovascular structures, a retractor was placed posteriorly. With the arthroscope in the inferolateral portal, a curved cannula was placed through the inferomedial portal and was positioned on the superior surface of the meniscus at the tear. Alternatively, the arthroscope may be placed in the inferomedial portal and the sutures passed through a straight cannula placed in the inferolateral portal. Our preferred suture is a 2.0 polydiaxone suture (Ethicon) swaged on two 10 inch needles. The sutures can be placed on either the superior or inferior surface of the meniscus. The vast majority, however, are placed on the superior surface. The needles were passed through the cannula at the desired position until the tips of the needles engaged the surface of the meniscus. The needles were then advanced 2.5 cm until they passed through the meniscal body, the peripheral meniscal rim, and the capsule. Care was taken to palpate through the posteromedial incision and feel the needle tips as they started to protrude. As soon as the needles were palpated, they were grasped with a needle holder and pulled through the posteromedial incision. This procedure was followed for the placement of as many sutures as needed, with placement of sutures approximately 2 to 3 mm apart. In tears of the most posterior aspect, it was easier to place the arthroscope in the inferomedial portal and pass the cannula through the inferolateral portal. Once all the sutures were in place, tension was applied to the sutures to reduce and stabilize the tear. The sutures were then tied over the capsule and the skin was closed in a routine fashion.

For repair of a lateral meniscal tear, the arthroscope was placed in the inferolateral portal and the cannula was placed in the inferomedial portal (after first positioning the leg in the "figure-four" position). The majority of lateral meniscal tears can be repaired with the cannula in the inferomedial portal, but occasionally the inferolateral must be used. The posterolateral corner of the joint line was palpated and a 1 inch vertical incision was made at the interval between the posterior border of the iliotibial band and just anterior to the biceps femoris tendon. The dissection was carried down to the posterolateral capsule. The common peroneal nerve lies just posterior to the biceps tendon with the leg in the flexed position. A spoon-type or speculum-type retractor was used to protect the neurovascular structures. The straight or curved cannula was placed through the inferomedial portal and placed against the meniscal body. The needles were advanced 2.5 cm and exited above the superior aspect of the biceps tendon to avoid injury to the common peroneal nerve. Additional sutures were placed as needed

TABLE 1
Subject data[a]

Patient no.	Sex	Age	Time from injury to surgery (weeks)	Length of followup (months)	Tear location	Type of repair	Degree of ACL instability (Pivot shift-ALRI)	Symptoms	
								Pain[b]	Giving way
1	M	21	5	73	MM	O	3+	2+	1+
2	F	18	3	87	MM	O	1+	–	–
3	F	42	28	65	MM	O	3+	1+	–
4	M	15	14	94	MM	O	2+	–	–
5	M	21	7	44	MM	O	2+	–	–
6	M	35	Unknown	77	MM	O	3+	1+	3+
7	M	20	8	54	MM	O	2+	1+	–
8	M	27	8	84	MM	O	3+	–	–
9	M	21	26	94	MM	O	3+	–	1+
10	M	22	5	81	MM	O	2+	1+	–
11	M	30	4	78	MM	O	3+	–	1+
12	M	30	12	69	MM	O	3+	2+	2+
13	M	19	1	42	MM	A	1+	–	–
14	F	48	6	25	MM	A	3+	1+	–
15	M	16	2	29	LM	A	2+	–	–
16	M	31	2	48	MM	A	1+	1+	–
17	M	31	2	48	LM	A	2+	–	–
18	M	16	1	41	MM	A	3+	1+	–
19	M	41	12	24	MM	A	3+	–	–
20	F	16	16	38	MM	A	3+	2+	2+
21	M	18	9	24	MM	A	2+	–	2+
22	M	27	1	53	MM	A	3+	–	–
23	M	17	19	36	MM	A	2+	–	1+

[a] Abbreviations: MM, medial meniscus; LM, lateral meniscus; O, open; A, arthroscopic; ALRI, anterolateral rotatory instability; FB, football; BB, basketball.
[b] Pain scale: 0, none; +1, mild—requiring no medication; +2, moderate—requiring aspirin or nonsteroid antiinflammatory drugs; +3, severe—incapacitating.

and tension was placed on the sutures to verify a stable repair. The sutures were then tied over the posterior capsule.

