



Extracorporeal Shock Wave Therapy for Sports Injuries

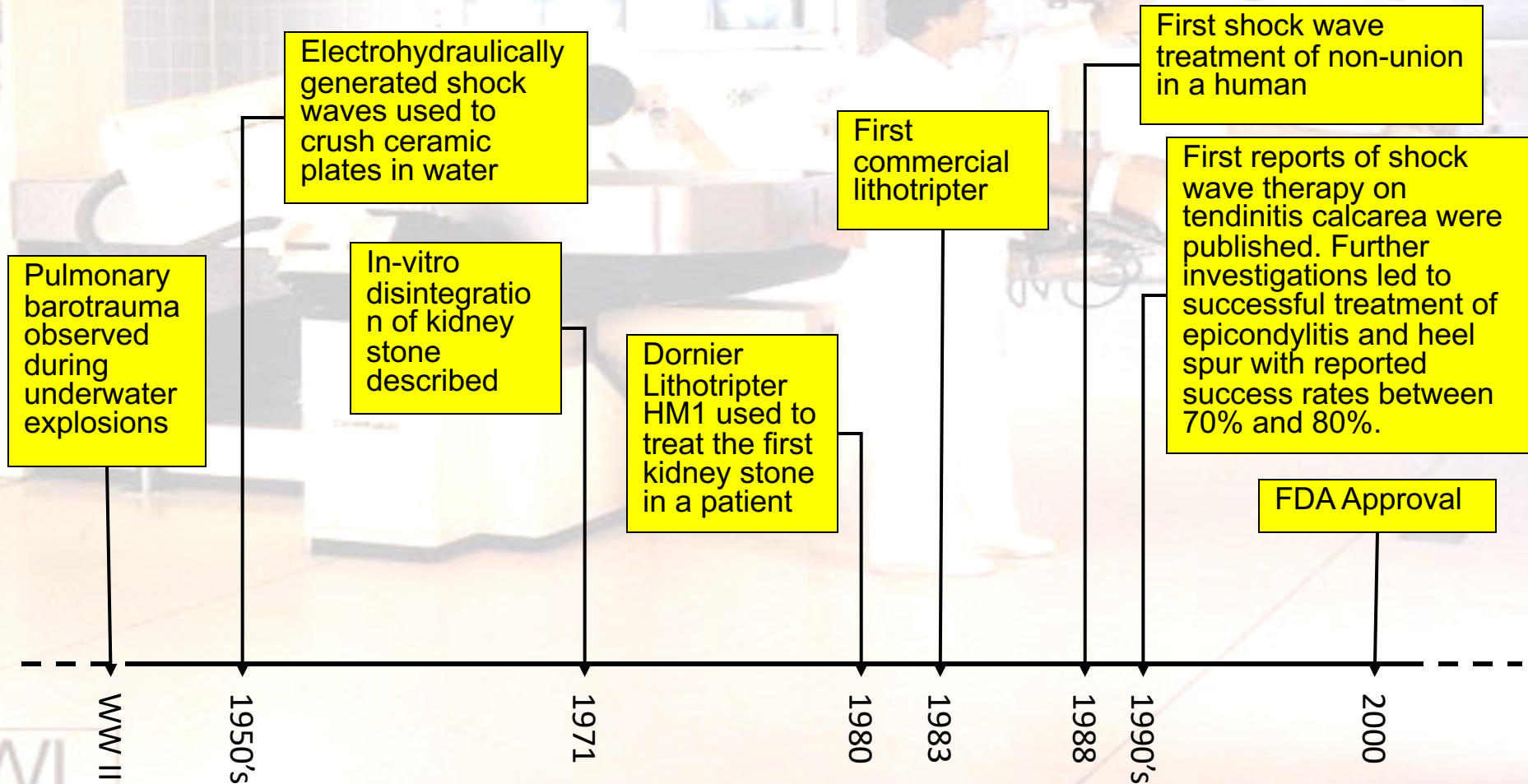
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Disclosures

- I have no disclosures

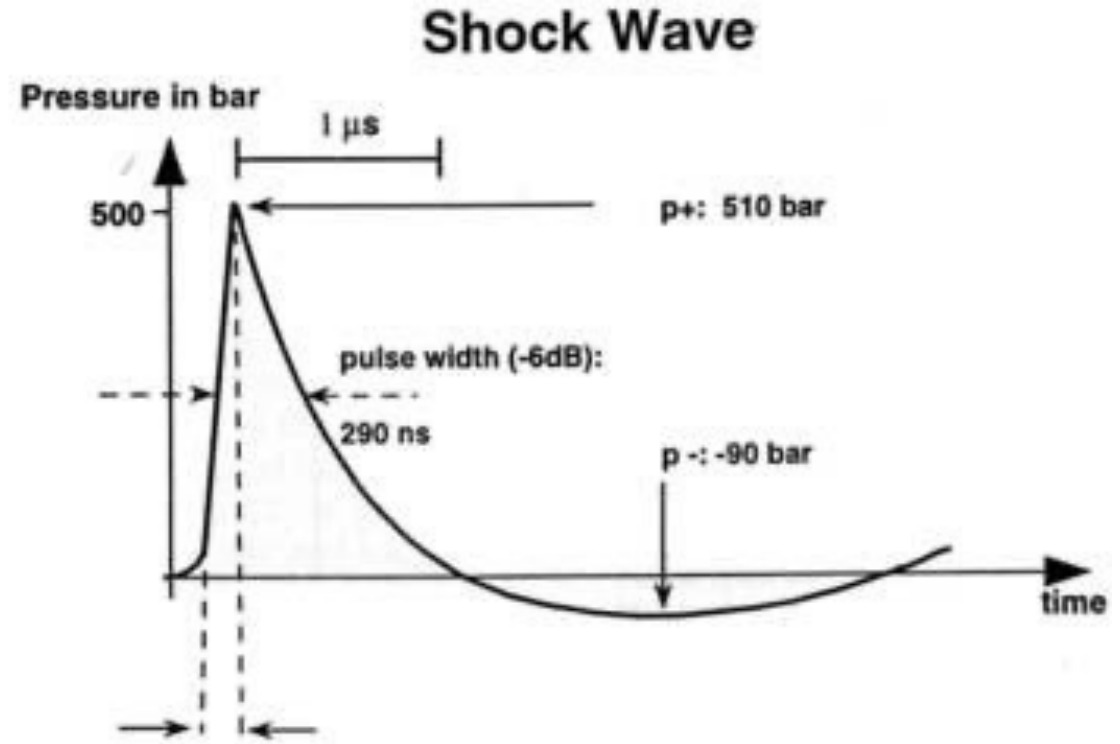
History



ESWL

What is a Shock Wave* ?

- Examples:
 - Depth charge
 - Lightning strike
 - Sonic boom
- Single large positive pressure pulse followed by small tensile wave



* Not to be confused with ballistic / pressure waves

Reviewing the Evidence

- Was it focal ESWT or Pressure Waves?

