

Plantar Plate Repair

Dorsal Approach Anatomical Repair Weil
Osteotomy: a case series

Matt Mee

Podiatric Surgeon (SpR)



Great Western Hospitals
NHS Foundation Trust

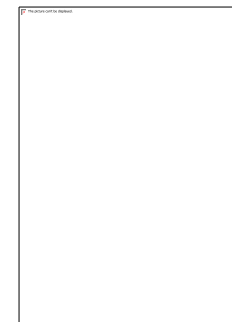
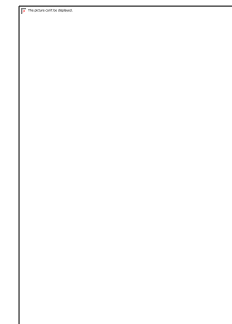
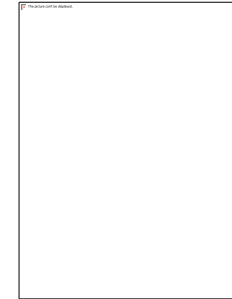
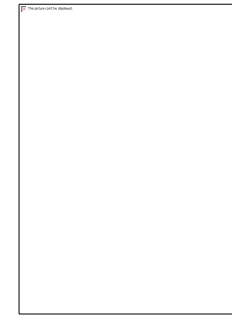
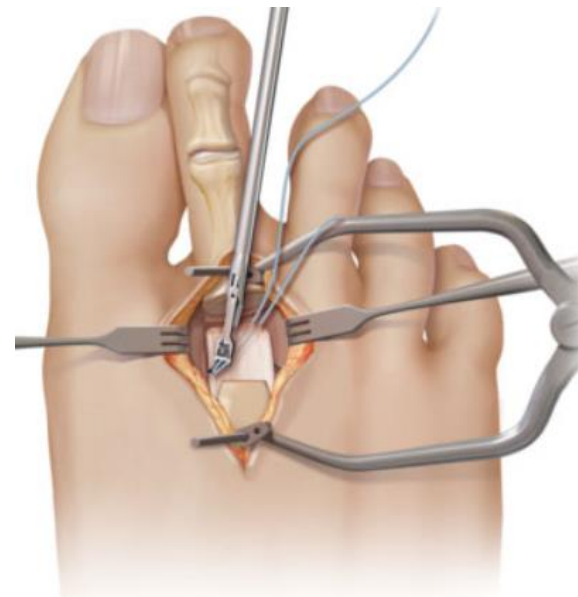


University of
HUDDERSFIELD



Why?

- Common cause of forefoot pain and deformity (Yao et al 1994)
- Direct repair of the plantar plate can be achieved through both plantar and dorsal incision approaches.
- Prissel et al (2016) highlighted a 31.6% incidence of painful scarring on the plantar aspect of the foot and wound healing complication rate of 9.2%.
- Improved instrumentation:
 - Direct visualisation
 - Osseous & Soft tissue
- Early PO WB with decreased wound complications and no plantar tissue trauma associated with a plantar approach (Weil, Sung, Weil & Malinoski 2011)
- Limited data / research / dissatisfaction with outcomes / cost



Aim

To evaluate the patient reported and clinical outcomes of patients who have undergone anatomical plantar plate repair using the DAARWO technique

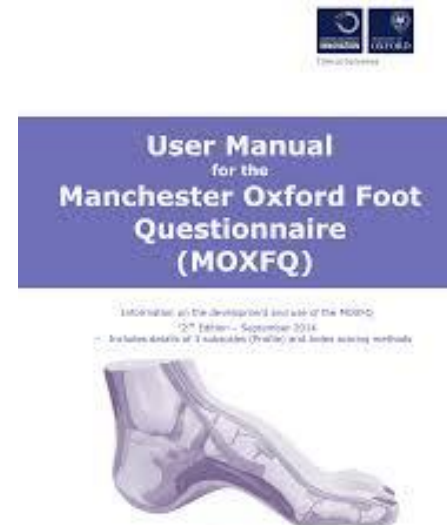
Objectives

Demographic data & indications

Clinical Outcomes

Patient reported Outcomes

Complications & Revision rate



Methodology



- Design: retrospective case series
- Ethics: Hospital and University ethics approval granted
- Patients: identified using PASCOM via '69 Repair of capsule for joint stabilisation'
- Exclusion criteria; dense neuropathy & inflammatory arthropathy
- Operation notes reviewed & pre MOXFQ score identified
- Patients contacted and invited to clinic for review of outcome
 - Post MOXFQ completed
 - Clinical evaluation; toe position, purchase power, MTPJ stability, ROM
 - PSQ10 questions; 7-10