Postoperative care

In the early part of this study, 1979 to 1982, the patients were placed in a long leg cast with approximately 30° of flexion for 4 to 6 weeks, followed by 2 weeks of partial weightbearing and active flexion-extension exercises in a brace. Since 1982 we have immobilized the leg in a locked brace at approximately 30° of flexion for 4 weeks. The position was determined at the time of surgery, prior to placement of the sutures, by observing whether or not there was any separation of the repair with the knee in various degrees of flexion.

The patient was kept nonweightbearing with crutches for 4 weeks. Electrical stimulation of the quadriceps and straight leg raising exercises were initiated to prevent muscle atrophy. At 4 weeks, the brace was started in a 60° arc of motion from 10° to 70°. Partial weightbearing with crutches was allowed at 4 weeks. Strengthening exercises were continued and, in addition, gentle passive flexion and extension were permitted with the brace off. Active flexion and extension was permitted with the brace on. Whirlpool therapy was also begun for range of motion. At 6 weeks, full weightbearing was permitted, as well as full active and passive range of motion out of the brace. Full progressive resistance exercises were initiated and advanced as tolerated.

The length of time required for maturation of a meniscal repair before allowing return to athletic activities with minimal risk is unknown. In the past, we arbitrarily used 6 months as our length of time, but more recently, we have adopted functional criteria to determine return to activity. In some cases, this has allowed return to athletics prior to 6 months. Return to athletic activity was permitted when there was full, painless range of motion, the patient could ambulate without a limp, and there was satisfactory restoration of both quadriceps and hamstrings muscle strength. Although the exact amount of time until full activity was resumed was variable, most patients were able to return to their sport by 3 to 6 months postoperatively.

RESULTS

The average length of followup for all patients was 56 months. There were no infections or vascular or neurologic complications in either group. The average length of followup was 75 months (range, 44 to 94 months) for the

TABLE 1
(continued)

Physical findings		Tegner Activity Score		Postop arthroscopy (yes/no)	Comments
Joint line tenderness	McMurray or Apley's sign	Preop	Postop		
+	−	9	7	Y, healed	Unsuccessfully attempted to return to college FB
−	−	7	7	N	College BB
−	−	6	6	N	
−	−	7	6	Y, healed	Derotation brace
−	−	10	10	N	Derotation brace—college FB
+	−	6	6	Y, retear	Had ACL reconstruction after retear 5 years later
+	−	10	10	Y, healed	Professional FB
−	−	4	4	N	
−	−	9	7	N	Derotation brace—college FB
−	−	9	9	N	Professional steer rider
−	−	6	4	N	Discontinued sports due to fear of reinjury
+	+	6	6	Y, retear	
−	−	7	7	N	College track
−	−	4	4	N	Required manipulation
−	−	8	7	N	Derotation brace—returned to high school FB and track
−	−	6	6	N	
−	−	6	6	N	
−	−	8	7	N	
−	−	6	6	N	
+	+	7	6	Y, retear	No sports due to instability, but does not want reconstruction
−	−	9	6	N	
+	−	6	5	Y, healed	
−	−	7	7	N	Derotation brace

patients who underwent an open arthrotomy. For those who had an arthroscopic repair, the average length of followup was 37 months (range, 24 to 53 months). The followup focused on the presence, character, and location of pain, the presence of swelling, and if symptoms of catching, snapping, or locking were present.

The patients were asked questions regarding their activity level and limitations. The activity level was classified using the Activity Score described by Tegner and Lysholm.[38] At the last followup, the knees were examined for range of motion and for signs of joint line tenderness and effusion. A McMurray's test and an Apley's compression test were performed. We could not justify a routine repeat arthroscopy of asymptomatic patients. With an average followup of over 4 years, if the meniscal repair had failed to heal, we would have expected the knee to have some signs or symptoms of a meniscal tear, especially since absorbable sutures were used in 16 of the 23 repairs. Thus, we assumed that the meniscus had healed if there was an absence of any clinical symptoms or physical findings. We recognize that there is a possible limitation in a clinical evaluation because it is possible that a tear has incompletely healed and has now become a smaller stable incomplete tear. We believe that a healed tear and a stable incomplete tear are, however, clinically equivalent. We expect that an unstable tear that had not healed would have produced some clinical findings. Seven of the patients, however, have had repeat arthroscopic examinations. Four were performed because of recurrent pain, one had an arthroscopy 5 years later at the time of an ACL reconstruction, one for removal of a loose body, and one following a giving way episode.