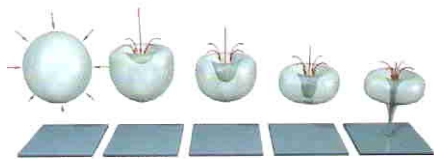
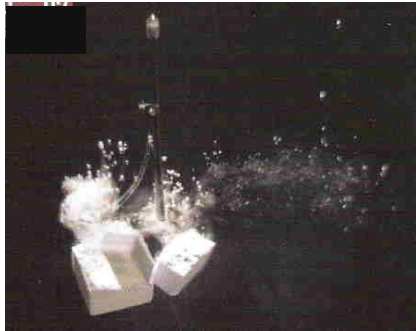


	Shock waves (focused)	Pressure waves (unfocused)	Difference
Focus	yes	no	
Propagation	non-linear	linear	
Steepening	yes	no	
Rise time	typically 0.01 μ s	typically 50 μ s	approx. 1:1000
Compression pulse duration	approx. 0.3 μ s	approx. 200 - 2000 μ s	approx. 1:1000
Positive peak pressure	0 - 100 MPa	0 - 10 MPa	10:1 - 100:1
Energy flux density	0 - 3 mJ/mm ²	0 - 0.3 mJ/mm ²	approx. 10:1

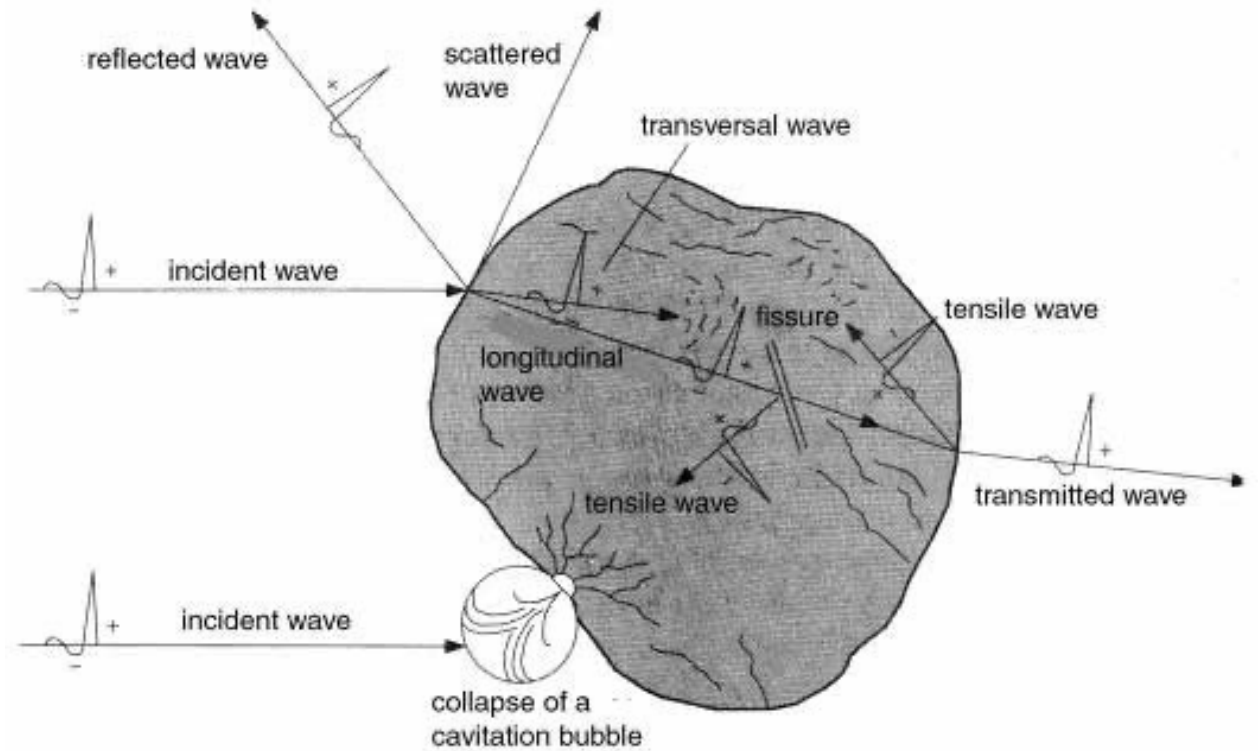
- What energy flux density ?
- What dosing regimen ?

Physical Effects of Shock Waves

- Direct effect

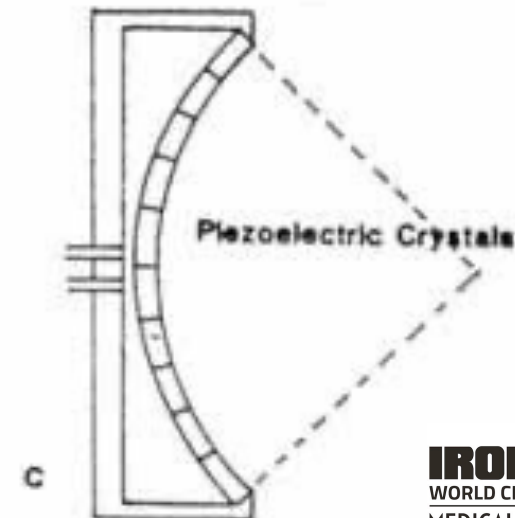
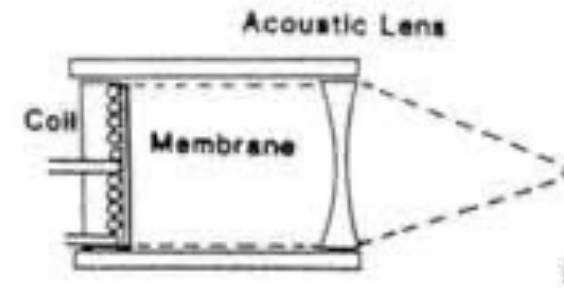
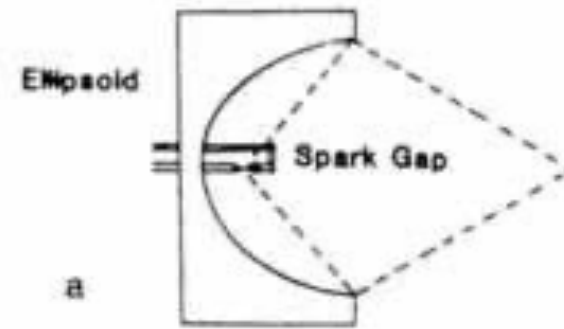


