Dr John Negrine
Foot and Ankle Surgeon
(To the poor and ignomious)

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Plantar plate repair
A “game changer”

John P. Negrine, F.R.A.C.S.
Foot and Ankle Surgeon
Sydney
Foot surgeon’s car vs knee surgeon’s car

Dr John Negrine
Adult Foot & Ankle Surgery
Patient expectations

- Always works on RPA
- The wardrobe full of sexy shoes
- Cosmesis a big issue
- Foot surgery definitely not glamorous!!
Second MTP synovitis 1991
2\textsuperscript{nd} MTP instability

- Very common cause of forefoot pain
- Patients describe walking on a stone
- Swelling
- Deviation of the toe
- Sometimes paraesthesia
There is a general lack of recognition of this condition among GP’s, rheumatologists, podiatrists, physiotherapists and the general orthopaedic community.
Second MTP synovitis

- Spectrum from mild pain to marked deformity
- Mostly misdiagnosed initially as 2,3 neuroma
- Much more common in my practice
Plantar plate

- Thick structure
- Blends with capsule
- From metatarsal neck proximal to articular surface to base of proximal phalanx
- Blends with collateral ligaments medially and laterally
Plantar plate anatomy

- Rectangular or trapezoidal in shape
- Approx 19 x 11 mm
- 2 – 5 mm thick
- Originated from the plantar aponeurosis and flimsy attachment to the metatarsal neck
- Firm attachment to the base of the proximal phalanx
Patho-anatomy

- Once plantar plate ruptures interossei become extensors at MTP joint
- EDL will only extend PIP joint when proximal phalanx is flexed or in neutral
- EDL therefore a significant deforming force when MTP is hyper-extended

Fortin and Myerson 1995

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Is this where hammer toes begin?
Isn’t that exciting???
Causes of 2nd MTP instability

• Long second metatarsal
• Hallux valgus
• Impact runners
• Arthritides
• Neuromuscular disease

• “Wear and tear”
What is the incidence of plantar plate tears in the normal population?

- 20 specimens
- 6 male average age 56.7
- 14 female average age 71.1
- 14/20 plantar plate tears 70%
- 3/6 males 50%
- 11/14 females 78.6%

(Intervertebral disc, rotator cuff, meniscus)

Lowell Weil Jr. August 2012
Diagnosis

• Clinical and usually obvious

• DD: Early arthropathy rheumatoid, Tumours such as PVNS, metatarsal stress fracture, neuroma
65 year old GP

- Avid walker
- Presents with 2\textsuperscript{nd} MTP pain and swelling
- Initial x-rays normal June 2001
- Settled with taping/insole returned to walking
Re-presents 2003

• Pain and swelling 2nd MTP joint
• Restriction of movement
• X-rays Freiberg's' infraction
• Adult cases rare but well described in the literature
45 year old lady

- 3 month history of 2nd MTP pain
- Clinically no instability
- MRI – Stress reaction proximal phalanx – normal plantar plate – normal metatarsal head
“Doctor do I need an M.I.R.?”

My iridologist said they were real good!!
Interpretation is the key
2\textsuperscript{nd} MTP JT capsulitis and lateral plantar plate tear
Table 2. Anatomic Grading of Plantar Plate Tears – Coughlin et. al 2011

Grade Patterns of Injury
0 Plantar plate or capsular attenuation, and/or discoloration

1 Transverse distal tear (adjacent to insertion into proximal phalanx [<50%]; medial/lateral/central area) and/or midsubstance tear (<50%)

2 Transverse distal tear (>50%); medial/lateral/central area and/or midsubstance tear (>50%)

3 Transverse and/or longitudinal extensive tear (may involve collateral ligaments)

4 Extensive tear with button hole (dislocation); combination transverse and longitudinal plate tear
2\textsuperscript{nd} instability treatment

- ??50\% can be treated non-surgically
- Tape the toe, toe splint
- Metatarsal dome
- ?Judicious cortisone injection
Non-operative treatment
When plantar plate ruptures pain often subsides but deformity increases
Once the toe no longer touches the ground the only way to bring it down is surgically.
Bad operations

• Phalangeal or hemi-phalangeal resection
• Isolated metatarsal head resection
• Second toe amputation (except in the very elderly)
Plantar plate repair

- 34 so far (began 21 November 2011)
- 30 female/4 male
- Age Range: 44 – 84
- Average age 61
- Second MTP 33/Third MTP 1
Associated procedures

- Scarf 22 patients
- First MTP fusion 2 patients
- Akin (phalangeal osteotomy) 1 patient
Plantar plate repair

- New instruments make it possible from “the top”
- Direct repair and advancement is performed
- Morbidity is less

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Small pin distractor
McGlamry Elevator
Mini scorpion
Mini scorpion
Steps of the procedure

1. Pass McGlamry elevator to release plantar plate adhesions to metatarsal head
2. Weil Osteotomy provisionally fix 1.6mm k-wire
3. Place pin in base of proximal phalanx
4. Section collateral ligaments
5. Expose and debride plate tear
6. Put 0-fibrewire sutures in plate
7. Drill holes in base of proximal phalanx
8. Pass sutures
9. Tie sutures
10. Replace and fix Weil osteotomy
Technique
Technique
Plantar plate repair
Passing the suture
Final steps
Recovery

- 6 weeks in a recovery shoe
- Swelling 6 months
- So far 75% good results in 34 cases follow up < 12 months
Word of caution: The plantar plate is composed of type 1 collagen...we wouldn’t repair a meniscus in a 60 year old woman.