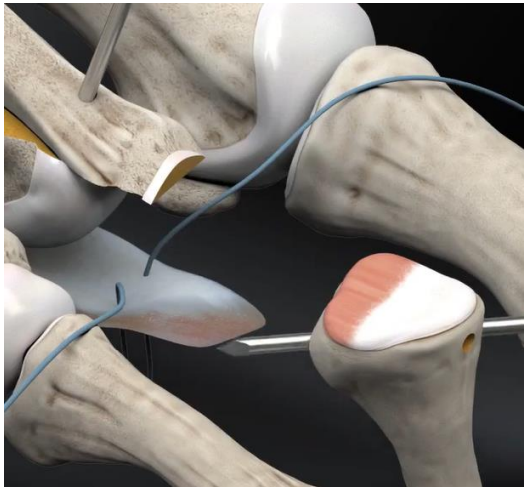
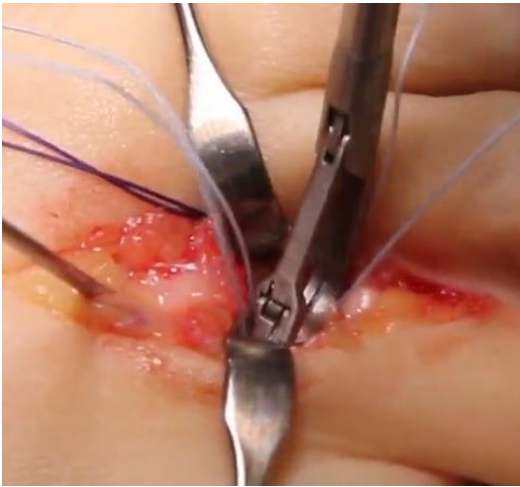
• SPSS v26

Paired T-Test $p=0.05$

Surgical Technique



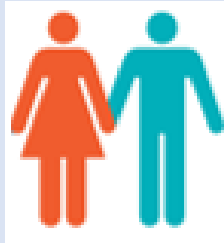
Surgical Technique continued...



Results

Demographics

- 23 procedure in 20 patients
- 90% (18) Females 10% (2) Males
- Mean age 58yrs (35-73yrs)



Follow up period

- Mean 22.5 months (8-44 months)

Clinical Evaluation

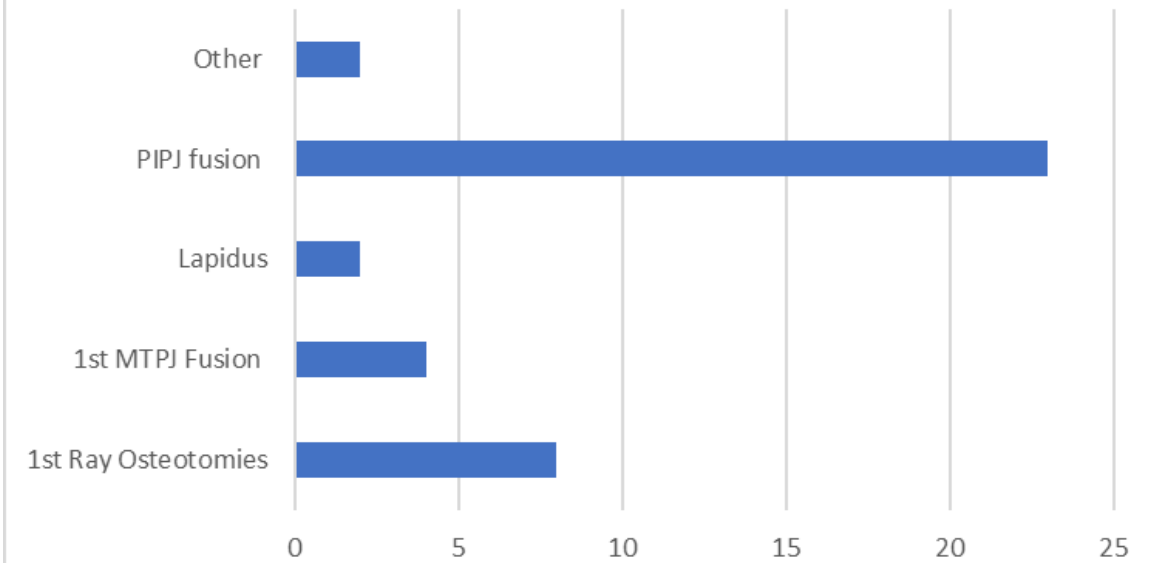
- 52% achieved ground contact in relaxed standing
- 100% stable on Lachman's testing
- 100% moderate purchase power
- Dorsiflexion: mean 29° (5-50°) Plantarflexion 15° (5-20°)