- Cavitation effect



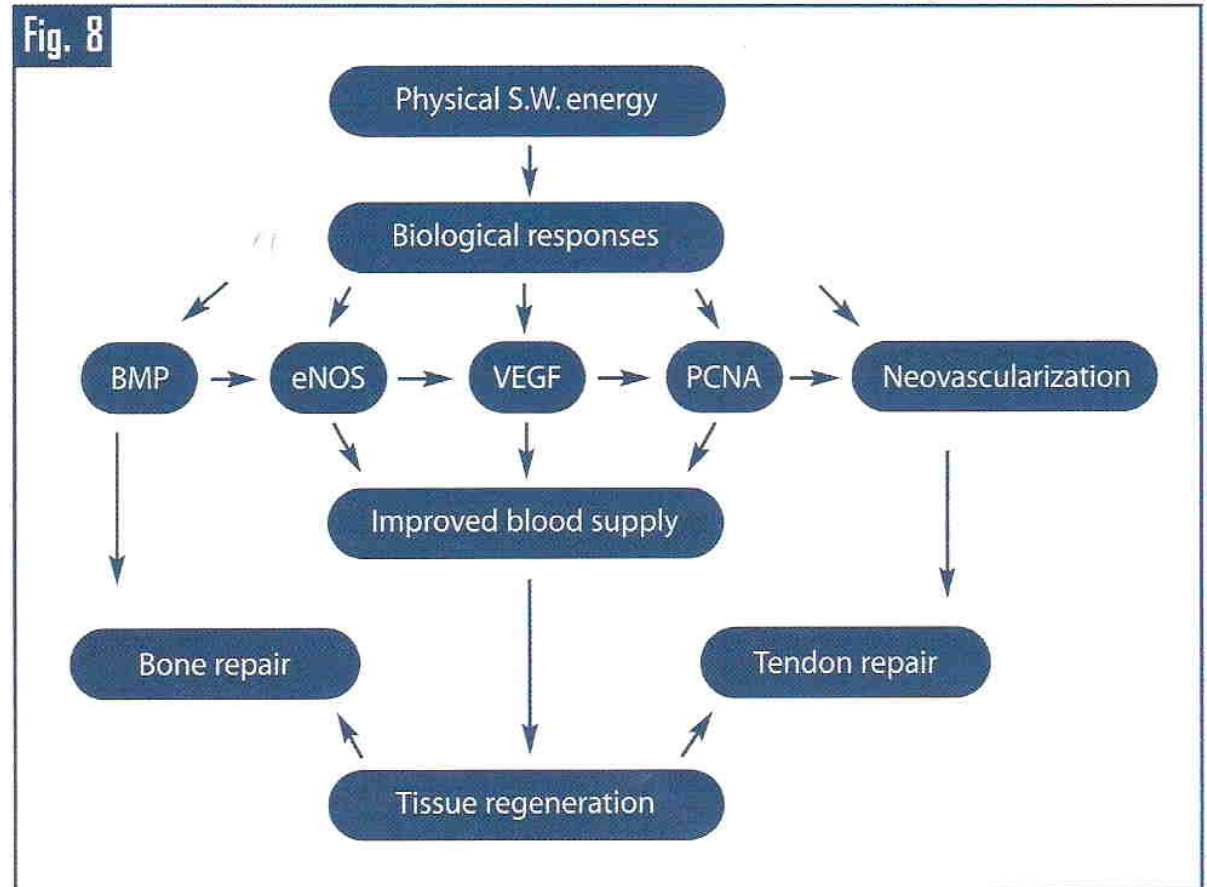
What is a Shock Wave ?

- Shock wave generation
 - a. Electrohydraulic
 - b. Electromagnetic
 - c. Piezoelectric
- Shock waves may be
 - a. Focal
 - b. Radial



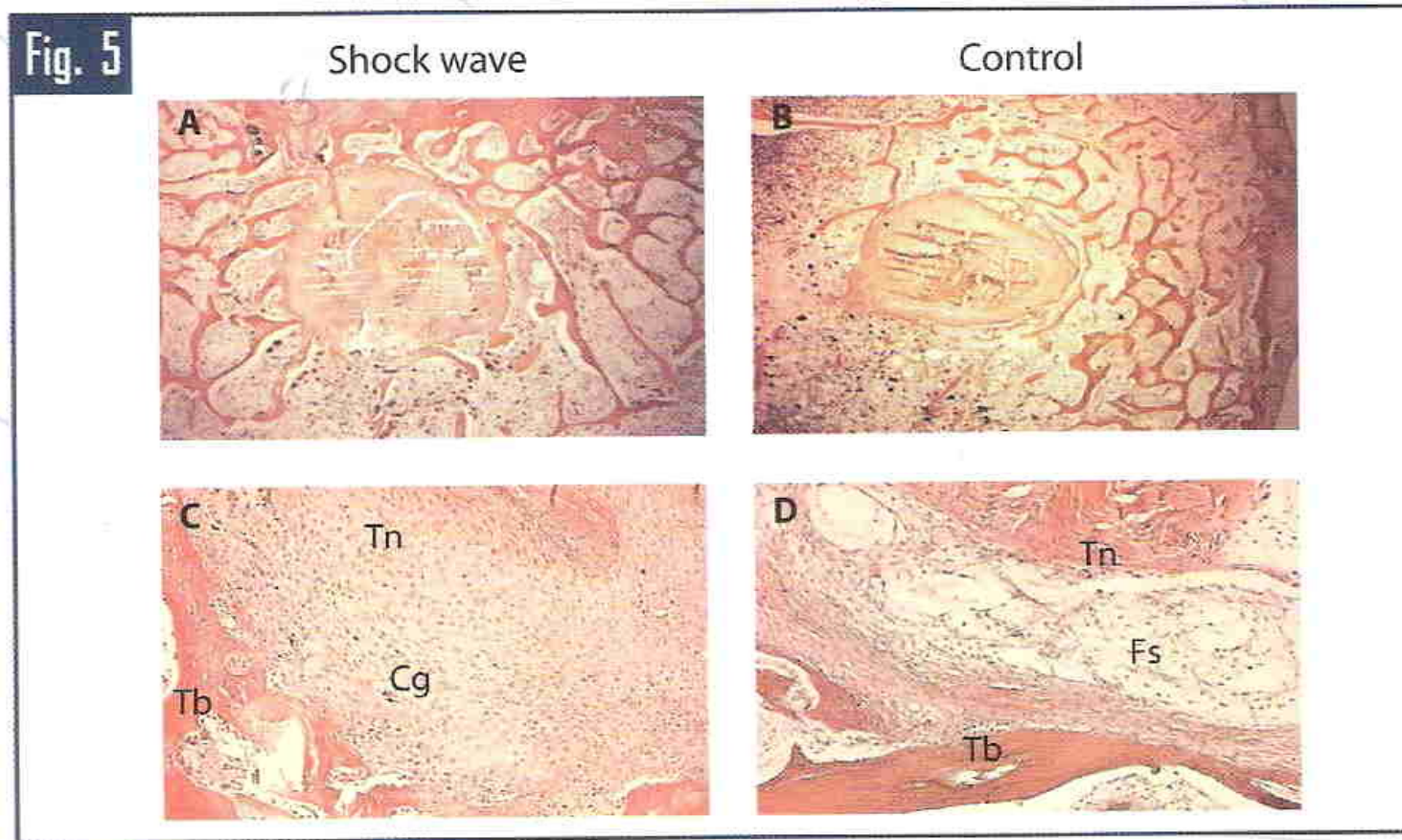
Biological Effect of Shock Waves

- Depolarization of pain fibres
- Mechanotransduction at tendon-bone interface through stimulation of:
 - Endothelial nitric oxide synthase (eNOS)
 - Vessel endothelial growth factor (VEGF)
 - Bone morphological protein (BMP-2)
 - Proliferating cell nuclear antigen (PCNA)



A proposed cascade of biological mechanism of extracorporeal shock waves in musculoskeletal tissues.

