

5 Year Follow-Up after AMIC[®] Chondro-Gide[®] in a Patient with Lesser Metatarsophalangeal (MTP) Joint Arthrosis



Mr Kailash Devalia

Mr Kailash Devalia graduated from the King Edward Memorial Hospital, Mumbai University. He was trained at Newcastle and Sheffield and was a proud winner of BOFAS travelling fellowship in Zurich. Since 2015, he works as a dedicated foot and ankle surgeon at Gateshead Hospital Newcastle.

Mr Devalia pioneered the development of novel surgical techniques to treat young patients with lesser MTP joints arthrosis including Freiberg's infractions using the Chondro-Gide[®] membrane. His approach to treatment is holistic. To optimize the treatment and the patient outcomes, he works closely with physiotherapists and other specialists.

Memberships

- British Foot and Ankle Society (BOFAS)
- European Foot and Ankle Society (EFAS)
- RCS Edinburgh
- Indian Medical Association IMA

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Clinical Problem

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Freiberg's disease affects young patients and can lead to second MTP joint arthrosis early in life. This can have detrimental long-term effects on the patient's function and affects the quality of life. The overall prognosis for Freiberg's disease remains uncertain. There is not a single procedure that has demonstrated consistent long-term good outcomes. Systematic review studies have concluded that both joint preserving and joint sacrificing procedures have poor or insufficient evidence for effective treatment for Freiberg's disease.

Getting the younger patients return to full activity is of utmost importance. The treatment described enables the remodelling of the affected metatarsal head and changes the local environment for the cartilage regeneration process triggered by the AMIC[®] Chondro-Gide[®].

Patient History

A 17-year-old female presented with chronic pain in her left foot after sustaining a fall from a rock. The preoperative physical examination revealed symptoms of pain and joint line tenderness, effusion, episodes of locking and discomfort on weight bearing and while tip-toeing.

Imaging Investigation

Preoperative radiographs (fig. 1a/1b) and MR images (fig. 2a/2b/2c) show Freiberg's disease of second MTP joint with reversal of metatarsal head convexity, subchondral bone oedema and loss of dorsal cortical shell of MT2 head.

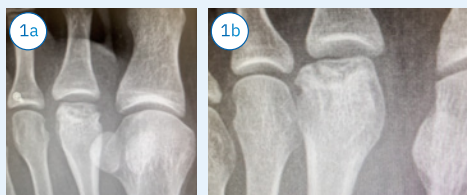


Fig. 1a/1b: preoperative radiographs



Fig. 2a/2b/2c: preoperative MR images

Treatment

Treatment

After the removal of the osteophytes, loose cartilage and necrotic subchondral bone, the defect was defined intraoperatively (fig. 3) to guide the harvest of the cancellous bone graft from calcaneum. If there is a cortical shell deficit, the harvest must contain cortico-cancellous bone graft to convert the uncontained defect into the contained defect.



Fig. 3: intraoperative presentation of the defect

Depending on the type of defect (contained or uncontained), cancellous or cortico-cancellous graft is harvested from the calcaneum (fig. 4).



Fig. 4: autologous bone was harvested from the calcaneum.

The medullary canal was opened up with a 1.1 mm drill bit as bone marrow stimulation (BMS). The first step was to convert the uncontained defect to a contained defect by impaction bone grafting in the deficient cortical shell of the metatarsal head. The remaining cancellous bone graft was deposited to regain the convex shape of the metatarsal head (fig. 5).



Fig. 5: the osteochondral defect was filled with autologous bone graft.

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The Chondro-Gide® membrane was hydrated in the tray using the bone marrow aspiration fluid from bone graft harvest site (calcaneum). It was then implanted over the impacted bone graft on the metatarsal head with the porous, rough layer of the membrane facing the MT head. Implanting the membrane in the correct orientation ensured that the cell-adhesive side remained in contact with the metatarsal head bone graft while the dense, smooth layer faced the joint space (fig. 6).



Fig. 6: the implanted Chondro-Gide® membrane.

Bone marrow was aspirated from the bone graft harvest site using a bone marrow biopsy needle. Approximately 5 ml were injected under direct vision between the Chondro-Gide® membrane and the impacted bone graft.

The membrane was fixed with commercial fibrin glue in this case. At times, the Chondro-Gide® is fixed additionally with resorbable sutures to enclose the impacted bone graft and further secure the membrane.

Follow-Up

The rehabilitation protocol was comparable to the one used for AMIC® in osteochondral lesions of the talus (OLT). During the initial 4 weeks, the patient used forefoot offloading shoes for partial heel weight-bearing. She was allowed active toe range of motion. After about 6 weeks, return to full weight-bearing and full range of motion was allowed. Return to strenuous activities was allowed after full recovery (approx. 6 months).

Five years after AMIC® in the MTP joint, the patient experienced no symptoms of pain, effusion or locking. She was able to engage in all her routine social and leisure activities.

Clinical scores were excellent. The MOXFQ (Manchester-Oxford Foot Questionnaire) score improved from 50/64 to 16/64 points. VAS pain score at 5 years was 0 which improved from 88 at first presentation.

The radiographs, MR and CT images showed almost complete remodelling of metatarsal head with only some dorsal incongruity (fig. 7 and 8). No signs of effusion or subchondral oedema indicating a normal healing process.



Fig. 7: postoperative radiographs



Fig. 8: postoperative MR image



For further information:
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Materials Used

- General Foot and Ankle Instrumentation
- Chondro-Gide® Membrane 30 × 40 mm
- BioSeal Glue
- Cancellous Bone Harvesting Kit
- 1.1 mm drill bit

Further Literature

Rajeev A, Yallop W, Devalia K. Freiberg`s disease of lesser metatarsals treated with bone grafting and autologous matrix induced chondrogenesis (AMIC) membrane – A series of 10 cases. Foot Ankle Surg. 2023 Feb;29(2).

Richter M, Zech S, Meissner SA, Naef I. Autologous Matrix Induced Chondrogenesis plus Peripheral Blood Concentrate (AMIC+PBC) in Chondral Defects of the First Metatarsophalangeal Joint: 5-Year Follow-up. Foot Ankle Orthop. 2023 Dec 23;8(4).

Nurmukhametov MR, Makarov MA, Makarov SA, Bialik EI, Bialik VE, Nesterenko VA. The Use of Autologous Matrix-Induced Chondrogenesis as a Surgical Treatment for Patients with the First Metatarsophalangeal Joint Osteoarthritis: Immediate and Medium-Term Results. Cartilage. 2021 Dec;13(1_suppl).