Meniscal Repair With the RapidLoc Meniscal Repair Device

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**Background:** The RapidLoc is an all-inside, self-adjusting, flexible meniscal repair device that combines a suture with an anchor component and, by using a reinforced sliding knot, allows for tightening to compress and hold the repaired meniscal segments. The purpose of this study was to evaluate the clinical success of the RapidLoc device. **Methods:** A prospective consecutive series of meniscal repairs performed with the RapidLoc device was studied. Lysholm, Tegner, Cincinnati, IKDC (International Knee Documentation Committee) activity scores, clinical examination findings, and adverse events were recorded on all patients. Associated procedures were recorded. An accelerated postoperative rehabilitation program was followed, independent of whether anterior cruciate ligament (ACL) surgery was also performed. **Results:** A total of 32 patients underwent 32 meniscal repairs, with an average follow-up of 31 months (18 to 48 months). In all, 23 repairs were done in conjunction with ACL reconstruction, and 9 repairs were carried out in stable knees. Repairs were made to 25 medial menisci and 7 lateral menisci. Tears repaired consisted of peripheral longitudinal tears with an average length of 2 cm (range, 15 to 30 mm). Four failures (12.5%) were arthroscopically documented. Clinical success occurred in 87.5% at the time of last follow-up. At follow-up, mean Tegner score was 5.1 (2.8 preoperative), IKDC activity score was 3.1 (1.8 preoperative), Lysholm score was 93.6 (48.4 preoperative), and mean Cincinnati score was 88.1 (43.7 preoperative). The most common adverse event was cutting of the suture during RapidLoc insertion. One patient had excoriation and grooving of the medial femoral condyle associated with failed repair. Another patient developed a postoperative infection. **Conclusions:** The early clinical success rate was 87.5% with the RapidLoc device. Chondral grooving was observed in a single case. **Level of Evidence:** Level IV, therapeutic case series. **Key Words:** Meniscus—Repair device—Bioabsorbable—Arthroscopy—RapidLoc—Panacryl.

An arthroscopic meniscal repair is a commonly performed procedure, and many all-inside devices have been developed to facilitate this procedure. The newest generation of meniscal repair devices consists of self-adjusting anchors. This type of repair device combines a suture with an anchor component and, by using a sliding knot, allows for tightening of the suture to compress and hold the repaired segments together.

The RapidLoc meniscal repair device (Fig 1) (DePuy-Mitek, Westwood, MA) consists of 3 elements: a “TopHat” and a bar, and a suture made of No. 2 Ethibond (Ethicon, Somerville, NJ) or No. 2 Panacryl (Mitek, Somerville, NJ), which connects the two. This device is inserted into the meniscus with the use of a gun that fires the bar through the inner portion of the meniscus tear, on through the peripheral meniscal rim, and into the joint capsule. The No. 2 suture comes with a pre-tied sliding knot. The bar measures 5 × 1.5 mm, and the “TopHat,” which should be pushed firmly enough into the meniscal surface to dimple that surface, is 4.5 × 2.5 × 0.25 mm and somewhat oval in shape. The “TopHat” and bar are made of poly-L-lactic acid (PLLA) or polylactide (PDS). Delivery needles are available in straight, 12°, and 27° versions, and a malleable insertion spatula is provided to facil-
itate passage of the gun through the fat pad. A single-
lumen knot pusher is used to advance the “TopHat”
and knot to the meniscus surface. Our hypothesis was
that this device would successfully repair longitudinal
meniscus tears. The purpose of this study was to
evaluate the clinical success of the RapidLoc meniscal
repair device.

**METHODS**

Between July 2001 and January 2004, all patients
undergoing arthroscopic meniscal repair with the
RapidLoc device were prospectively evaluated (Fig 2).
Patients were enrolled into the study at the time of
meniscal repair and were evaluated postoperatively at
regular intervals. Preoperative and postoperative Ly-
sholm, Tegner, Cincinnati, and IKDC (International
Knee Documentation Committee) activity scores were
calculated at 6 months and 12 months after surgery,
and annually thereafter. Criteria for clinical success
included absence of joint line tenderness, swelling,
and a negative McMurray test. Follow-up results were
attained through annual clinic visits, mailed question-
naires, or phone interviews. Data on results and ad-
verse events were collected and consolidated. Clinical
success was achieved when the patient was asympto-
matic and showed no specific objective evidence of
a meniscus tear (e.g., effusion, positive McMurray
test) at follow-up, or at the point when meniscal
healing was arthroscopically verified.

Inclusion Criteria were patients with longitudinal,
full-thickness meniscus tears in the “red-red” (3 mm
from the synovial-meniscal junction) or “red-white”
(3 to 5 mm from the synovial-meniscal junction) zone
of the meniscus. No age restrictions were imposed.
Associated anterior cruciate ligament (ACL) recon-
struction was permitted.