Biological Effect of Shock Waves



The trabecular bone surrounding the tendon graft increased significantly in the shock wave group as compared with the control group. The bonding between tendon and bone was much more intimate in the study group than the control.³⁷

6-Monthly Audit of ESWT Data from SSMC@CGH

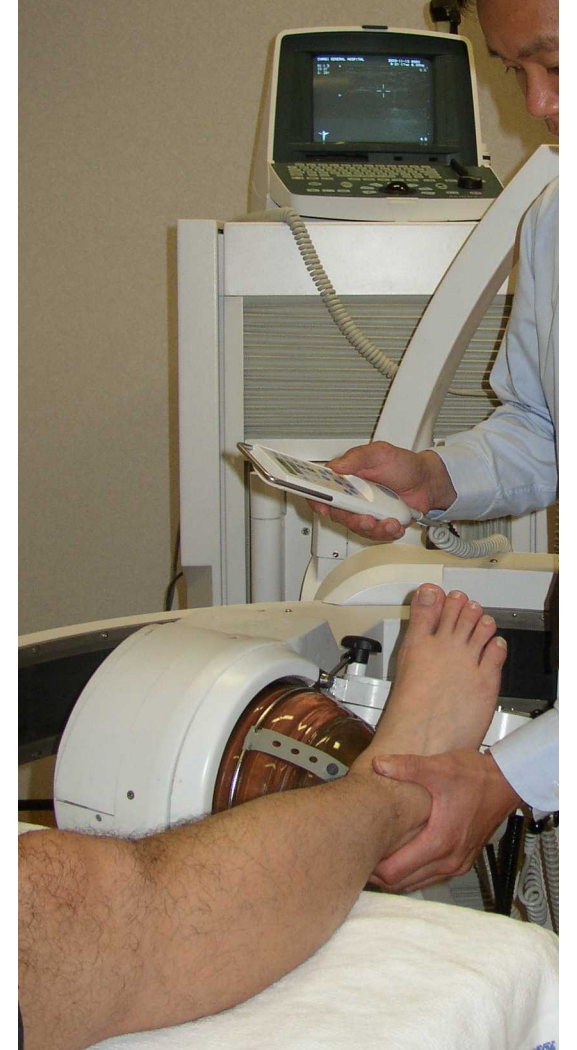
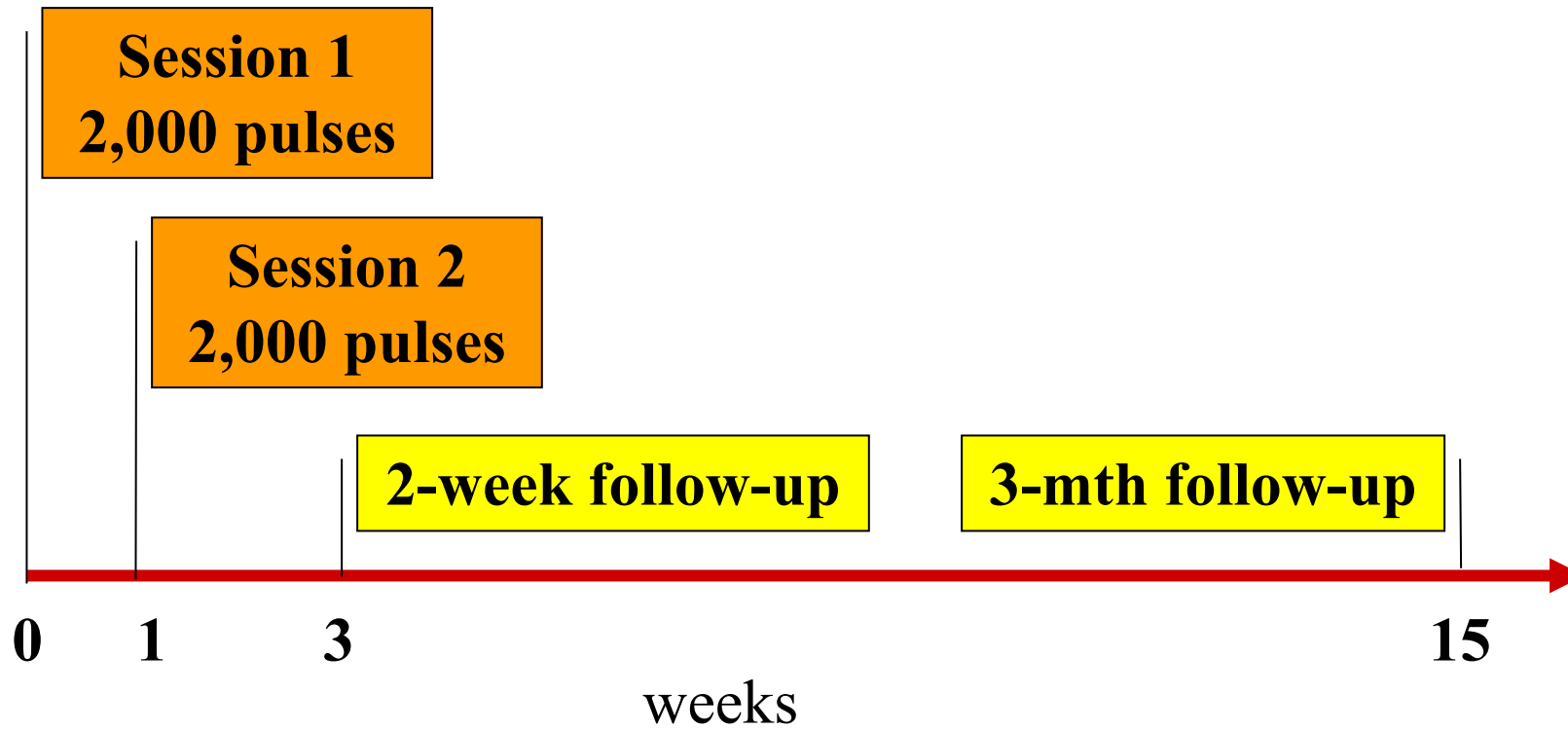