Pain

At followup, seven patients reported occasional mild pain with activity, which did not require medication (Table 1). Four patients had new onset of moderate pain and all four required a repeat arthroscopy; new or repeat tears were found in three of those patients.

Instability

Eight patients had some instability symptoms (Table 1). In four of these, the giving way caused a moderate restriction in their activities. Two patients who had mild instability and two patients who denied any pain or giving way stated that they wore a derotation brace for participation in any

sports. One patient who complained of frequent giving way sustained a retear of the meniscus 5 years following the initial repair and then elected to have a ligament reconstruction.

All three patients who had retears had joint line tenderness upon physical examination and two of the three had a positive McMurray sign. There were no patients who complained of locking.

Activity level

The activity level of the patients was classified by assigning a Tegner Activity Score[38] prior to the injury and at followup. Nine patients had lost one or more grades of the Tegner Activity Score. In four of these, however, the change in score was due to graduation from college or high school after which they participated only in recreational sports rather than competitive sports. One patient attempted to return to college football, but even though he was not having significant knee symptoms, he was unable to perform at his previous level of effectiveness. Four additional patients had lost at least one grade in the Tegner Activity Score because of knee symptoms of pain, instability, or both.

Subjectively, four of the patients in the arthrotomy group and two in the arthroscopic repair group felt limited in their activity level. Several recreational athletes remained active in recreational sports, but because of the age factor, they admitted that the frequency of participation had diminished. Using the Tegner scale, however, their activity scores were unchanged. Two patients who did not participate in sports prior to their injuries had unchanged activity scores of 4.

Repeat arthroscopy

Seven patients underwent repeat arthroscopic examinations. Four of these had healed meniscal lesions and three had meniscal tears at either the previous repair site or more central on the same meniscus. If a new tear was found, even if it occurred at another site on the same meniscus, this was rated as a failure.

A 16-year-old gymnast initially had an arthroscopic repair of a peripheral tear involving the posterior horn of the medial meniscus. Eight months later she had several episodes of giving way and was noted to have new medial joint line tenderness and a positive McMurray sign. A vertical longitudinal tear was found at the previous repair site and a partial medial meniscectomy was performed. One year later she had moderate pain requiring occasional aspirin, instability, and felt limited in her ability to change direction abruptly, but still did not elect to have a ligament reconstruction.

A second patient, a 35-year-old recreational male, had a rotational injury 56 months after an open repair of the posterior horn of the medial meniscus. He had recurrent medial joint line pain. The peripheral repair was found to be intact but a new, slightly more centrally located, oblique tear was found and a partial medial meniscectomy was performed. Four months later an ACL reconstruction was performed because of persistent instability symptoms.

A third patient reinjured his knee 5 years after the initial open repair. Arthroscopy demonstrated a vertical longitudinal tear in the central portion of the body of the meniscus. A partial meniscectomy was performed.

DISCUSSION

Fairbank[15] reported on the radiographic evidence of degenerative changes following meniscectomy in 1948. These signs consisted of femoral condyle ridging on the anteroposterior view, condylar flattening, and joint space narrowing. He cautioned that meniscectomy was not an innocuous procedure and his concerns have been echoed by others. Jackson,[23] in 1968, reviewed 640 knees following meniscectomy and found a significant increase in the incidence of degenerative changes. In 1974, Johnson et al.[24] revealed a 39% incidence of degenerative arthritis in postmeniscectomy knees, with only a 6% incidence in the contralateral knee. Several other clinical and biomechanical studies have supported the importance of the menisci in the mechanics of the knee.[6, 9, 10, 27, 31, 39]

Although Thomas Annandale[1] repaired a torn meniscus in 1885, until recently, the usual options for a meniscal tear included conservative treatment with temporary immobilization and restriction of activity or total meniscectomy. In 1936, King's[26] experiments with dogs revealed that a meniscus could repair itself if the tear communicated with the synovial-capsule junction. Heatley[18] similarly had successful results in rabbits. Arnoczky and Warren[2] showed that the vascular supply of the meniscus originated from the perimeniscal capillary plexus, which gives off radial branches that penetrate the peripheral 10% to 30% of the meniscal width. Others have shown similar findings and it became clear that tears involving the vascular region have the potential to heal.[3, 5, 11, 22] Since then, a number of authors have reported encouraging results following meniscal repair performed by both open and arthroscopic techniques[3, 7, 12–14, 16, 17, 19–21, 29, 30, 32–37, 40, 41] McDaniel and Dameron[28] showed that one third of knees in which an ACL disruption is left untreated developed degenerative changes. Eighty-six percent of the knees had one or both menisci removed. Kannus and Järvinen[25] found a 70% incidence of radiographic degenerative changes at an 8 year average followup for Grade III cruciate tears treated conservatively. Perhaps the long-term effects of an untreated ACL tear in conjunction with a meniscal tear are cumulative with respect to degenerative changes.

