Midterm Results of Meniscal Repair Using the BioStinger Meniscal Repair Device

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Purpose: The purpose of this study was to evaluate the midterm healing rate and any adverse events from meniscus repair using the BioStinger meniscus repair device (Linvatec, Largo, FL). **Methods:** A retrospective review of a consecutive series of meniscal repairs performed by a single surgeon using the BioStinger was conducted. The BioStinger is cannulated, made of molded poly L-lactic acid, and inserted over a needle into the meniscus tissue. Clinical results and adverse events were noted, and Lysholm, Tegner, Cincinnati, and International Knee Documentation Committee (IKDC) activity scores were obtained on all patients. **Results:** Forty-one patients underwent 41 meniscal repairs with an average follow-up of 38.6 months (range, 24 to 69 months); 35 meniscus repairs were performed in conjunction with anterior cruciate ligament reconstruction and 6 in stable knees. Tears repaired were peripheral, posterior horn tears with an average length of 2 cm. Clinical evidence of meniscal healing was observed in 95% at the time of last follow-up. Six second-look arthroscopies were performed and 2 failures were found. All other patients were symptom free. At follow-up, the mean Tegner score was 6.1 (2.8 preoperative), IKDC activity score was 3.3 (2.1 preoperative), Lysholm score was 90.6 (48.7 preoperative), and the mean Cincinnati score was 86.7 (41.3 preoperative). Four patients had peripheral migration of the device without skin tenting or perforation; 3 underwent removal of the BioStinger from the soft tissues and the other resolved after 12 months. **Conclusions:** The midterm clinical success rate was 95% using the BioStinger device. Adverse events were observed in few cases. **Level of Evidence:** Level IV, cases series. **Key Words:** Meniscus—Repair device—Bioabsorbable—BioStinger.

The importance of meniscal preservation has been well documented and the loss of a meniscus carries with it the increased risk of osteoarthritis.[1-4] Meniscal functions include shock absorption, distribution of forces, proprioception, joint stabilization, articular cartilage protection, and joint lubrication.[5-7] Consequently, repair of amenable meniscal tears is commonly performed. As all-inside devices have become more popular, modified suture repairs have been proposed in an attempt to facilitate this technique.[8,9] Successful repair for tears in the red-red and red-white zones have been reported with a number of bioabsorbable devices.[10-15] All-inside devices avoid extra incisions and are rapidly performed.

The BioStinger (Linvatec, Largo FL) is a cannulated device with 4 rows of molded barbs and a cross-piece. It is inserted over a needle, which reduces the meniscal fragments into the proper alignment, and into the meniscus material. It is biodegradable and composed of poly L-lactic acid. Our hypothesis was that this device would successfully repair longitudinal meniscus tears. The purpose of this study was to evaluate the midterm healing rate and safety of the BioStinger meniscal repair device.

METHODS

Beginning in 1998 and ending in 2002, 48 patients with meniscal tears underwent arthroscopic repaired using the BioStinger by a single surgeon. Institutional

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Review Board approval for the study was obtained before its initiation. The BioStinger is made of molded poly-L-lactic acid and is available in lengths of 10, 12, and 16 mm. It has 4 rows of barbs along the length of its shaft and a low-profile cross-bar. The shaft is hollow, allowing a needle trocar to be inserted, which both positions the meniscus fragments and guides the BioStinger into place. The surgical technique has been previously described[16] and includes meniscal healing enhancement with rasping[17] and trephination but not marrow stimulation[18] or fibrin clot creation.[19]

Inclusion criteria were longitudinal meniscal tears in the red-red (3 mm from the synovial-meniscal junction) or red-white (3 to 5 mm from the synovial-meniscal junction) zones of the meniscus.[9,20] There were no age restrictions. An associated anterior cruciate ligament (ACL) reconstruction was permitted.

Exclusion criteria were previous meniscus surgery including repairs and horizontal, transverse, or complex tears of the meniscus. Patients with longitudinal tears with degenerative changes (which rolled when probed), multiple longitudinal meniscus tears, and tears for which an attempted repair was unsuccessful because of the fragile nature of the tissue were excluded.

All patients were evaluated postoperatively at regular intervals. Lysholm,[21] Tegner,[22] Cincinnati,[23] and International Knee Documentation Committee (IKDC) activity scores were calculated at intervals of 6 to 12 months. Long-term follow-up results were obtained by annual clinic visits, mailed questionnaires, or telephone interviews. Data on results and adverse events were also collected and consolidated.

An accelerated postoperative rehabilitation program was used for all patients regardless of whether ACL surgery was also performed. No postoperative bracing was used, and the patients were allowed full, immediate weight bearing, and a return to pivoting sports once they showed no evidence of inflammation.[24-27] The specific criteria for this were no effusion, full extension, and nearly full flexion (135°). Patients with meniscal repairs performed without an associated ACL reconstruction were not held back or subjected to a less aggressive program than those patients undergoing an ACL reconstruction, and they were released when they met these criteria.[24]

RESULTS

A total of 48 patents were enrolled in the study and underwent arthroscopic BioStinger meniscal repair surgery by a single surgeon. Forty-one of the 48 patients (85.4%) were available with an average follow-up of 39 months (range, 24 to 69 months) and 7 were lost to follow-up. The average age was 29.8 years (range, 16 to 48 years). There were 29 male and 12 female patients with 18 right knees and 23 left knees involved. Thirty-five of the 41 repairs (85%) were performed in conjunction with ACL reconstructions; the remaining 6 repairs were performed in ACL intact knees. Thirty-three medial menisci and 8 lateral menisci were repaired. During this same period, 10 BioStinger meniscus repairs were performed using a hybrid repair. This hybrid repair consisted of a combination of inside-out sutures and BioStingers. Hybrid repairs were performed for cases in which the tear extended into the anterior horn of the meniscus (an area not reached by the BioStinger insertion device) or when the BioStinger repair needed to be supplemented because the quality of the repair was judged inadequate by the surgeon. In 2 cases, the BioStinger repair was inadequate because the devices punched through the inner rim of the meniscus.

Table 1. *Number of BioStingers Used According to Length of Tear*

	≤10 mm	15 mm	20 mm	25 mm	30 mm
Patients	2	16	15	7	1
Average no. of BioStingers	1.5	1.6	2.5	2.9	3

Thirty-one of the 41 repairs were done in the red-red zone and 10 were in the red-white zone. Repairs typically required 2 BioStingers (range, 1 to 4; mean, 2.1; median, 2; mode, 2). The average tear length was 18.5 mm (range, 10 to 30 mm; median, 20 mm; mode, 15 mm). The number of BioStingers used compared with the length of the tear is recorded in Table 1.

Associated lesions were observed in this group at the time of meniscus repair. There were 16 lateral meniscectomies performed in the 33 knees that underwent medial meniscus repair, and 3 medial meniscectomies on the 8 knees that had a lateral meniscus repair. Medial femoral chondroplasty was performed in 4 knees, all of which underwent medial meniscus repair. Patellar chondroplasty was performed in 8 patients, loose body removal in 3, and 1 patient also had an arthroscopic chondral osseous transplant (COR procedure; DePuy Mitek, Westwood, MA) of the medial femoral condyle associated with an ACL reconstruction and lateral meniscus repair.

The 2 arthroscopically documented failures were both in medial meniscus red-red zone repairs of tears