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Tips, Quips, and Pearls

"Tips, Quips, and Pearls" is a special section in The Journal of Foot & Ankle Surgery®, *which is devoted to the sharing of ideas to make the practice of foot and ankle surgery easier. We invite our readers to share ideas with us in the form of special tips regarding diagnostic or surgical procedures, new devices or modifications of devices for making a surgical procedure a little bit easier, or virtually any other "pearl" that the reader believes will assist the foot and ankle surgeon in providing better care.*

Tarsometatarsal Joint Arthrodesis with Trephine Joint Resection and Dowel Calcaneal Bone Graft

Christopher J. Withey, BSc (Hons) [1], Anthony L. Murphy, MRes, FCPodS [2], Rebecca Horner, BSc (Hons) [3]

[1] *Podiatric Surgical Trainee, Norwich Community Hospital, Norwich, United Kingdom*
[2] *Consultant Podiatric Surgeon, Norwich Community Hospital, Norwich, United Kingdom*
[3] *Specialist Podiatrist, Norwich Community Hospital, Norwich, United Kingdom*

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ABSTRACT

Arthritis of the tarsometatarsal joints is a challenging problem to treat. It can cause chronic foot pain and functional disability. We present a surgical technique for tarsometatarsal joint arthrodesis using a trephine to resect the articular surfaces and a dowel plug of an autogenous calcaneal graft with locking plate fixation. The procedure has been shown to result in osseous fusion, and it is technically relatively simple to complete.

Arthritis of the tarsometatarsal joint (TMTJ, Lisfranc joint) is a commonly encountered pathologic finding in foot and ankle clinics. The etiology of midfoot arthritis includes primary osteoarthritis and inflammatory and post-traumatic arthritides, with post-traumatic the most common (1). The potential risk factors for the development of degenerative arthrosis at the Lisfranc joint include obesity, female gender, gastrocnemius equinus, and a relatively long second metatarsal (2,3), although the latter could not be proved in the study by Kilmartin and O'Kane (4). They showed that 65% of patients with TMTJ degeneration also had coexisting hallux valgus. From their findings, they suggested that the change of the first metatarsal position in hallux valgus results in the transfer of excessive loading to the second TMTJ. However, they also concluded that osteoarthritis of the TMTJs was likely to be multifactorial in origin rather than related to a single mathematical or geometric relationship between the first and second rays.

Regardless of the cause, midfoot osteoarthritis can be a challenging and sometimes disabling condition to treat. The conservative treatments described for this condition have included rocker bottom shoes, orthoses, analgesics, and fluoroscopic-guided injections of corticosteroid (5,6). When conservative management is not sufficient to relieve pain and the patient requests a surgical opinion, it is important that the painful joint, or joints, be accurately identified, and the preoperative planning should start with a detailed clinical examination. The "piano key test" (7) can be useful in isolating and assessing each of the TMTJs individually. The test involves supporting the hindfoot and then applying plantar pressure to each metatarsal head. The test should be considered positive if pain is elicited in the midfoot. Furthermore, dorsal osteophytes are often palpable and grossly visible clinically, and the patient might report difficulties fitting into shoes owing to the prominence of dorsal bone at the involved TMTJ.

Plain radiographs are required to accurately determine the extent of osteoarthritis present. Dorsoplantar (anteroposterior) radiographic views can help identify any evidence of Lisfranc dislocation, and lateral and oblique views will often show dorsal bossing owing to osteophytosis. The medial oblique radiographic view enables visualization of the separate joint spaces, which are often difficult to identify on other views because of superimposition of the involved bones. Magnetic resonance imaging can also aid the diagnosis, especially in early cases of articular degeneration. Verhoeven and Vandeputte (8) have suggested the use of single photon emission computed tomography-computed tomography scans, which combine the images of a bone scan with those of a computed tomography scan to provide simultaneous information about the anatomy and physiology of the TMTJs. Fluoroscopic injections in isolated joints can also aid in diagnosis (5) and preoperative planning.

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Address correspondence to: Christopher J. Withey, BSc (Hons), Norwich Community Health and Care National Health Services Trust, Norwich Community Hospital, Bowthorpe Road, Norwich NR2 3TU, UK.
E-mail address: chris.withey@nchc.nhs.uk (C.J. Withey).

