

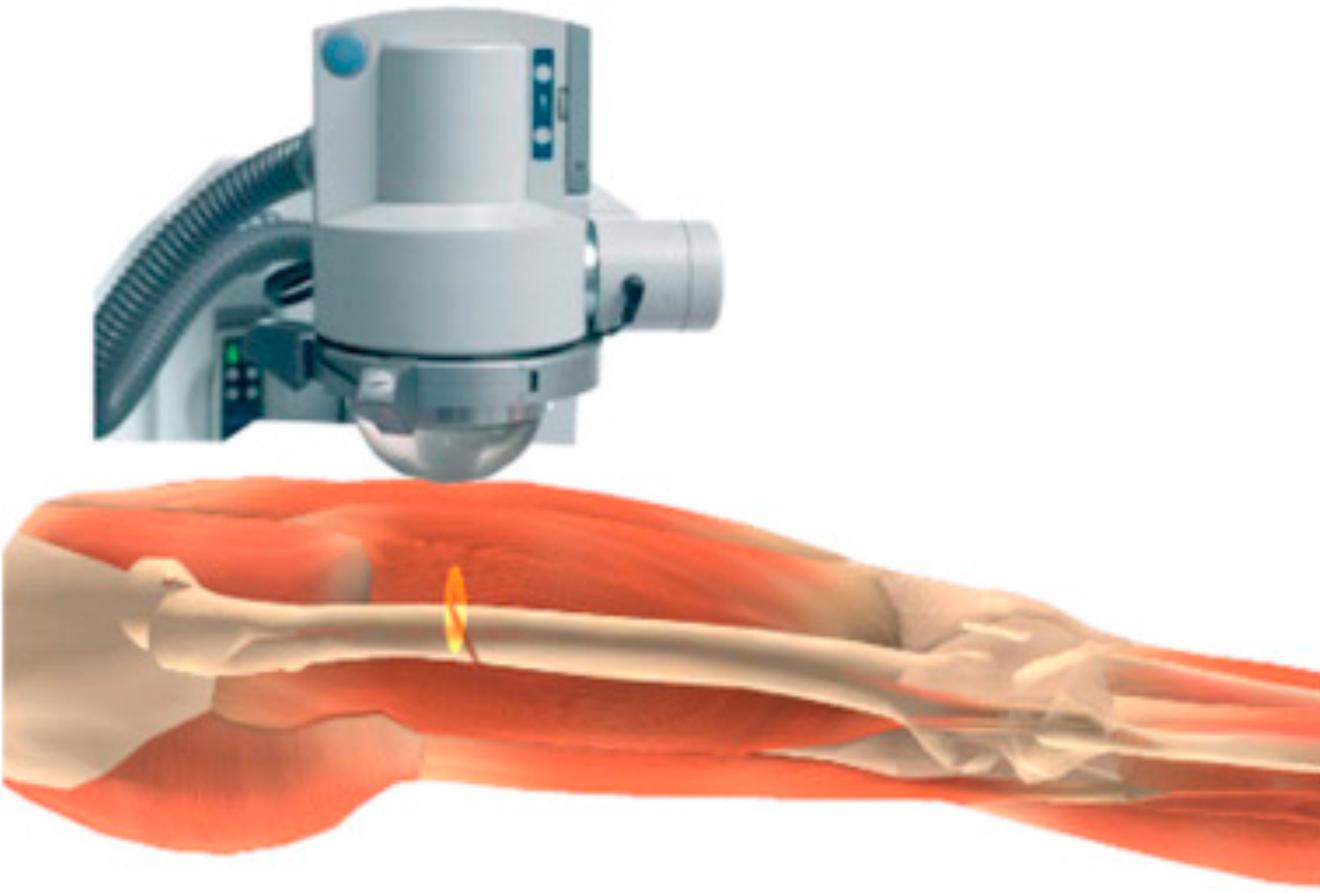
# Stressfraktur Non unions AVN

DS)KESWT

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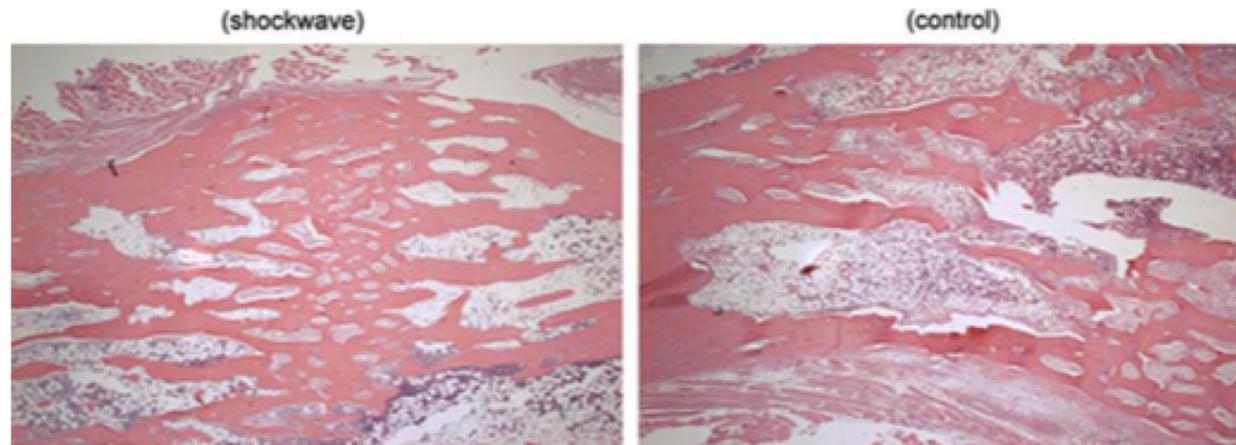
Kim Corfixen, Kiropraktor  
Kiropraktorerne Valby

# BIOLOGISKE VIRKNINGER



“ Shockwave-promoted bone healing was associated with increases in neovascularization and angiogenic and osteogenic growth factors. ”

Wang CJ, Wang FS, Yang KD. Biological effects of extracorporeal shockwave in bone healing: a study in rabbits. Arch Orthop Trauma Surg. 2008 Aug;128(8):879- 84. Epub 2008 Jun 17. 21.



↑ Øget eNOS  
(neovascularisering)

↑ Øget cortical knogle  
formation.

↑ Øget VEGF (Vascular  
Endothelial Growth Factor)

↑ Øget BMP-2 (bone  
morphogenetic protein –  
øget knoledannelse)

↑ Øget PCNA (Proliferating  
cell nuclear antigen) DNA  
syntese

# Stressfrakturer

Case reports

Moretti et al.

Moretti, B., Notarnicola, A., Garofalo, R., Moretti, L., Patella, S., Marlinghaus, E., & Patella, V. (2009). Shock Waves in the Treatment of Stress Fractures. *Ultrasound in Medicine & Biology*, 35(6), 1042–1049.

- Behandlinger:** 3-4
- Impuls:** 4000 i snit
- Dose:** 0.09-0.17mj/mm<sup>2</sup>
- Apparatur:** Stortz monolith
- Område:** Tibia & metatarsaler
- Resultat:** 100% heling og smertefrihed
  
- Øvrig:** Aflastning og ingen sport i 6-8 uger. Foot cast.

Taki et al.

Taki, M., Iwata, O., Shiono, M., Kimura, M., & Takagishi, K. (2007). Extracorporeal Shock Wave Therapy for Resistant Stress Fracture in Athletes. *The American Journal of Sports Medicine*, 35(7), 1188–1192.

