



particularly for symptomatic OLTs < 15 mm in diameter. This procedure is technically simple and minimally invasive with low complication rates and postoperative pain [Ferkel RD et al. *Am J Sports Med.* 2008].

However, the quality and volume of repair tissue can be affected by postoperative loading, with excessive loads causing destruction of repaired tissue. For this reason, early non-weight bearing range-of-motion exercises for a minimum of 6 to 8 weeks, followed by progression to full weight bearing by 3 months, are widely recommended [Ferkel RD et al. *Am J Sports Med.* 2008]. Although a few investigators have reported successful outcomes after early weight bearing in patients treated with microfracture for chondral knee and ankle injuries with lesions < 15 mm in diameter [Li S et al. *Chin Med J.* 2014; Lee DH et al. *Am J Sports Med.* 2012], early and delayed (or non-weight bearing for 6 weeks) postoperative treatments after microfracture have not been compared in a randomized controlled trial.

Keun-Bae Lee, MD, PhD, Chonnam National University Hospital, Gwangju, Korea, reported that delayed and early weight-bearing postoperative regimens are equally beneficial for patients treated by microfracture for small to midsized OLTs.

Of 99 patients presenting with OLTs, 41 were randomized to delayed weight bearing and 40 to early weight bearing. For patients in the delayed weight-bearing arm, a posterior splint was applied during the first week. Active ankle range-of-motion and strength exercises were started in the second week. Non-weight bearing was maintained for 6 weeks. After 8 weeks, the posterior splint was removed. Patients in the early weight-bearing arm also received a posterior splint during the first week. Early in week 2, partial weight bearing in a walking boot was allowed, followed by early full weight bearing as tolerated. After 8 weeks, the walking boot was removed.

There were no significant demographic differences between the 2 arms. The mean age was 36 years; the majority were men; and the mean lesion size was 1.0 cm<sup>2</sup>. There were no differences in American Orthopaedic Foot & Ankle Society scores preoperatively or during follow-up out to 24 months between the arms. There were also no differences in visual analogue scale or ankle activity score during postoperative follow-up out to 24 months.

No significant correlations were found between final American Orthopaedic Foot & Ankle Society scores based on sex, age, body mass index, duration of symptoms, or lesion size. Similar outcomes for delayed and early weight-bearing postoperative treatments suggest that either approach can be recommended for patients treated by microfracture for small to midsized OLTs.

## MAST Is Safe and Effective in Treatment of Chondral Defects of Foot and Ankle

Written by Phil Vinall

According to a study reported by Martinus Richter, MD, Hospital Rummelsberg, Schwarzenbruck, Germany, matrix-associated stem cell transplantation (MAST) is a safe and effective method for the treatment of chondral defects of the foot and ankle. Its main advantage is that it requires only a single procedure.

MAST is a modified version of matrix-induced autologous chondrocyte implantation (ACI) that allows for implantation of a potentially higher concentration of stem cells [Richter M, Zech S. *Foot Ankle Surg.* 2013]. For this open surgical procedure, stem cell-rich blood (about 3% stem cells) is harvested from pelvic bone marrow and centrifuged at 1500 revolutions per minute to double the concentration of stem cells. The resulting cells are implanted via microfracturing or bone transplantation in the case of a defect that is deeper than 5 mm, through a collagen matrix impregnated with the stem cell and fibrin glue. Motion is permitted 3 days postsurgery. Postoperative treatment includes 15 kg of partial weight bearing for 6 weeks.

In this more recent prospective study, surgeons determined 75 consecutive patients (78 defects) to be eligible for MAST based on initial arthroscopy. All procedures took place between April 2009 and September 2011. Defect size, procedural time, and Visual Analogue Scale Foot and Ankle (VAS-FA) score were recorded. Patients were followed for 2 years. There was no control group.

Patients (mean age, 34 years; range, 16 to 64; 72% men) had a mean baseline VAS-FA score of 50.2 out of 100 (range, 24.3 to 68.4). Medial and lateral talar shoulders were the most common defect sites (28 patients each), followed by defects of the metatarsophalangeal joint 1 head (10 patients). Of the remaining 9 patients, 3 had defects of the medial and lateral shoulders; 3 had defects of the tibia; and 3 had defects of the calcaneus. The mean defect size was 1.1 cm<sup>2</sup> (range, 0.2 to 6); mean procedural time was 15.4 minutes (range, 5 to 38). Autologous bone graft was used in 3 cases. More than 300 additional procedures were performed at the time of MAST. All patients returned to work after an average of 6 weeks. At 24 months, mean VAS-FA scores were significantly ( $P = .01$ ) increased (mean, 94.5; range, 73.4 to 100), and no complications were reported.