MOXFQ scores

- WS ↓ 28.53 (95% CI 11.08-45.99)
- P ↓ 29.23 (95% CI 19.30-39.16)
- SI ↓ 34.46 (95% CI 20.13-48.79)

All scores deemed **clinically** and **statistically** sig ($p < 0.001$)

Concurrent Procedures



PSQ10

- Mean score 80 (35-96)
- 85% (17) reported symptoms better or much better
- 10% (2) considered that their symptoms had deteriorated

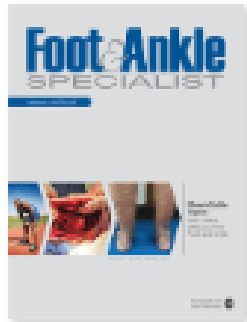
Complications

- 1 post op infection, 1 suspected DVT
- 1 patient developed OA / hypertrophy of the 2nd MTPJ

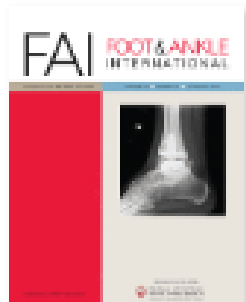
Discussion



Gregg et al (2007) reported that 100% of their patients noted an improvement in their pain levels however 26% were dissatisfied with the overall result. **23 feet / 35 tears @ 26 months**



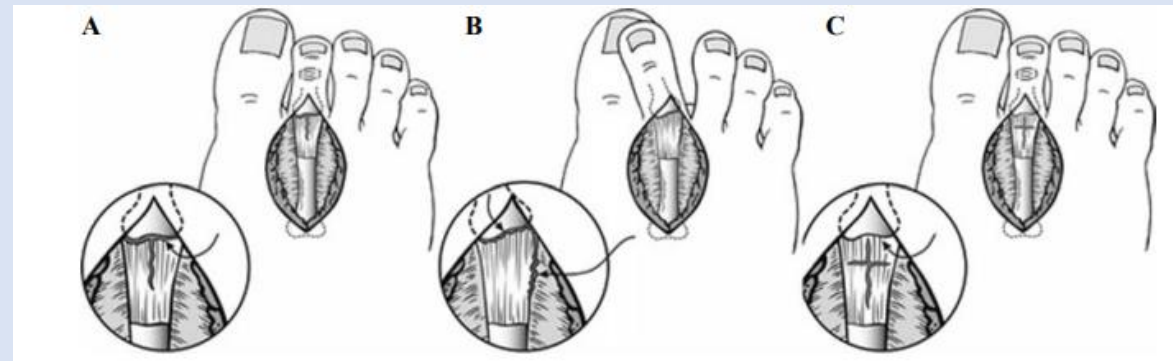
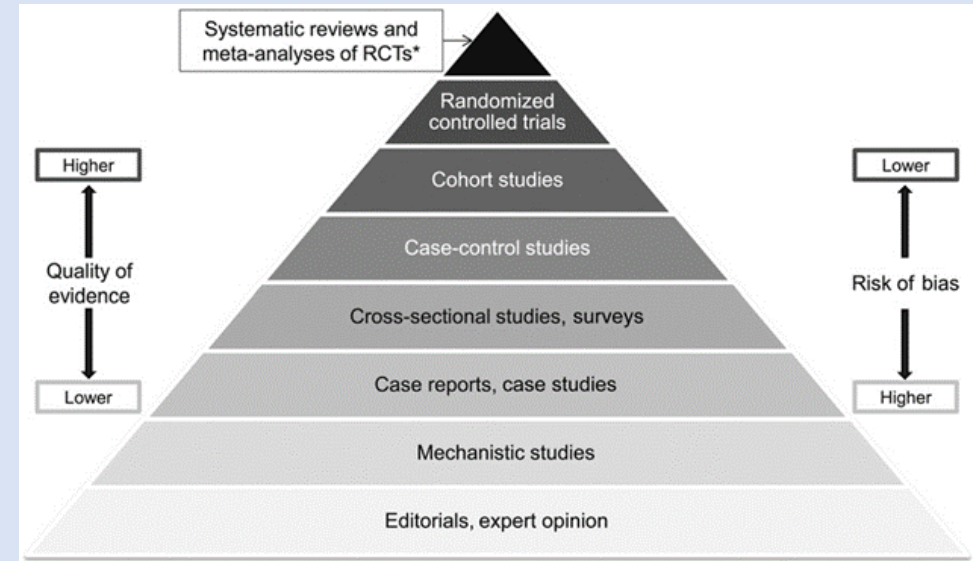
Weil et al (2011) reported similar levels of patient satisfaction with 85% reporting improved function, and 77% were satisfied or very satisfied with the outcome of their surgery. **13 feet / 15 tears @ 22.5 months**