Dornier Epos Ultra



Storz Duolith Ultra

Departmental Protocol

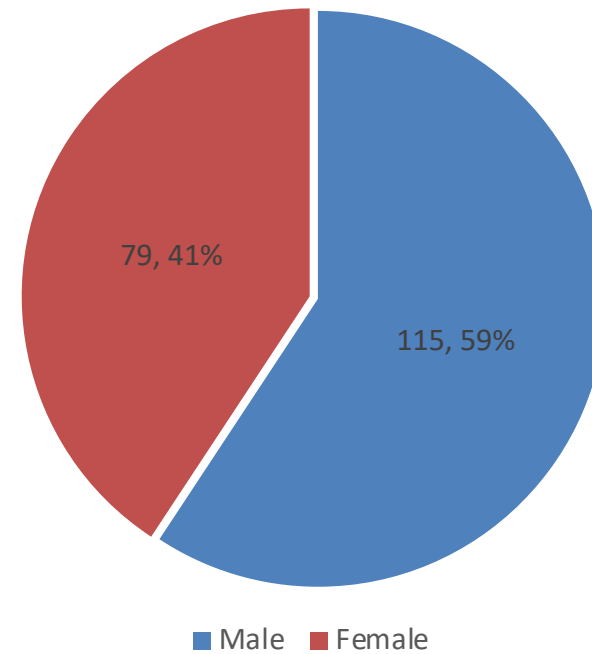


Patient Demographics - Gender

- Total no. of patients: 194

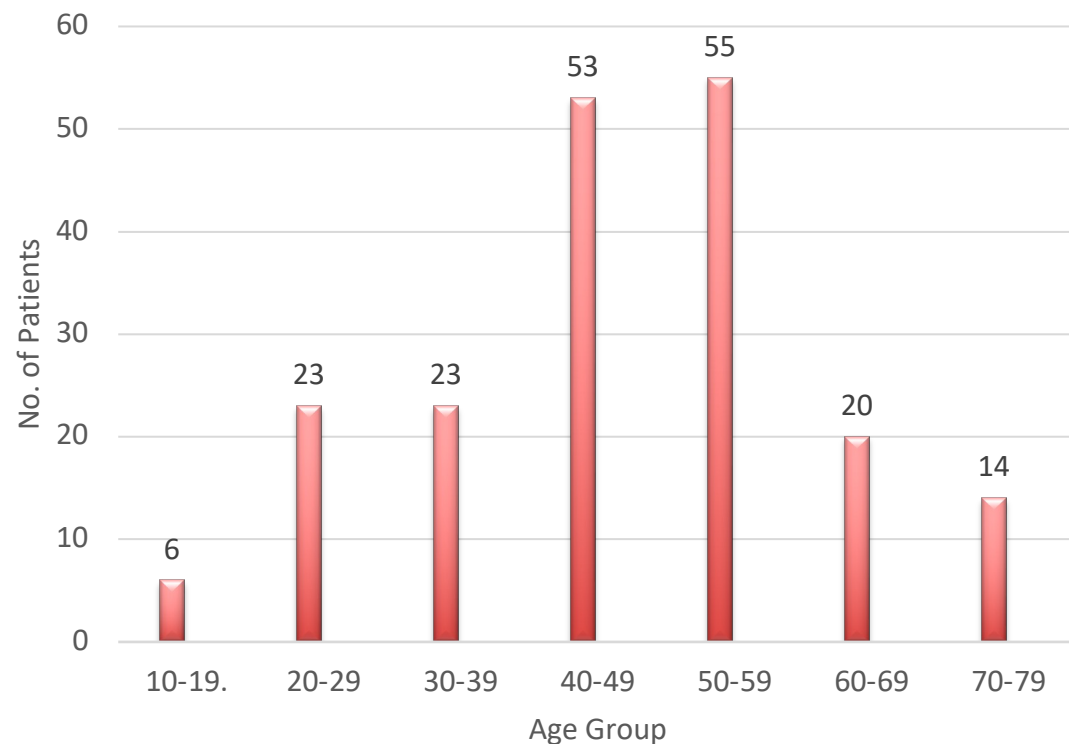


Gender Breakdown of Patients
Treated last 6 months (Oct 2022 –
Mar 2023)



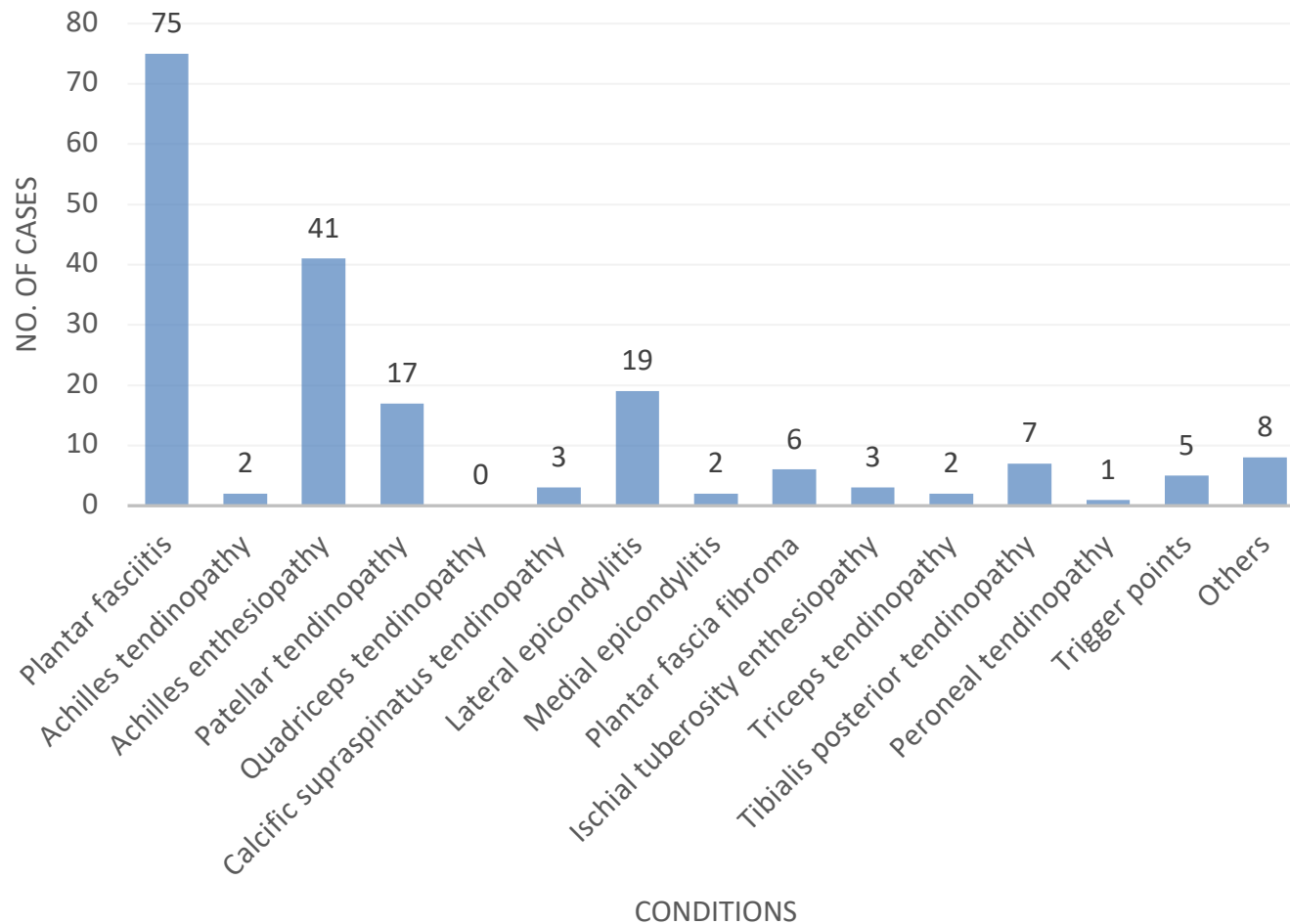
Patient Demographics – Age Group

Age Groups of Patients (Oct 2022 – Mar 2023)



