# MIS Distal Metatarsal Metaphyseal Osteotomy in the treatment of mechanically induced metatarsalgia: MOXFQ patient reported outcomes

Contact Details
**W.McMurrich** MSc, Scottish Surgical Podiatry Trainee[1, 3]
**D. MacDonald** BA (Hons), Clinical Researcher[1]
**A. Peters**[2] BA (Hons) MPhil CPsychol, AHP Research and Development Facilitator
**H. Shalaby** MD, FRCS (Orth), Consultant Trauma and Orthopaedic Surgeon[1]
**Dr G.Baer**[3] PhD MSc MCSP FHEA, Senior Lecturer Physiotherapy
**Dr M. Ellis**[3] BSc MSc FHEA, Senior Lecturer,
**J.Veto**[3] Senior Lecturer
**J. McKinley,** MBChB, BMSc(Hons), FRCS (Orth), Consultant Trauma and Orthopaedic[1]
[1.] Royal Infirmary of Edinburgh, Little France Crescent, Old Dalkeith Road, Edinburgh EH16 4SA, UK
[2.] Western General Hospital, Crewe Road South, Edinburgh EH4 2XU, UK.
[3.] Queen Margaret University Edinburgh, Edinburgh, EH21 6UU, UK

## Aim
To present patient reported outcome measures following DMMO for the treatment of mechanical metatarsalgia, and report any complications.

## Introduction
Metatarsalgia is a term to describe pain in the ball of the foot and is estimated to occur in 10% in the general population.

The standard surgical treatment for mechanical metatarsalgia is Weil`s osteotomy [(1)] . However, reported complications include;

- 30% joint stiffness,
- 15% recurrence of symptoms
- 7% transfer metatarsalgia [(2)].

An alternative to the Weil`s osteotomy is the minimally invasive DMMO which is designed to restore the lesser metatarsals` position and distribute weight bearing forces.

**Major advantages of this procedure include**:

- a very small wound and minimal stripping of soft tissues
- less MTP joint stiffness as it is an extra articular procedure
- no internal fixations - reduced risk of infection or implant breakage[(3)].

## Methodology

### Participants
Ethical approval was obtained. Between October 2014 and February 2016 the 2nd, 3rd, 4th DMMO procedure plus or minus toe straightening was offered to patients who had failed 6 months of conservative treatment for mechanical metatarsalgia.

### Exclusion criteria
- Patients having concurrent surgery including 1st ray surgery or gastrocnemius lengthening
- Morton's neuroma
- Lesser MTP degenerative joints
- Plantar plate tear
- MTP dislocation
- Equinus or cavus foot deformity
- Inflammatory arthritis

### Procedures and Outcomes
MOXFQ outcome measure completed three weeks pre-operatively and at least one year post-operatively.

Additional supplementary question "How satisfied are you with your operated foot?" answered on a five-point Likert scale.