Flint (2017) reported similar patient satisfaction scores for those patients undergoing plantar plate repair with concurrent 1st ray procedures but did highlight that 100% of patients who underwent isolated plantar plate repairs described 'good' to 'excellent' results. **97 feet / 138 tears @ 12 months**

Limitations

- Retrospective / case series / no control
- Inherent risk of non-responder and selection bias. Originally 52 patient records identified
- No pre or intraoperative grading of tears prior to repair
- Time constraints & COVID19 reduced clinical throughput during study period
- No radiographic evaluation
- Concurrent Procedures



Conclusions

- DAARWO is effective at improving MOXFQ scores in the medium term
- High patient satisfaction scores according to the PSQ10 questionnaire data
- Clinical evaluation revealed stable joints with moderate digital purchase power post operatively. 50% of digits had sub-optimal sagittal plane position and reduced ROM compared to a normal lesser MTPJ
- The incidence of significant post operative complications is low with no cases requiring revision surgery at a mean of 22.5 months
- Future research should incorporate clinical & radiographic grading

References

Reference List

Agha, R. A., Fowler, A. J., Rajmohan, S., Barai, I., Orgill, D. P., & PROCESS Group. (2016). Preferred reporting of case series in surgery; the PROCESS guidelines. *International Journal of Surgery (London, England)*, 36(Pt A), 319-323. <https://doi.org/10.1016/j.ijssu.2016.10.025>

Aveyard, H. (2018). *Doing a literature review in health and social care: A practical guide* (Fourth ed.). Maidenhead, London, England:: Open University Press.

Beauchamp, L.T., Childress, J.F. (2001) *Principles of Biomedical Ethics*. 5th Ed. Oxford: Oxford University Press.

Campbell, S., Greenwood, M., Prior, S., Shearer, T., Walker, K., Young, S., Bywaters, D., & Walker, K. (2020). Purposive sampling: Complex or simple? research case examples. *Journal of Research in Nursing*, 25(8), 652-661. <https://doi.org/10.1177/1744987120927206>

Chan, K., & Bhandari, M. (2011). Three-minute critical appraisal of a case series article. *Indian Journal of Orthopaedics*, 45(2), 103-104. <https://doi.org/10.4103/0019-5413.77126>

Cunningham, C.J.L., Weathington, B.L., Pittenger, D.J. (2013) *Understanding and Conducting Research in the Health Sciences*. John Wiley & Sons Inc. Hoboken, New Jersey

Dawson, J., Boller, I., Doll, H., Lavis, G., Sharp, R., Cooke, P., & Jenkinson, C. (2011). The MOXFQ patient-reported questionnaire: Assessment of data quality, reliability and validity in relation to foot and ankle surgery. *Foot (Edinburgh, Scotland)*, 21(2), 92-102. <https://doi.org/10.1016/j.foot.2011.02.002>

Department of Health (2005) Commissioning a patient-led NHS. HMSO, London.