Ideally, in a knee in which there is both an ACL tear and a repairable peripheral meniscal tear, the former should be reconstructed and the latter repaired. Even with this philosophy, however, for various reasons some patients do not elect to undergo a ligament reconstruction. Although a few patients have returned to sports 6 to 8 months following ACL reconstruction, most do not return to sports for 9 to 12 months. Some patients feel they must return to their

sport or vocation sooner and do not undergo a reconstruction. In addition, although we advocate ACL reconstruction for any patient who wishes to continue to place a high functional demand on his knee, not all orthopaedic surgeons who perform arthroscopy agree with this philosophy.

To date, few studies have investigated the feasibility of meniscal repair in the anterior cruciate deficient knee. DeHaven[12] found a 30% incidence of retears in meniscal repairs in knees with anterior cruciate laxity as opposed to a 10% failure rate in the knees that underwent reconstruction. However, his study included only 14 patients with unreconstructed unstable knees. Sommerlath and Hamberg,[35] on the other hand, showed an 89% success rate in meniscal repairs in 28 unstable knees. Furthermore, in 20 of these, healing of the tear was documented by repeat arthroscopy. The failure rate of our study is nearly identical to that found in Sommerlath's study.

Both open and arthroscopic techniques appear to be equally safe and effective, but the followup was twice as long in the open repair group. In our hands, the arthroscopic technique was easier to perform and expanded the indications for repair by allowing access to tears in the substance of the outer third of the meniscus as well as tears of the coronary ligament attachments. Many of the tears in the substance of the meniscus would not be suitable for the open repair technique.

With an overall average followup of 56 months, our data showed that meniscus repair was successful (in terms of preservation of the meniscus) in 87% of anterior cruciate deficient knees compared to a 94% success rate in cruciate stable knees (G. A. Hanks et al., unpublished data, 1989). Even if the two patients lost to followup are both assumed to be failures, the success rate would still be 80%. We believe that ACL stability is preferred, but would proceed with a meniscal repair regardless of the desired treatment for the instability. The alternative to a meniscal repair would be a subtotal meniscectomy, removing a large portion of the meniscus. This would result in a greater likelihood of degenerative changes, especially in a knee with a torn ACL. Preservation of meniscal tissue by meniscus repair should reduce the incidence and severity of degenerative changes in an anterior cruciate deficient knee. Further long-term followup will be needed to carefully assess the incidence of late degenerative joint disease in this group of patients.

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COMMENTARY

Charles E. Henning, MD, *Wichita, Kansas:* The clinical approach to the meniscal tear in the anterior cruciate deficient knee presented in this paper may be considered as the authors' experience but not necessarily as recommendation for current treatment of this problem. The majority of young athletes who tear the ACL, and attempt to remain active, frequently present with increasing disability because of a meniscal tear. It is unlikely that a repaired meniscus would be more durable than the original meniscus. Some athletes are quite clever at favoring their unstable knee and appear to function pretty well at the expense of their good knee.

Our experience has been that the majority of repaired menisci in still cruciate deficient knees in active young athletes end up becoming symptomatic rather quickly. Thus, the indications for repair of the meniscus only must be very strictly defined. The authors' subsequent reoperation rate was 39% for the combination of subsequent ACL reconstruction (indicating improper patient selection for this initial operation) and subsequent subtotal meniscectomy (a failure of concept of the operation to make the knee more normally functional again).

COMMENTARY

Kenneth E. DeHaven, MD, *Rochester, New York:* This controversial paper raises several interesting and important issues: meniscus repair in the unstable versus stable knee, time to return to sports, clinical versus "objective" followup, and open versus arthroscopic repair.