## Results

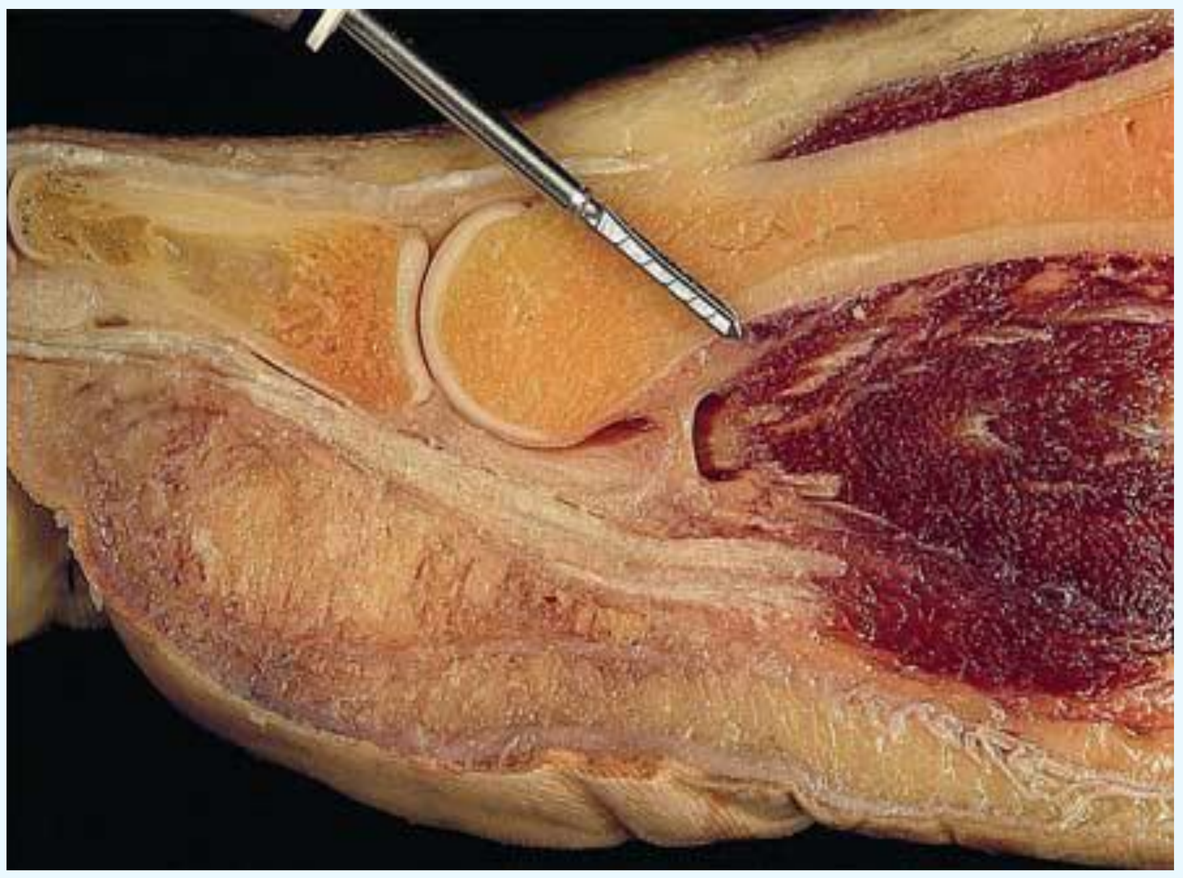

**Figure 1 MIS DMMO using a stab incision dorsally and osteotomy with 45° angulation to the metatarsal shaft using a 2x 12mm Shannon burr and no fixation [(4)]**

### Results
24 patients were included, from 57 identified, following the exclusion criteria. 20 women and 4 men with a mean age of 64 years (sd 8.6).

- The Shapiro-Wilk was normally distributed therefore the Paired sample T-Test was used.
- Statistically significant differences between the pre and post-operative MOXFQ Index score and domain scores <.001 (level of significance 0.05)
- Recorded complications: 1 broken burr intra operatively, 1 delayed union with hypertrophic bone formation, 1 GI bleed following NSAI plus PE

| | Pre-op score | | | | Post-op score | | | |
|---|---|---|---|---|---|---|---|---|
| | Walking | Pain | Social | Index Score | Walking | Pain | Social | Index Score |
| **Mean** | 57.3 | 56.5 | 44.5 | 53.8 | 23.7 | 25.6 | 24.0 | 24.3 |
| **Sd** | 26.3 | 19.6 | 25.4 | 20.3 | 26.6 | 21.2 | 22.2 | 21.8 |