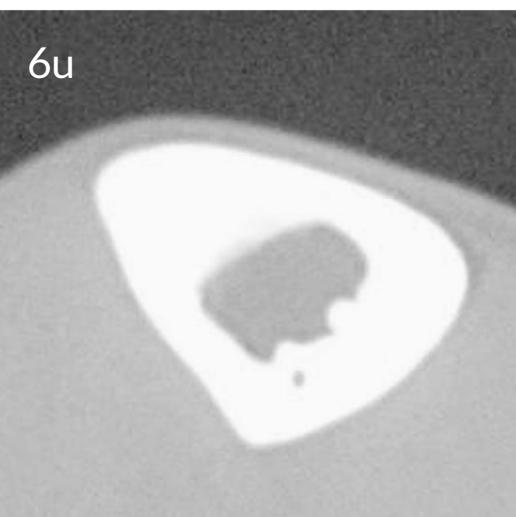
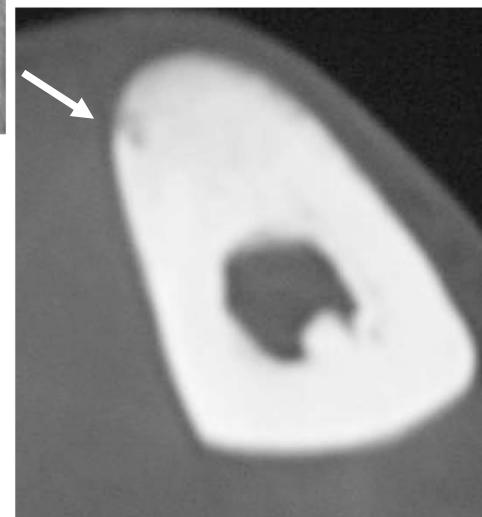
- Behandlinger:** 1
- Impuls:** 2000-4000
- Dose:** 0.29-0.4mj/mm<sup>2</sup>
- Apparatur:** Ossatron
- Område:** Tibia, metatarsal, ramus pubis, malleol
- Resultat:** 100% heling og smertefrihed
  
- Øvrig:** Aflastning i 4 uger.

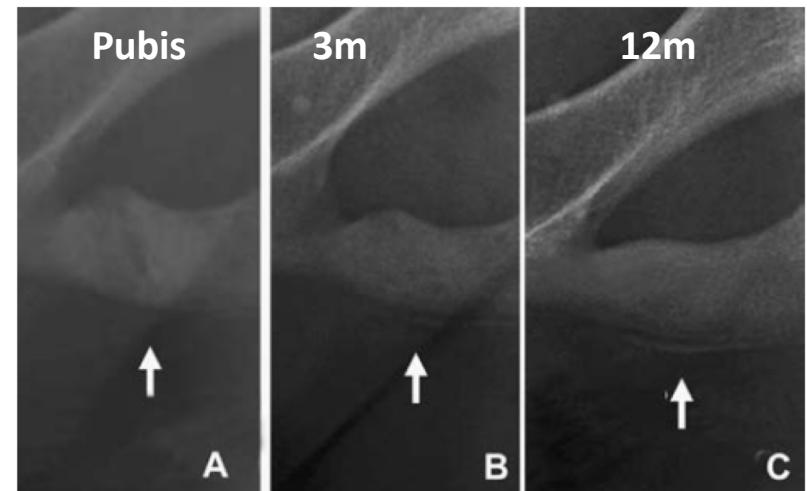
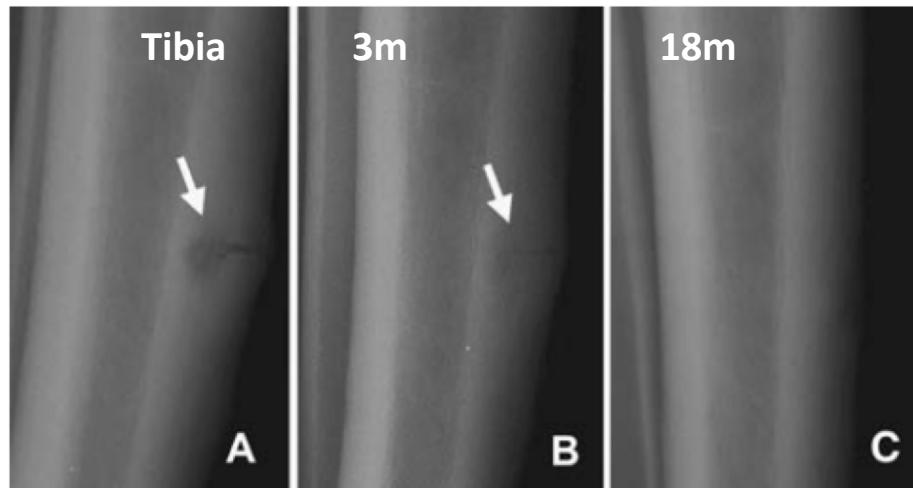
# Moretti