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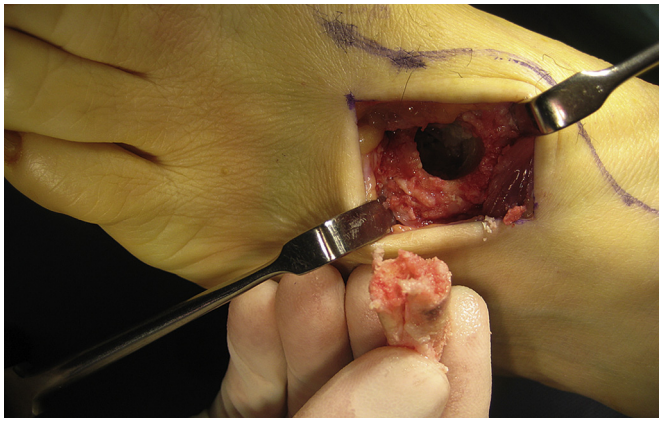

Fig. 1. Resected second tarsometatarsal joint.

The TMTJ region can be considered as 3 distinct components:

1. Medial, involving the first metatarsocuneiform joint
2. Middle, involving the second and third metatarsocuneiform joints
3. Lateral, involving fourth and fifth metatarsocuboid joints

Kilmartin and O'Kane (4) reported that the clinical and radiographic examinations will often reveal isolated midfoot osteoarthritis localized to the second TMTJ, with minimal overall deformity of the midfoot. If significant deformity is present and warrants reconstruction, realignment of the foot can be achieved during surgery by wedging the joint resection.

Arthrodesis of the affected joints in the midfoot remains the mainstay of surgical treatment of recalcitrant TMTJ arthrosis. Various techniques for TMTJ arthrodesis, with and without the use of a bone graft, have been described in published reports. Autogenous graft options have included a sliding wedge local bone graft (9), unicortical, bicortical, and tricortical bone grafts, and dowel graft plugs (10). Common sites for harvesting the autogenous bone graft to be used for TMTJ fusion have included the calcaneus, iliac crest, proximal tibia, and distal tibia (11,12). The use of the resected medial eminence of the first metatarsal when performed in conjunction with hallux valgus surgery has also been described (4). A variety of different fixation techniques have been described for stabilization of the TMTJ fusion, including plates and screws, lag screws, and staples (13,14).

In our practice, patients who are considered for TMTJ fusion for the treatment of recalcitrant arthritis have failed nonoperative efforts that have included foot orthoses and fluoroscopic-guided injection of a corticosteroid. They have also been educated regarding their treatment options and prognosis. Patients who smoke are offered smoking cessation advice. If they continue to smoke, the increased risk of nonunion will be discussed as a part of the consent process. We have also used, with success, the TMTJ fusion technique that we have described in the present report in obese patients and patients with arthritis in more than 1 TMTJ. The main contraindication to the use of this procedure is the need for reconstructive wedge resection of the bone, because the cylindrical shape of the joint resection and dowel graft does not lend itself to deformity correction beyond removal of prominent osteophytes and elimination of painful joint tissue. If reconstructive wedging is required, we have preferred the use of a trapezoidal graft from the ipsilateral calcaneus.

Surgical Technique

Under local anesthesia (popliteal block) with the patient in the supine position on the operating table and an ankle tourniquet applied and inflated, 2 separate incisions are made, the first, a 6-cm longitudinal incision over the second TMTJ, and the second, a 3-cm longitudinal incision along the lateral aspect of the ipsilateral calcaneus. The incision over the second TMTJ is then deepened by blunt dissection, and the extensor tendons and muscle belly of extensor hallucis brevis are retracted such that the underlying joint capsule is incised and reflected to expose the second TMTJ. The dorsal osteophytes are then removed with rongeurs to expose the pathologic joint

Fig. 2. Intraoperative dorsoplantar fluoroscopic image after joint resection.

Fig. 3. Intraoperative lateral fluoroscopic image showing graft site in the calcaneus.