**Table 1 Pre and post operative MOXFQ metric scores**

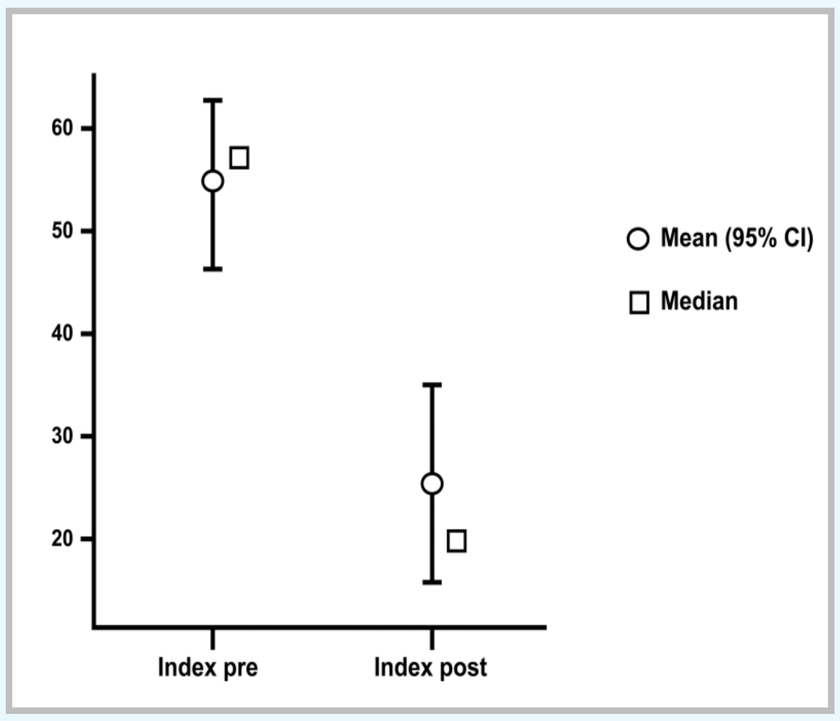


**Figure 2 A 29 point improvement in mean pre and post operative MOXFQ index scores**

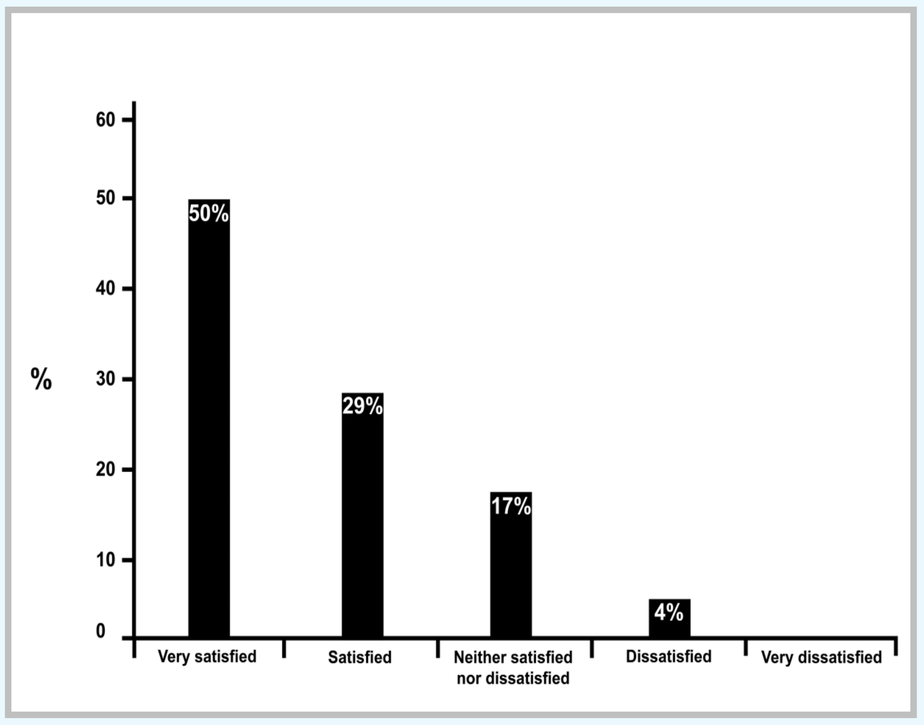


**Figure 3 Patient satisfaction following the DMMO procedure**

## Discussion
This study provides support that the DMMO procedure offers an effective method to reduce pain and improve function in the treatment of mechanical metatarsalgia. The current evidence base for using DMMO over other procedures is limited, based on a small number of studies where limitations variously include: patients received concurrent 1st Ray surgery, retrospective post-operative evidence, the use of non validated outcome measures and lacking preoperative scores [(5,6,7)]. Whilst the current study is a relatively small sample, it is relevant due to the limited independent research available.

## Conclusion
A statistically significant improvement was demonstrated between pre and post operative MOXFQ index and domain scores. These results are clinically significant. Seventy-nine percent of patients reported to be satisfied or very satisfied.

**References**
(1) DeCarbo W. The weil osteotomy: A refresher. Techniques in foot & ankle surgery 2014;13(4):191-198.
(2) Highlander P, VonHerbulis E, Gonzalez A, Britt J, Buchman J. Complications of the Weil osteotomy. Foot & ankle specialist 2011;4(3):165-170.
(3) Wong T, Kong S. Minimally Invasive Distal Metatarsal Osteotomy in the Treatment of Primary Metatarsalgia. Journal of Orthopaedics, Trauma and Rehabilitation 2013 6;17(1):17-21.
(4) De Prado M, Cuervas-Mons M, Golanó P, Vaquero J. Distal metatarsal minimal invasive osteotomy (DMMO) for the treatment of metatarsalgia. Techniques in Foot & Ankle Surgery 2016;15(1):12-18.
(5) Haque S., Kakwani R., Chadwick C., Davies M.B., Blundell C.M. Outcome of minimally invasive distal metatarsal metaphyseal osteotomy (DMMO) for lesser toe metatarsalgia. Foot and Ankle International 2016;37(1):58-63.
(6) Yeo NEM, Loh B, Chen JY, Yew AKS, Ng SY. Comparison of early outcome of Weil osteotomy and distal metatarsal mini-invasive osteotomy for lesser toe metatarsalgia. Journal of Orthopaedic Surgery 2016;24(3):350-353.
(7) Magnan B, Bonetti I, Negri S, Maluta T, Dall'Oca C, Samaila E. Percutaneous distal osteotomy of lesser metatarsals (DMMO) for treatment of metatarsalgia with metatarsophalangeal instability. Foot and Ankle Surgery 2017.