The authors call into question two currently accepted principles of meniscus repair: 1) there are significantly increased retear rates in ACL unstable (compared to stable) knees subjected to athletic levels of stress, and 2) the need to allow sufficient time (i.e., 6 months) for maturation of the meniscus healing response before subjecting the repaired meniscus to high levels of stress. The authors have encountered only a slightly increased retear rate (13%) in unstable versus stable knees (6%), in spite of having been subjected to athletic levels of stress (postoperative Tegner scores between 5 and 10 in 20 of the 23 patients). As the authors have indicated, this is very different from this reviewer's experience[1] (38% retears in unstable knees versus 5% in stabilized knees) and that of most surgeons who have attempted meniscal repair in unstable knees. It should be emphasized that the authors continue to recommend ACL stabilization in conjunction with meniscal repair in high demand knees. Even though I am unable to understand why the results are so much better in this series, I agree with the authors' statement that if such a patient elects not to have ACL surgery, meniscal repair should still be performed because the majority will be successful even in the presence of continuing instability (87% in this study, 62% in ours) and because removal of a repairable tear would result in near total meniscectomy.

The issue of allowing time for maturation of the healing response (i.e., 6 months) before returning to activities that place significant stresses upon the knee is more difficult to assess. While the authors currently permit return to sports as early as 3 months postoperatively if certain functional criteria are met, it is not clear how many of their patients actually returned to strenuous agility or contact sports in less than 6 months, and I would urge caution in drawing the conclusion that it is safe to do so from the limited data presented in this paper. While I permit return to some sports activities as early as 3 months (jogging, cycling, swimming, rowing machine, cross country ski simulator), I continue to advise waiting 6 months before returning to full-speed running, agility, or contact sports since two of our early retears (both through the repair site) occurred when return to soccer was permitted before 6 months.

This study also raises the issue of adequacy of clinical followup of meniscal repair since other authorities (particularly Henning) have strongly advocated routine followup by arthrography for medial and arthroscopy for lateral repairs. I concur with the authors' position that it is not necessary to routinely recommend invasive procedures to assess initial healing. Over the 14 years that this reviewer has been performing meniscal repairs, typical symptoms and signs of meniscal abnormalities have been present in every instance in which failure to heal or meniscus retear has required additional surgical treatment (repeat repair or partial meniscectomy). The main contribution of routine arthrography and/or arthroscopy would be to detect incomplete versus complete healing and I am in agreement with the authors that incomplete but stable healing is clinically comparable to complete healing, which has been documented in a follow-up study of stable meniscal tears left alone.[2] In addition, the majority of meniscal repairs that require subsequent treatment are new tears in a different area of the meniscus with the original repair site remaining intact, and prior documentation of complete healing would be of questionable relevance.

Finally, regarding the issue of open versus arthroscopic repair, I agree that not all tears definitely suitable for repair (i.e., within the vascular zone of the meniscus) can be performed by an open technique. And while I personally still prefer an open procedure for cases within 2 mm of the meniscosynovial junction, I routinely use arthroscopic techniques to repair tears 3 to 5 mm from the meniscosynovial junction. This has allowed the frequency of repair to increase from 18% to nearly 30% of personal meniscus cases being treated at the present time. To date, results of open and arthroscopic repair in the vascular zone of the meniscus appear to be comparable.

As the authors themselves have implied, this paper should not be taken to refute the prevailing consensus that meniscus repair *and* ACL stabilization are advisable for patients intending to place high levels of demand upon their knees, but rather as support for repairing the meniscus in those high demand patients who for various reasons elect not to undergo ACL stabilization.

REFERENCES

1. DeHaven KE, Black KP, Griffiths HJ: Open meniscus repair. Technique and two to nine year results. *Am J Sports Med 17:* 788–795, 1989

2. Weiss CB, Lundberg M, Hamberg P, et al: Non-operative treatment of meniscal tears. *J Bone Joint Surg 71A:* 811–822, 1989

Authors' Reply: We appreciate the reviewers' comments. Dr. Henning states that "the indications for repair of the meniscus only must be very strictly defined." Our paper clearly states three times that we advocate concurrent repair or reconstruction of the ACL. Dr. DeHaven's commentary accurately underscores our recommendation. Despite our philosophy about ACL stabilization, some patients elect not to have the ACL reconstruction and it is only those select patients that we are discussing. To deny them a meniscal repair because of their decision about the ACL would necessitate a near total meniscectomy. This would amplify the already increased risk of degenerative changes. We feel that our indications are in fact very strictly defined.