Metatarsal



Tibia





# Non Union Frakturer

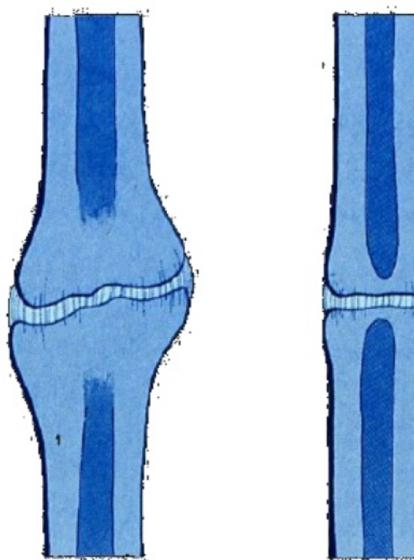
Hypertrofisk

Formation af callus men ingen kontakt imellem brudlinjer

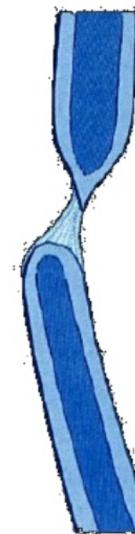
Atrofisk

Ingen callus formation og ingen kontakt mellem brudlinjer

Vascular/Vital



Avital?



# Non Union frakturer

Petrisor, B., Lisson, S., & Sprague, S. (2009). Extracorporeal shockwave therapy: A systematic review of its use in fracture management. Indian Journal of Orthopaedics, 43(2), 161

## Systematisk review

Behandlinger: 1

Impuls: 2000-12.000 (snit 4000)

Dose: 0.3-0.7mj/mm<sup>2</sup>

Apparatur: Ossatron, Osteostar,

Dornier

Resultat: Overall 72% (pooled)

Hypertrophic 78%

Atrophic 42%

Område: Femur, Tibia, humerus, metatarsaler

Followup: 1.8år (6md-4år) forventeligt efter 3-6m

Øvrig: 6md uden union. Sker under anæstesi.

Primært case serier

Ingen rapporterede bivirkninger!