Department of Health (2008) Local Involvement Networks (LiNs). [online] http://www.dh.gov.uk/en/Managingyourorganisation/PatientAndPublicinvolvement/DH_076366.

Dinnot, M.C. & Michaud, T.C. (2003). Plantar plate rupture. *Australasian Journal of Podiatric Medicine*, 37 (2) 43-36

Flint, W. W., Macias, D. M., Jastifer, J. R., Doty, J. F., Hirose, C. B., & Coughlin, M. J. (2017). Plantar plate repair for lesser metatarsophalangeal joint instability. *Foot & Ankle International*, 38(3), 234-242. <https://doi.org/10.1177/1071100716679110>

Ghasemi, A., Zahediasl, S. (2012) Normality Tests for Statistical Analysis: A Guide for Non-Statisticians. *International Journal of Endocrinology and Metabolism*, 10(2), 486-489

Gregg, J., Marks, P., Silberstein, M., Schneider, T., & Kerr, J. (2007). Histologic anatomy of the lesser metatarsophalangeal joint plantar plate. *Surgical and Radiologic Anatomy (English Ed.)*, 29(2), 141-147. <https://doi.org/10.1007/s00276-007-0188-2>

Hawker, G. A., Mian, S., Kendzerska, T., & French, M. (2011). Measures of adult pain: Visual analog scale for pain (VAS pain), numeric rating scale for pain (NRS pain), McGill pain questionnaire (MPQ), Short-Form McGill pain questionnaire (SF-MPQ), chronic pain grade scale (CPGS), short Form-36 bodily pain scale (SF-36 BPS), and measure of intermittent and constant osteoarthritis pain (ICOAP). *Arthritis Care & Research (2010)*, 63(S11), S240-S252. <https://doi.org/10.1002/acr.20543>

Isis Innovation Ltd (2011) Manchester-Oxford Foot Questionnaire. Oxford University, Oxford, UK

Kinser, P. A., & Robins, J. L. (2013). Control group design: Enhancing rigor in research of mind-body therapies for depression. *Evidence-Based Complementary and Alternative Medicine*, 2013, 140467-10. <https://doi.org/10.1155/2013/140467>

Klein, E. E., Weil, L., Weil, L. S., & Knight, J. (2013). Musculoskeletal ultrasound for preoperative imaging of the plantar plate: A prospective analysis. *Foot and Ankle Specialist*, 6(3), 196-200. <https://doi.org/10.1177/1938640013484795>

Klein, E. E., Weil, L., Weil, L. S., Coughlin, M. J., & Knight, J. (2013). Clinical examination of plantar plate abnormality: A diagnostic perspective. *Foot & Ankle International*, 34(6), 800-804. <https://doi.org/10.1177/1071100712471825>

Maher, A., & Kilmartin, T. (2010). Patient-reported outcomes: a new direction for podiatric surgery?. Retrieved from <https://www.pascom-10.com/documents/Patient%20Reported%20Outcomes%20a%20new%20direction%20for%20podiatric%20surgery.pdf>

Mathes, T., & Pieper, D. (2017). Clarifying the distinction between case series and cohort studies in systematic reviews of comparative studies: Potential impact on body of evidence and workload. *BMC Medical Research Methodology*, 17(1), 107-107. <https://doi.org/10.1186/s12874-017-0391-8>

Menz, H. B., Jordan, K. P., Roddy, E., & Croft, P. R. (2010). Characteristics of primary care consultations for musculoskeletal foot and ankle problems in the UK. *Rheumatology (Oxford, England)*, 49(7), 1391-1398. doi:10.1093/rheumatology/keq092

National Patient Safety Agency (2009) Defining Research. NRES guidance to help you decide if your project requires review by a Research Ethics Committee. London: NPSA [online] Available at: www.nres.nhs.uk/EasySiteWeb/GatewayLink.aspx?allid=355

Nery, C., Coughlin, M. J., Baumfeld, D., & Mann, T. S. (2012). Lesser metatarsophalangeal joint instability: Prospective evaluation and repair of plantar plate and capsular insufficiency. *Foot & Ankle International*, 33(4), 301-311. <https://doi.org/10.3113/FAI.2012.0301>