The results of this study indicate that MAST is safe and associated with good outcomes in patients with chondral defects of the ankle or foot. An important advantage over

other approaches is that it can be accomplished with 1 procedure (vs ACI or matrix-induced ACI, which requires 2 procedures). Whether MAST is superior to other available procedures—such as debridement, microfracturing, or abrasion; use of a matrix without cells; or other available cells—is not known. How the result with MAST might compare to the use of “real” stem cells is also not known. Prof Richter concluded that MAST is “just one single step forward.” Prospective randomized studies are needed to compare these methodologies.

## Similar Functional Outcomes With Open and Minimally Invasive Gastrosoleus-Lengthening Techniques

Written by Phil Vinal

Results of a study comparing open and minimally invasive approaches to gastrosoleus lengthening showed similar functional outcomes for all techniques. Complications were generally lower in patients treated noninvasively except for weakness of plantar flexion, which was significantly higher in patients treated using the Hoke technique. The study results were presented by Chamnanni Rungprai, MD, University of Iowa Hospitals and Clinics, Iowa City, Iowa, USA.

When conservative management fails in the treatment of gastrocnemius or gastrosoleus contracture, surgical treatment is indicated. Standard techniques are open lengthening and percutaneous triple hemisections (Hoke); however, 2 newer approaches, Baumann and endoscopic, are gaining popularity. Dr Rungprai reported the results of a retrospective chart review, Endoscopic Gastrocnemius Recession for the Treatment of Isolated Gastrocnemius Contracture: A Prospective Study on 320 Consecutive Patients [Phisitkul P et al. *Foot Ankle Int.* 2014], of 610 consecutive patients (640 legs) who

received surgery at a single institution between 2006 and 2013 using 1 of 4 techniques: an open Vulpius or Strayer approach (VSO; 200 patients; 206 legs), a Baumann approach (38 patients; 38 legs), a Hoke procedure (52 patients; 52 legs), or endoscopic gastrocnemius recession (EGR; 320 patients; 344 legs). Outcome measures were the Foot Function Index (FFI), the Short Form-36 (SF-36), the visual analog scale (VAS), ankle dorsiflexion, operative time, and complications.

There were no significant differences in age, body mass index, and average time to follow-up, although Hoke patients tended to be older (around 60 years) and those receiving EGR were younger (approximately 47 years) than VSO or Baumann patients (close to 51 years). The majority of Hoke patients were men; women were in the majority in all other groups. Preoperatively, patients treated with the Baumann technique had significant equinus compared with other groups.

Functional outcomes improved for all groups post-surgery. VAS scores and scores on the SF-36 were similar for all 4 approaches, as were scores on the FFI for pain, disability, activity limitation, and total score. Operative time was considerably shorter for the Hoke procedure ( $3.1 \pm 1.1$  minutes; range, 2 to 5 minutes) compared with the 3 other procedures, which ranged from  $18.2 \pm 5$  minutes for the endoscopic approach to  $28.1 \pm 5.1$  minutes and  $29 \pm 6.5$  minutes for the VSO and Baumann approaches, respectively.

Hoke patients had significantly less correction immediately postsurgery and at final follow-up, and less ankle dorsiflexion at final follow-up, compared with the other groups. Ankle range of motion preoperatively, immediately postoperatively, and at final follow-up for all groups is shown in Table 1.

A significantly higher rate of superficial infection was seen with the invasive procedures compared with the less invasive approaches. Weakness of plantar flexion was significantly higher in Hoke patients. The approaches

Table 1. Ankle Range of Motion

Dorsiflexion	Open Strayer or Vulpius, n = 206	Baumann, n = 38	Hoke, n = 52	Endoscopic, n = 344
Preoperative (range, degrees) up (number of available patients/total number)	$-2.8 \pm 8.9$ ([−50]–10) (n = 164)	$-5.1 \pm 6.6$ ([−30]–10) (n = 34)	$-0.5 \pm 8.1$ ([−20]–10) (n = 40)	$-0.8 \pm 5.4$ ([−50]–10) (n = 294)
Immediate postoperative improvement (range, degrees) (number of available patients/total number)	$12.4 \pm 4.8$ /(15.0) ([−5]–30) (n = 164)	$9.8 \pm 4.7$ /(14.9) (0–20) (n = 34)	$10.1 \pm 5.5$ /(10.6) (0–20) (n = 40)	$14.7 \pm 6.7$ /(15.6) (0–30) (n = 294)
At final follow-up improvement (range degrees) up (number of available patients/total number)	$7.8 \pm 5.7$ /(10.6) ([−10]–30) (n = 164)	$7.8 \pm 4.6$ /(12.8) (0–20) (n = 34)	$6.6 \pm 5.8$ /(7.1) ([−5]–20) (n = 40)	$11.0 \pm 6.6$ /(11.8) ([−10]–30) (n = 294)

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