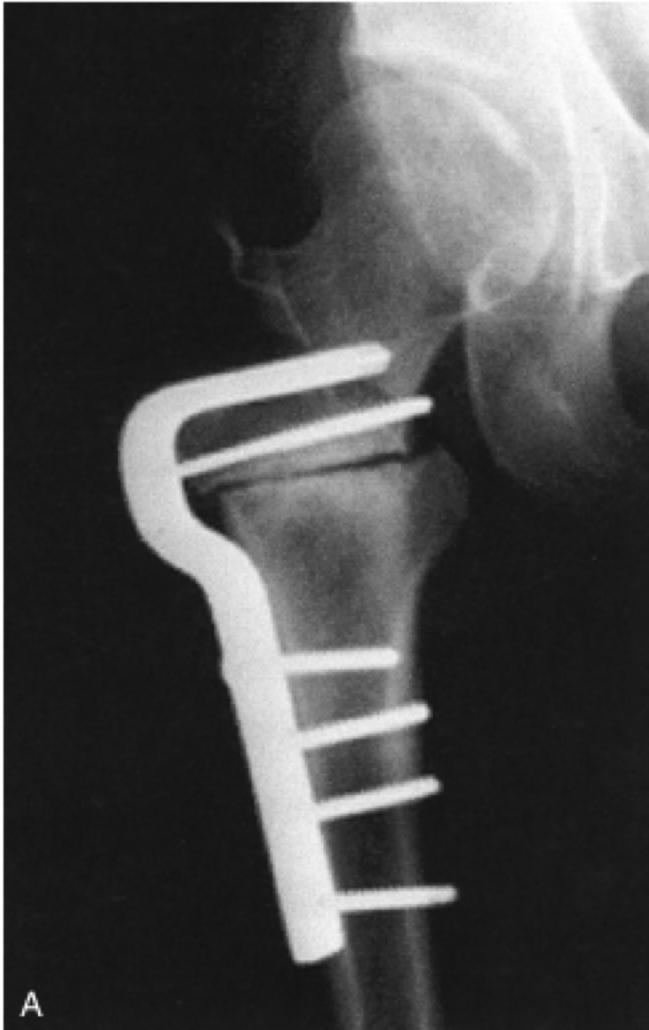
# Cases



# Cases



# Cases



A

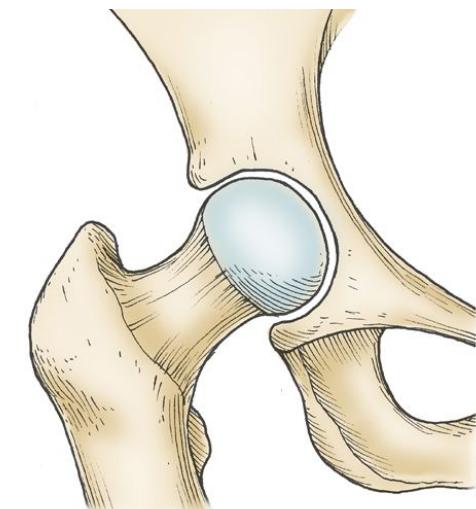


C

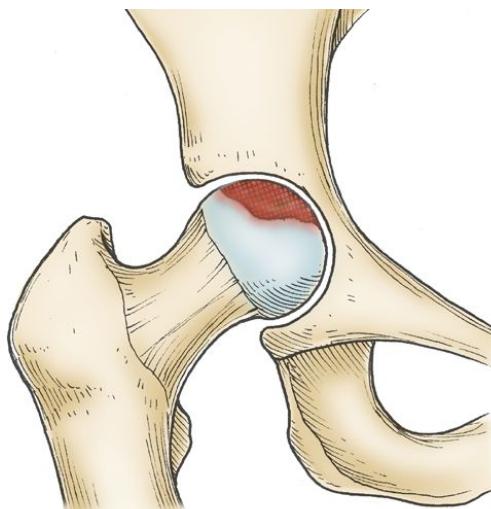
5m

# Osteonecrose af caput femoris (ONFH)

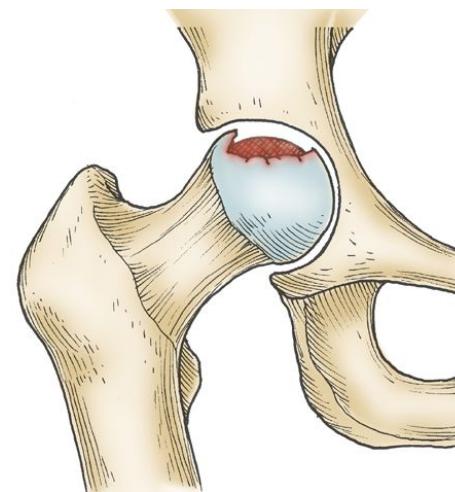
AKA Avaskulær nekrose



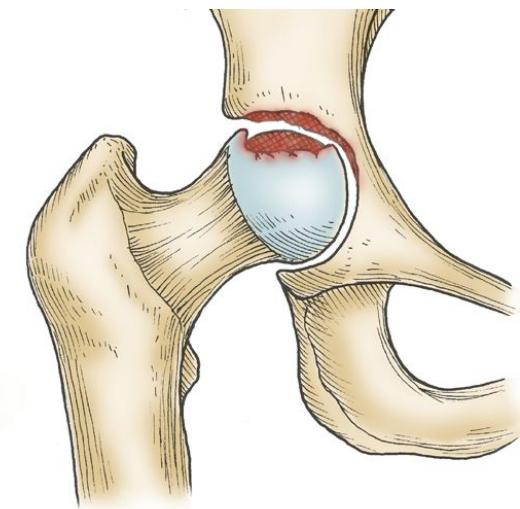
Stage I



Stage II



Stage III



Stage IV

# ONFH

Alves, E. M., Angrisani, A. T., & Santiago, M. B. (2009). The use of extracorporeal shock waves in the treatment of osteonecrosis of the femoral head: a systematic review. *Clinical Rheumatology*, 28(11), 1247–1251.