Nery, C., Coughlin, M. J., Baumfeld, D., Raduan, F. C., Mann, T. S., & Catena, F. (2014). Prospective evaluation of protocol for surgical treatment of lesser MTP joint plantar plate tears. *Foot & Ankle International*, 35(9), 876-885. <https://doi.org/10.1177/1071100714539659>

NHS Wirral (2011) Fact sheet 5: Why do I need to evaluate my project/service? [Online] Available at: <http://info.wirral.nhs.uk/document/uploads/evidence-factsheets/5Whyevaluateproject10052011.pdf>

Pallant, J. (2010) *SPSS survival manual 4th edition: A step by step guide to data analysis using the SPSS program*. Maidenhead: McGraw-Hill

Polgar, S., & Thomas, S. A. (2020). *Introduction to research in the health sciences* (Seventh ed.). Elsevier.

Prior, T. D. (2011). *os.com*. *Journal of Foot and Ankle Research*, 4(S1), I8-I8. <https://doi.org/10.1186/1757-1146-4-S1-I8>

Prissel, Mark A., DPM, AACFAS, Hyer, Christopher F., DPM, MS, FACFAS, Donovan, J. K., DPM, & Quisno, A. L., DPM. (2016;2017;). Plantar plate repair using a direct plantar approach: An outcomes analysis. *The Journal of Foot and Ankle Surgery*, 56(3), 434-439. <https://doi.org/10.1053/j.iftas.2016.12.002>

Riskowski, J. L., Hagedorn, T. J., & Hannan, M. T. (2011). Measures of foot function, foot health, and foot pain: American academy of orthopedic surgeons lower limb outcomes assessment: Foot and ankle module (AAOS-FAM), bristol foot score (BFS), revised foot function index (FFI-R), foot health status questionnaire (FHSQ), manchester foot pain and disability index (MFPDI), podiatric health questionnaire (PHQ), and rowan foot pain assessment (ROFFPAQ). *Arthritis Care & Research (2010)*, 63(S11), S229-S239. <https://doi.org/10.1002/acr.20554>

Rudge, G., & Tollafield, D. (2003). A critical assessment of a new evaluation tool for podiatric surgical outcome analysis. *British Journal of Podiatry*, 6(4), 109-119.

Schrier, J. C. M., Palmen, L. N., Verheyen, C. C. P. M., Jansen, J., & Koeter, S. (2014;2015;). Patient-reported outcome measures in hallux valgus surgery. A review of literature. *Foot and Ankle Surgery*, 21(1), 11-15. <https://doi.org/10.1016/j.fas.2014.11.004>

Swaider, A., Sydes, M. R., Gelling, L., & Wilkinson, M. (2009). PRACTICE POINTER: Applying for ethical approval for research in the united kingdom. *BMJ: British Medical Journal*, 339(7727), 968-971.

Stainsby, G. D. (1997). Pathological anatomy and dynamic effect of the displaced plantar plate and the importance of the integrity of the plantar plate-deep transverse metatarsal ligament tie-bar. *Annals of the Royal College of Surgeons of England*, 79(1), 58-68.

Taylor, N. G., Tollafield, D. R., & Rees, S. (2008). Does patient satisfaction with foot surgery change over time? *Foot (Edinburgh, Scotland)*, 18(2), 68-74. <https://doi.org/10.1016/j.foot.2008.01.003>

Thompson, F.M. & Hamilton, W.G. (1987). 'Problems of the second metatarsophalangeal joint'. *Orthopedics*, 10 (1) 83-89

Twycross, A. Shorten, A. (2014) Service evaluation, audit and project: what is the difference? *Evidence Based Nursing*, 17(3), 65-66

Weil, L., Sung, W., Weil, L. S., & Malinoski, K. (2011). Anatomic plantar plate repair using the weil metatarsal osteotomy approach. *Foot and Ankle Specialist*, 4(3), 145-150. <https://doi.org/10.1177/1938640010397342>

Yu, G. V., Judge, M. S., Hudson, J. R., & Seidelmann, F. E. (2002). Pre-dislocation syndrome. progressive subluxation/dislocation of the lesser metatarsophalangeal joint. *Journal of the American Podiatric Medical Association*, 92(4), 182-199.

Thank you

Any Questions ?