- Mainly adults between 50-59 (28.4%) years old

Conditions Treated by fESWT In Oct 2022 – Mar 2023

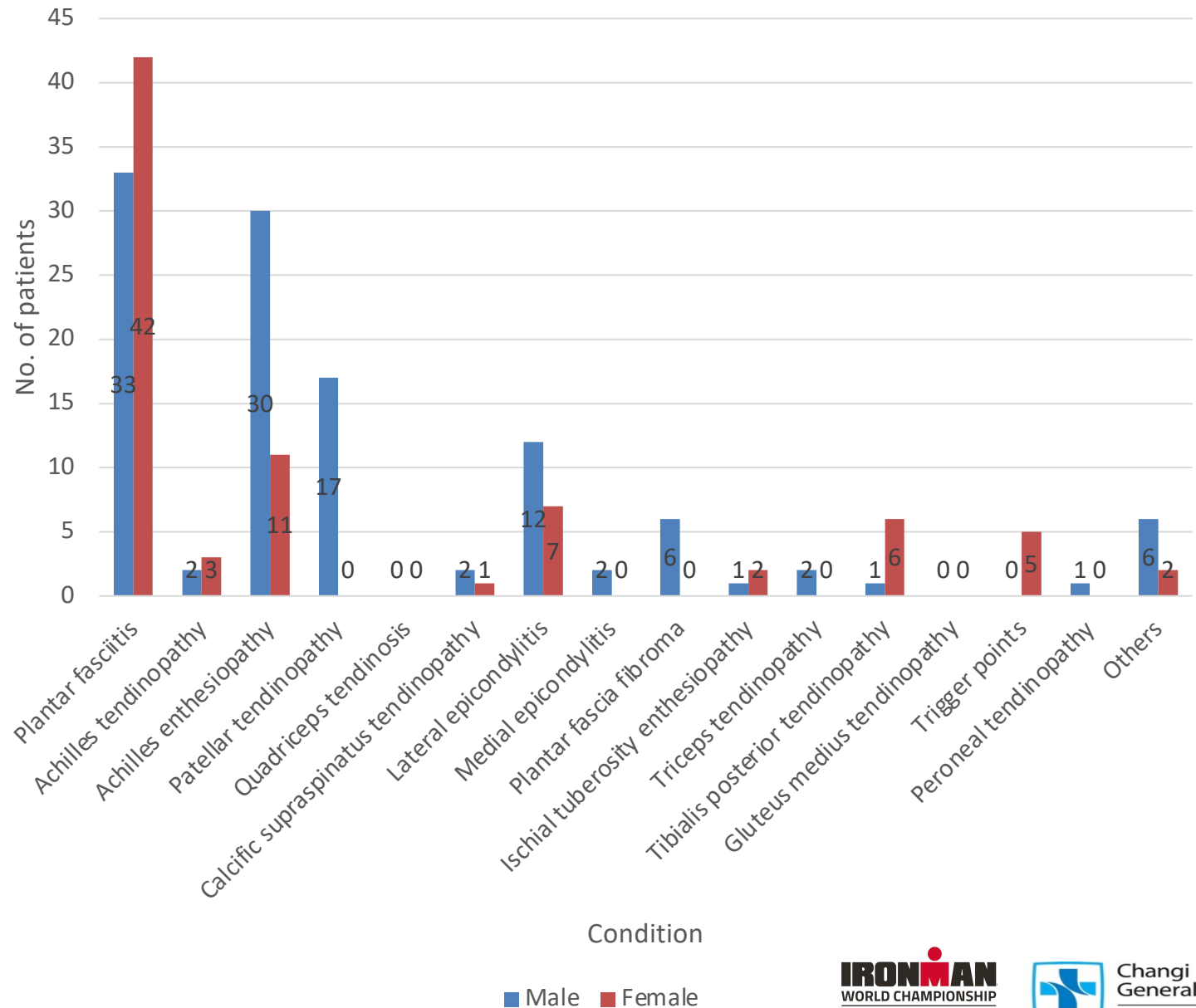


- Plantar fasciitis: 38.7%
- Achilles enthesopathy: 21.1%
- Lateral epicondylopathy: 9.8%

■ Oct 2022 - Mar 2023

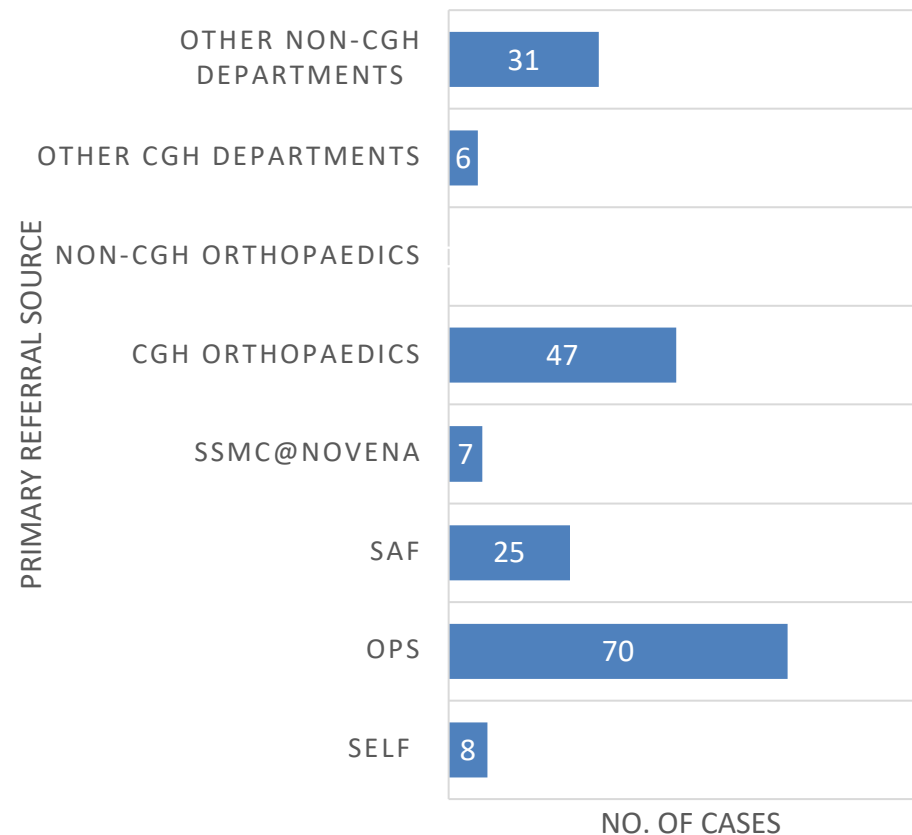
Gender Breakdown Of All Conditions Treated by fESWT In Oct 2022 – Mar 2023

- Mostly male preponderance
- Female preponderance for
 - Plantar fasciitis (56%)
 - Trigger points (100%)
 - Ischial tuberosity enthesopathy
 - Tibialis posterior tendinopathy



