

Free Vascularized Toe Joint Transfer to the Metacarpal phalangeal Joint: new surgical techniques to improve the functional outcome.

Objective: Reconstruction of dysfunctional or painful damaged metacarpophalangeal joints (MCPJs) is challenging. The current treatment of choice remains controversial, including arthrodesis, implant arthroplasty or vascularized joint transfer (VJT). Although previous studies showed that implant arthroplasty provide superior range of motion (ROM) than VJTs, in young or high-demand patients for whom either potential growth or maintenance of a good ROM is required, VJTs provide a good solution to their needs. Furthermore in case of tendon and skin defects, VJTs can also provide specific soft tissue replacement, in a one-stage procedure. Since the toe metacarpal phalangeal joint (MTPJ) and finger MCPJ have similar anatomical structure, vascularized MTPJ transfer is an ideal transplant for reconstructing the damaged MCPJ, except for having dorsal extension as its main function. The aim of this study, is to provide new anatomical knowledge and reconstructive techniques in a clinical series for the reconstruction of the MCPJ using toe joint transfers.

Methods: Nine patients (eight male and one female) with ankylosed MCPJ underwent reconstruction with vascularized second-toe MTPJ transfer over a five-year period. All cases suffered from post-traumatic arthritis. The average age of the patients was 42.3 years. The follow-up period ranged from 8 to 37.5 months and outcomes were assessed by grip strength and ROM of the reconstructed joints.

Results: All of the joints survived without any microvascular compromise. At an average period of 4.5 weeks bony union was achieved in all patients. Constant and sizable articular branch originated from the first plantar metatarsal artery was intentionally included to achieve reliable blood supply to the MTPJ. Indeed, to overcome the problem of excessive dorsal extension of MTPJs in four cases we adopted the Turnover Technique in which the joint is turned upside-down around its longitudinal axis and in two MTPJ we used the 45° Oblique Osteotomy technique of the metatarsal head. In addition, in two cases an innovative modification of the skin paddle design was performed. A fillet flap from the same toe based on the distal run off of the tibial plantar digital artery provided additional skin for coverage the neo-MCPJ. No evidence of postoperative arthritis was noted and a total ROM of 57.8° (mean flexion, 72.2°) was achieved over the follow-up period

Conclusion: Vascularized second-toe MTPJ allows for restoration of powerful pinch/grasp and ROM of a MCPJ in the hand. Improvement of the surgical techniques can result in very favorable functional outcomes enabling more patients to benefit from VJTs.