Exclusion Criteria were patients with horizontal,
transverse, or complex tears of the meniscus. Those
with longitudinal tears with degenerative changes
(which rolled when probed), multiple longitudinal me-
nsicus tears, and tears for which attempted repair was
unsuccessful because of the fragile nature of the tissue
were excluded. The meniscal repair surgical technique
used involved healing enhancement by rasping8 and
trephination but not marrow stimulation9 or fibrin clot
creation.10

The postoperative rehabilitation program was an
“accelerated” one that did not vary, whether or not an
ACL reconstruction was performed. No postoperative
bracing was used. Patients were allowed to actively
move their knees within the nonpainful range. They
were asked to refrain from forcefully flexing their
knees but to allow flexion to improve as swelling
decreased. Patients were permitted full, immediate
weight bearing as soon as pain allowed. Those under-
going ACL reconstruction usually did not need their
crutches within 1 to 2 weeks after surgery, and those
with isolated meniscal repairs were usually off
crutches in 1 to 2 days. Patients were allowed to return
to pivoting sports once inflammation had resolved.
Flexion beyond 90° was discouraged for the first 4
weeks. The specific criteria for a return to sports were
no effusion, full extension (comparable to the contralateral knee), nearly full flexion (135°), and good strength. Patients in whom meniscal repairs were done without an associated ACL reconstruction were not treated less aggressively than patients who underwent ACL reconstruction.

RESULTS

A total of 35 patients were enrolled in the study and underwent arthroscopic RapidLoc meniscal repair performed by a single surgeon (F.A.B.). In all, 32 of 35 patients (91.4%) were available at average follow-up of 31 months (range, 18 to 48 months), and 3 were lost to follow-up. Follow-up was conducted by questionnaire in 16 patients and by office visit in 16. Average patient age was 30 years (range, 14 to 53 years). A total of 20 males and 12 females with 15 involved right knees and 17 involved left knees were studied. Of 32 repairs, 23 (72%) were done in conjunction with ACL reconstruction, and 9 repairs were carried out in stable knees. In all, 25 medial menisci and 7 lateral menisci were repaired. One medial meniscal repair was performed with the use of a “hybrid” technique. This hybrid repair, which consisted of a combination of 3 inside-out No. 2 braided polyester sutures and 3 RapidLoc devices, was performed because the medial meniscus tear extended anteriorly to an area that could not be reached by RapidLoc devices.

Of 32 repairs, 11 were done in the “red-red” zone and 21 in the “red-white” zone. Repairs typically required 2 RapidLoc devices (range, 1 to 4) (mean, 2.2). Average tear length was 18.6 mm (range, 15 to 30 mm). Information on the number of RapidLoc devices used compared with the length of the tear is recorded in Table 1.

Associated lesions observed at the time of meniscal repair were recorded. Partial lateral meniscectomy was performed in 6 of 25 knees that underwent medial meniscal repair, and 1 partial medial meniscectomy was completed in 7 knees that underwent lateral meniscal repair. Medial femoral chondroplasty was performed in 4 knees, lateral femoral chondroplasty in 1 knee, lateral tibial plateau chondroplasty in 3 knees, and patellar chondroplasty in 10 knees.

Four failures were arthroscopically documented out of a total of 32 repairs (12.5%). Patients with significant pain, swelling, and locking after meniscal repair were arthroscopically evaluated and, at the time of this repeat arthroscopic surgery, tears were found at the site of previous meniscal repair. All were located in the medial meniscus. Two tears were located in the “red-red” zone and 2 in the “red-white” zone. These tears measured between 15 and 25 mm in length. Failures were documented arthroscopically between 8 and 29 months after the index procedure was performed. Three were medial meniscus repairs associated with ACL reconstructions, and 1 was a medial meniscus repair associated with an ACL intact joint. Magnetic resonance imaging (MRI) was performed in 4 other medial meniscal repairs for unrelated reasons. All repaired menisci were seen to be stable and intact. Meniscal repairs done in conjunction with ACL reconstruction were clinically symptom free in 87% (20 of 23). One of 9 meniscal repairs in ACL-intact knees failed (89% clinically symptom free).

At the most recent follow-up; the mean Tegner score had improved from 2.8 preoperatively to 5.1 (range, 2 to 9), and the IKDC activity score had increased from 1.8 to 3.1 out of 4 (range, 1 to 4). The mean Lysholm score improved from 48.4 to 93.6 (range, 73 to 100), and the mean Cincinnati score improved from 43.7 to 88.1 (range, 67 to 95).