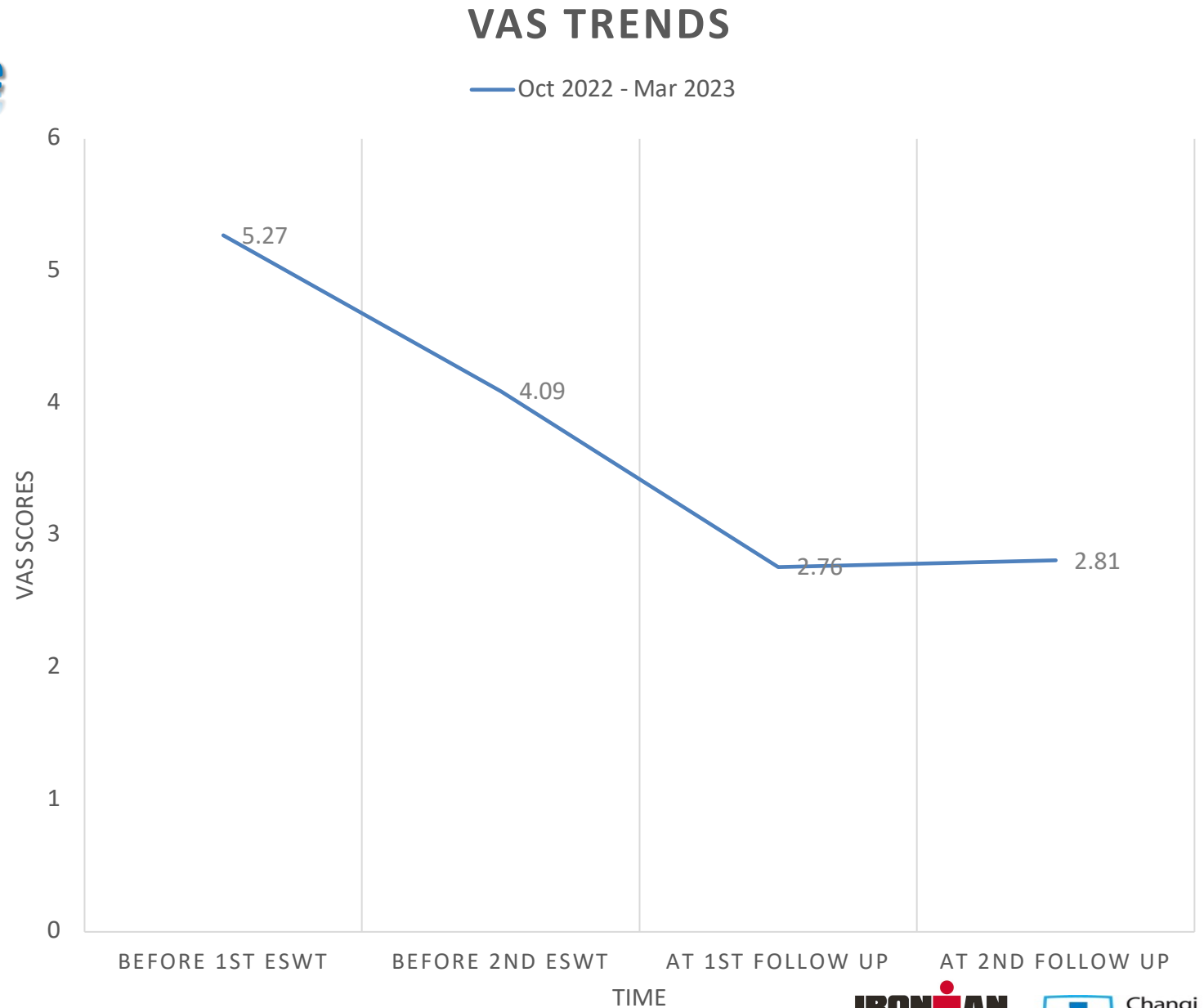
Primary Referral Sources For Focal ESWT (Oct 2022 – Mar 2023)

- 36.1% are from OPS
- 24.2% are from CGH Orthopaedics
- 4.1% are self referred



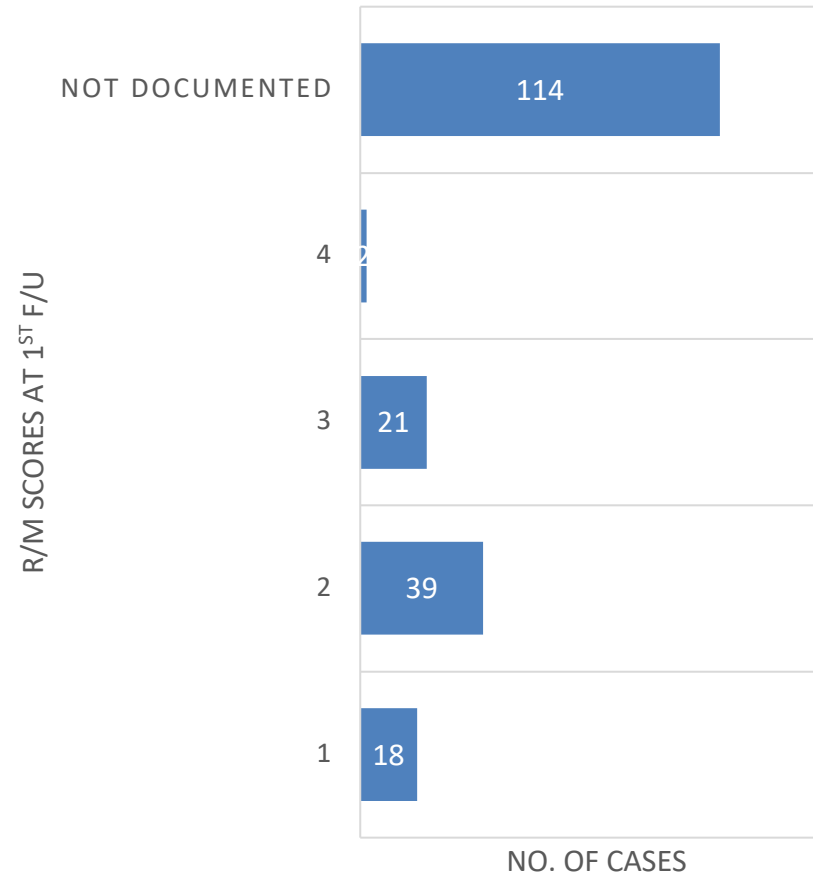
General VAS Trends Before And After fESWT

- VAS reduced generally after 1st and 2nd ESWT sessions



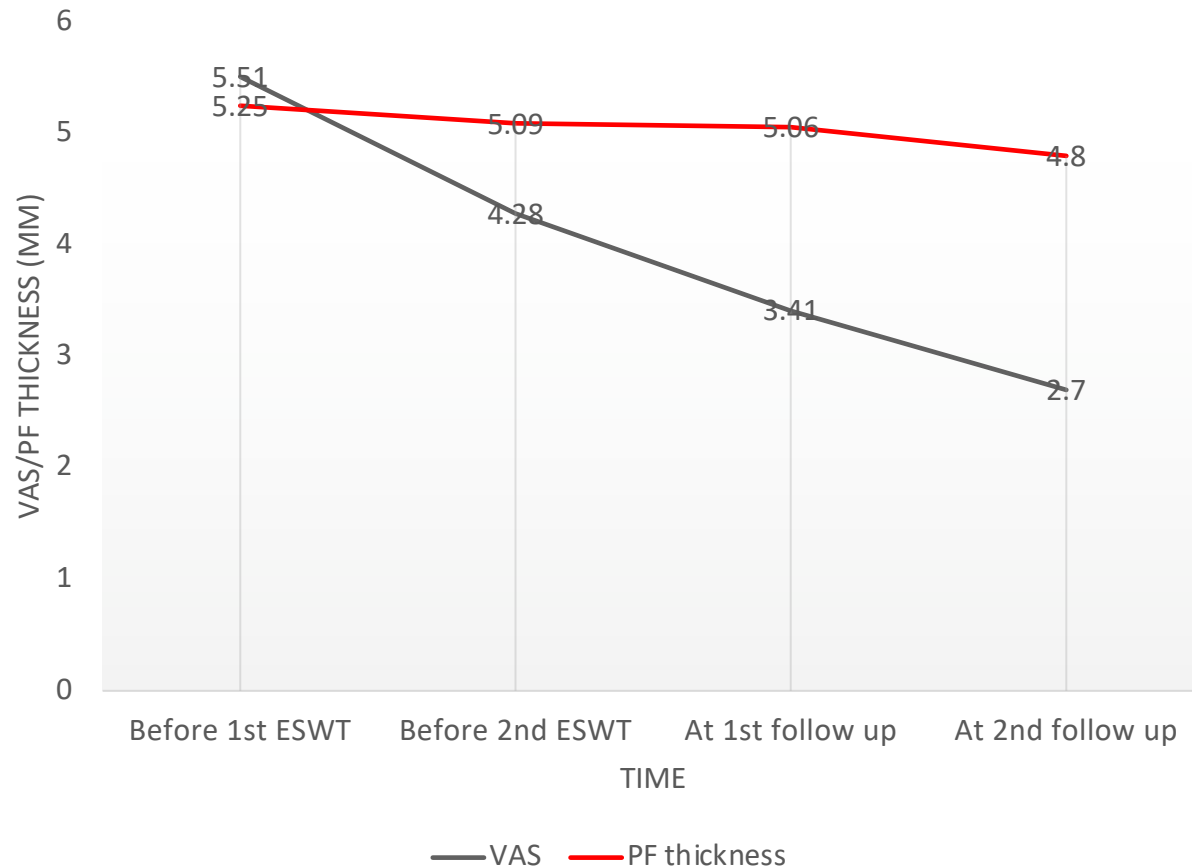
Roles & Maudsley Scores at First Follow-Up (Oct 2022 – Mar 2023)