## Systematisk review

Behandlinger: 1

Impuls: 4000-6000

Dose: ca. 0.6mj/mm<sup>2</sup>

Apparatur: Ossatron

Resultat: Generel forbedring i VAS og HHS for alle studier. Ca 60-80% succes.

Område: Caput femoris

Followup: 1-3år

Øvrig: Sker under anæstesi.

Fandt mindre knoglemarvsødem på MR samt øget neovascularisering.

Primært stadie 2+3

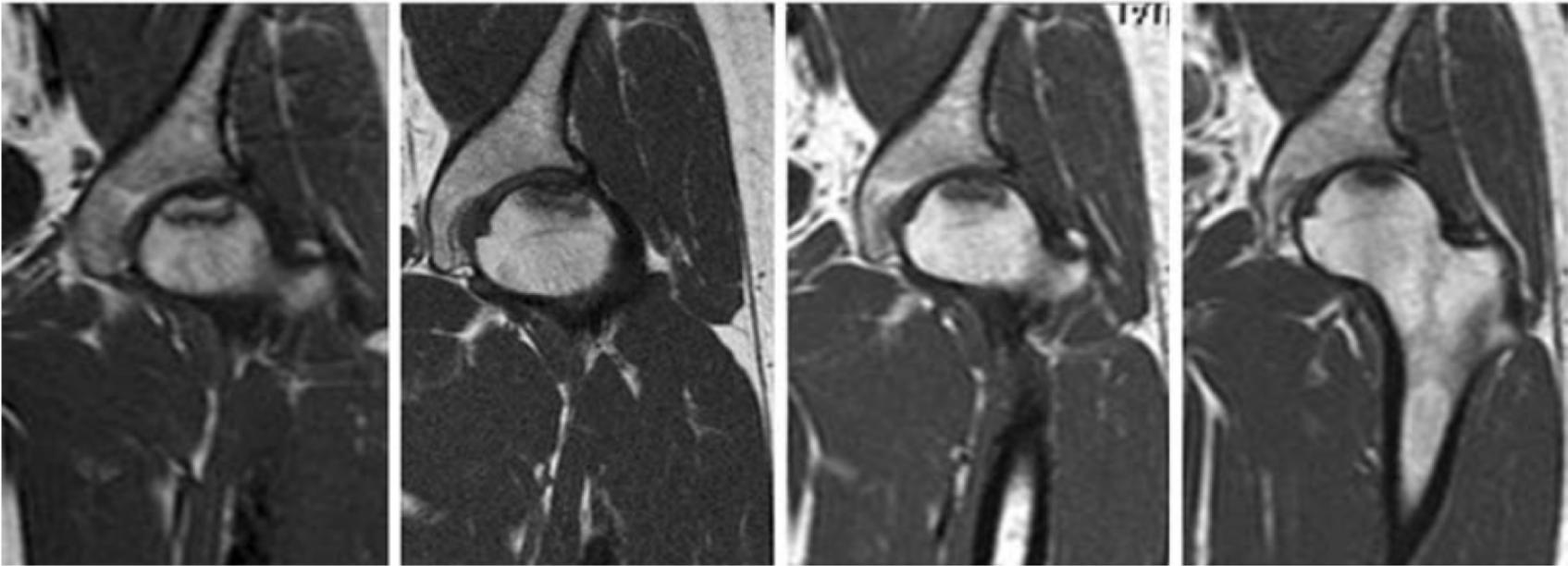
NB: Enkelt studie viser frekvens på 2Hz

pre-treatment

6 months

12 months

24 months

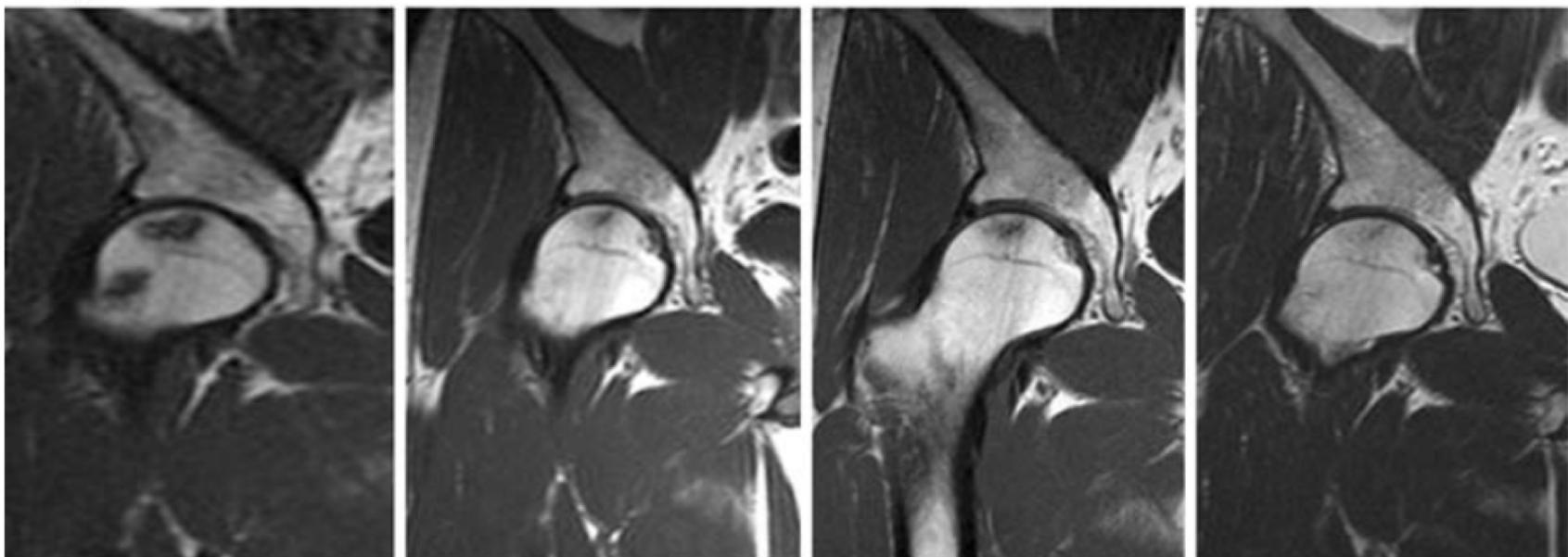


pre-treatment

6 months

12 months

24 months



# Protokol

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## Stressfraktur

Ultralydsscanning inden behandling

**Dose:** 0..1-0.2mj/mm<sup>2</sup>

**Impuls:** 4000

**Frekvens:** ?

**Antal:** 4

## Non-union

Ultralydsscanning inden behandling

Undgå metal - multidirektionel

**Dose:** 0..3mj/mm<sup>2</sup>

**Impuls:** 4000-

**Frekvens:** ?

**Antal:** 2-4

## ONFC

Ekspertise felt

Ultralydsscanning inden behandling

**Dose:** op til 0.6mj/mm<sup>2</sup>

**Impuls:** 4000-6000

**Frekvens:** ?

**Antal:** 1

Forsøg at juster frekvens for højere dosis. Lavere dosis flere behandlinger.

# Referencer

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Moretti, B., Notarnicola, A., Garofalo, R., Moretti, L., Patella, S., Marlinghaus, E., & Patella, V. (2009). Shock Waves in the Treatment of Stress Fractures. *Ultrasound in Medicine and Biology*, 35(6), 1042–1049.

Petrisor, B., Lisson, S., & Sprague, S. (2009). Extracorporeal shockwave therapy: A systematic review of its use in fracture management. *Indian Journal of Orthopaedics*, 43(2), 161.

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# Tak for opmærksomheden

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