Adverse events were observed in several cases. The most common of these was cutting of the suture during RapidLoc insertion. This technical error was caused by release of the trigger after the device was deployed but before the insertion gun was withdrawn from the meniscus. This occurred several times at the beginning of the case series and is an example of our learning curve. This problem was eliminated by maintaining pressure on the trigger (keeping it pulled) until the insertion gun was completely removed from the joint. The second adverse event was observed in a single medial meniscus repair done in conjunction with an ACL reconstruction. The medial meniscus repair in this patient failed 8 months after the index procedure was performed and during the second arthroscopic procedure undertaken to perform a medial meniscectomy; excoriation and grooving of the medial femoral condyle were observed. Although only 1 patient was observed to have grooving of the articular cartilage (Fig 3), it cannot be stated without arthroscopic evaluation that the others did not have grooving. One patient who underwent an isolated meniscal

<table>
<thead>
<tr>
<th>Tear Length</th>
<th>15 mm</th>
<th>20 mm</th>
<th>25 mm</th>
<th>30 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients</td>
<td>8</td>
<td>14</td>
<td>9</td>
<td>1</td>
</tr>
<tr>
<td>Average no. of RapidLocs used</td>
<td>1.5</td>
<td>2.2</td>
<td>2.7</td>
<td>3.0</td>
</tr>
</tbody>
</table>
repair developed a postoperative infection that cleared with arthroscopic debridement and antibiotics. Meniscal repair devices were not removed during debridement.

**DISCUSSION**

The value of meniscal retention makes repair whenever possible a desirable goal. The overall clinical success (symptom free) rate with the RapidLoc device was 87.5%, which is consistent with another report of this device. Being clinically symptom free should not be considered equivalent to meniscal healing because such healing can be confirmed only by arthroscopic evaluation. Clinical measures studied, including Tegner, Lysholm, Cincinnati, and IKDC, all showed improvement from the preoperative state in this prospective data collection study. Only 4 patients who underwent meniscal repair required repeat surgery, and all of these attempts at repair were failures. Four additional patients underwent MRI studies for unrelated reasons, and no meniscal tears were observed. The symptom-free rate represented by these data is consistent with previously reported healing rates associated with meniscal suture repair. Although reported success rates for meniscal repair performed with other all-inside devices are similar to those for meniscal sutures, earlier designs have shown a downward trend in reported success over time. In fact, recent intermediate- and long-term reports of repairs performed with the Meniscus Arrow (ConMed, Largo, FL) describe deterioration in healing rates to about 70% over 6 years.

Many different all-inside meniscal repair devices are available as alternatives in meniscal suture repair. The RapidLoc represents the latest generation of all-inside repair devices that use a suture in combination with biodegradable components to place an adjustable stitch through the torn meniscus. This “self-adjusting” repair device gives the surgeon tactile feedback and provides compression to torn meniscal edges that is not provided by “tack-,” “screw-,” and “staple-type” devices.

The RapidLoc is especially useful for repairs performed in the meniscal posterior horn. Tears in the middle third of the meniscus can also be repaired with RapidLoc, but, as with other all-inside meniscal repair devices, access to the anterior horn is not possible. Sometimes, the combination of a meniscal repair device and conventional inside-out sutures (the so-called hybrid repair) may be needed, as was the case for one of these patients.

The lack of implant rigidity was an asset during device insertion. An ability to adjust the tension of the repair permits the surgeon to variably increase compression across the entire repair line. This can be accomplished by refraining from cutting the attached sutures until all implants have been inserted. Then, the sutures that remain attached to the implanted RapidLoc devices can be “cinched up” to achieve uniform compression without buckling of the repaired meniscus. This flexible aspect of the repair device is due to the suture component and probably explains why this class of “self-adjusting” repair devices responds well to cyclic loading without significant displacement.

Adverse events associated with a meniscal repair device are usually related to that portion of the device that remains between the meniscal surface and the articular cartilage. Although meniscal suture repairs present the possibility for intra-articular cartilage damage, reports of problems caused by the Arrow and other devices are far more common. Anchor migration and prominence, synovial cyst formation, chondral injury, aseptic synovitis, and hematoma formation have been reported. The more rigid Arrow has been reported to have a soft tissue complication rate of about 32%, include “tenting” and perforation of the skin.

Weaknesses of this study include the lack of a control group and the use of a historical control for
comparison. Meniscal healing may be complete or incomplete, or it may fail. In most cases, a successful outcome was decided on the basis of clinical findings rather than the results of arthroscopic reevaluation. It is certainly possible that cases of incomplete healing and asymptomatic failure were counted as successes. With longer follow-up times, a greater number of failures are expected. The meniscus repairs reported averaged slightly less than 2 cm long and were posterior horn tears; 72% were performed in conjunction with an ACL reconstruction. Longer, more anterior, and displaceable bucket-handle tears were not commonly encountered, which could add to the selection bias.

The hypothesis of this study—that the RapidLoc meniscal repair device would successfully repair longitudinal meniscus tears—is supported by the data. The clinical success rate is comparable with the initial success reported for other all-inside meniscal repair devices. The purpose of this study was to evaluate the healing rate and safety of the RapidLoc meniscal repair device. Articular cartilage excoriation was found in only one case. No evidence of device migration, tenting of the skin, synovial cyst formation, or aseptic synovitis was observed.

In conclusion, the RapidLoc meniscal repair device was found to have a clinical success rate of 87.5%. Clinical measures, including Tegner, Lysholm, Cincinnati, and IKDC, were all noted to improve. Early data suggest that the RapidLoc is an effective all-inside repair device, but longer-term follow-up is needed.

REFERENCES