- 29.4 % had R&M score of 1 (excellent) and 2 (good) after 1 course of fESWT
- 58.8% had no R/M scores documented

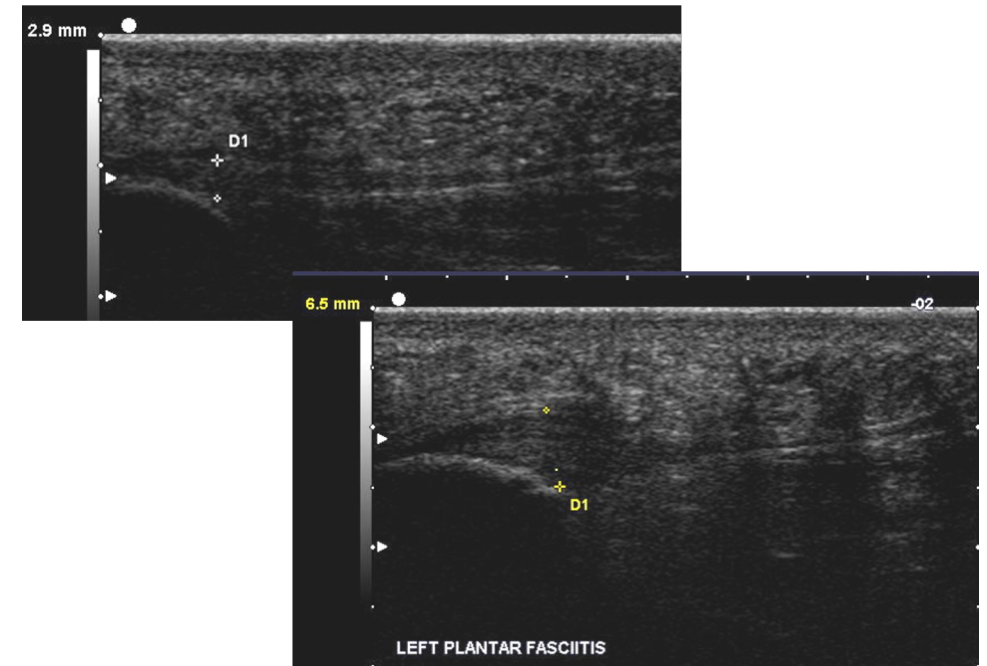


Plantar Fasciitis: VAS Trends And PF Thickness Before And After fESWT

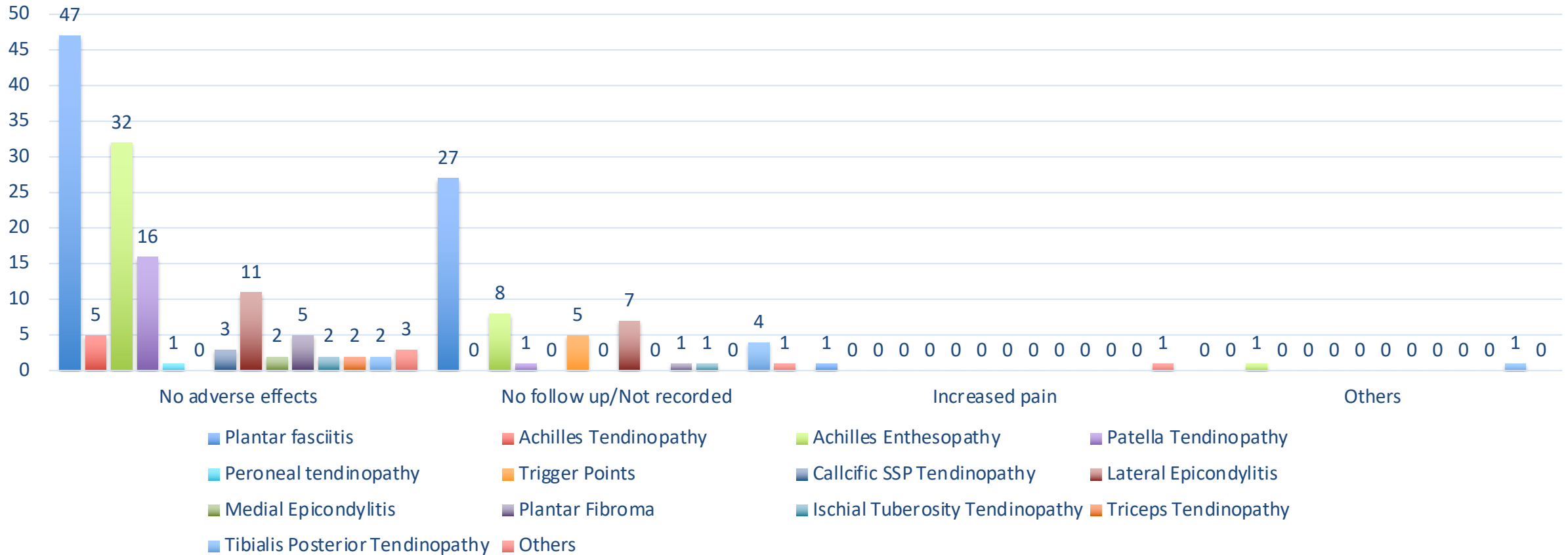
VAS and PF Thickness Trends Pre- and Post-ESWT (Oct 2022 – Mar 2023)



- PF thickness remained relatively constant
- VAS reduced throughout treatment



Adverse Effect(s) At 1st Follow-Up Post fESWT (Oct 2022 – Mar 2023)



Takeaways

- Focal ESWT is a useful and safe modality for degenerative tendon-bone junction lesions
- A shock wave is a single-pulse wave with a very rapid rise in pressure followed by a small negative pressure. Ballistic / pressure waves are not shock waves
- Precise targeting gives better outcomes
- Protocols vary (intensity, number of pulses, number of sessions) ... perhaps take the "middle path"?
- Need to address root causes e.g. tight plantar fascia, running gait, muscle weakness
- Reference – International Society of Medical Shockwave Treatment:
<https://www.shockwavetherapy.org/about-eswt/ismst-guidelines/>



Q & A