Matrix-Associated Stem cell Transplantation (MAST) in Chondral Defects is Effective

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Introduction
The optimal treatment for chondral defect at foot and ankle is debatable. The current options are debridement, microfracturing, abrasion, autologous chondrocyte implantation (ACI), matrix-induced autologous chondrocyte implantation (MACI), or autologous matrix-induced chondrogenesis (AMIC). Matrix-associated stem cell transplantation (MAST) is a modification of AMIC with a potential higher concentration of stem cells in the implanted matrix. The aim of the study was to assess the feasibility and 2-year-followup of MAST in chondral defects of foot and ankle.

Methods
In a prospective consecutive non-controlled clinical follow-up study, all patients with chondral defect that were treated with MAST from April 1st to November, 30th, 2010 were analyzed. Patients with bilateral treatment or with MAST at more than one joint surface were excluded from the study. The size and location of the chondral defects, method-associated problems and the Visual-Analogue-Scale Foot and Ankle (VAS FA) before treatment and at followup were registered and analyzed. MAST was performed as a single open procedure including debridement and microfracturing of the chondral defects. Stem cell-rich blood was harvested during the procedure from the ipsilateral pelvic bone marrow with a Jamshidi needle (10 x 3mm, Cardinal, Dublin, OH, USA) and a special syringe (Arthrex-ACP, Arthrex, Naples, FL, USA). The syringe was centrifuged (10 minutes, 1,500 RPM). The supernatant was used to impregnate a collagen I/III matrix (Chondroguide, Geistlich, Baden-Baden, Germany) that was cut to the size of the defect before. The matrix with stem cells was fixed into the chondral defect with fibrin glue (Tissucoll, Deerfield, IL, USA). The postoperative treatment included 15 kilogram partial weight bearing for 6 weeks without orthosis. Joint motion was started 3 days after surgery.

Results
Twenty-six chondral defects in 25 patients were included in the study. The age of the patients was 33 years on average (range, 16-48 years), 18 (72%) were male. The VAS FA before surgery was 49.2 on average (range, 24.3-68.4). The defects were located as follows, medial talar shoulder, n=9; lateral talar shoulder, n=13 (medial and lateral talar shoulder, n=1); distal tibia, n=1; posterior calcaneal facet, n=1; head of 1st metatarsal, n=2. The defect size was 1.1cm² on average (range, .2 - 6cm²). Additional autologous bone transplantation (harvested from the proximal tibia) was performed in 3 cases (medial talar shoulder, n=2; distal tibia, n=1). All patients completed 2-year-followup. No method related complications or consecutive surgery were registered. The VAS FA improved to an average of 94.5 (range, 73.4-100; t-test, p=.01).
Conclusion
MAST led to good clinical scores. No complications were registered. Even though a control group is missing, we conclude that MAST is a safe and effective method for the treatment of chondral defects. The main advantage of MAST in comparison with ACI and MACI is the single procedure methodology. The advantage in comparison with AMIC is the potential higher concentration of stem cells. It remains unclear if this method is superior to AMIC, and what kind of tissue is created.