

Lessons learned at the Italian Congress
for the Study of Focused Shock Waves
(FST)

Saturday 1st July 2023

«Focal shock waves in
musculoskeletal pathology:
non-union and pseudarthrosis.»

Prof. U. Tarantino – MD, PHD

Doctor A. Di Giorno

Doctor S. M. Tecce – MD

Resident Orthopedics and Traumatology

Policlinico Universitario Roma Tor-Vergata

Director Prof. U. Tarantino



Indication

CONSOLIDATION
DELAYS

PSEUDOARTHROSIS

STRESS FRACTURES

ASEPTIC NECROSIS/
OSTEOCHONDRITIS
DISSECANS



B. INDICAZIONI

1. Indicazioni approvate come "standard"

1.1 Tendinopatie croniche

- 1.1.1. Tendinopatia calcifica di spalla
- 1.1.2. Epicondilopatia laterale del gomito (epicondilitite, o gomito del tennista)
- 1.1.3. Sindrome del grande trocantere
- 1.1.4. Tendinopatia rotulea
- 1.1.5. Tendinopatia Achillea
- 1.1.6. Fascite plantare (con o senza sperone calcaneare)

1.2. Patologie dell'osso

- 1.2.1. Ritardi di consolidazione
- 1.2.2. Pseudoartrosi
- 1.2.3. Fratture da stress
- 1.2.4. Necrosi asettica senza degenerazione articolare
- 1.2.5. Osteocondrite dissecante (OCD) senza degenerazione articolare

1.3. Patologie cutanee

- 1.3.1. Ferite "difficili"
- 1.3.2. Ulcere diabetiche
- 1.3.3. Ulcere distrofiche
- 1.3.4. Ustioni non circonferenziali

Bone pathologies are among the standard indications for shock wave therapy.

What is our experience?



Review > Foot (Edinb). 2022 May;51:101889. doi: 10.1016/j.foot.2021.101889. Epub 2021 Dec 10.

Extracorporeal shock wave treatment of ankle fracture non-unions - A review
Iris H Y Kwok ¹, Edmund Ieong ², Mosaab A Aljalalham ³

High-energy extracorporeal shockwave therapy in humeral delayed and non-unions
Falko Dahm ^{1 2}, Xaver Feichtinger ^{3 4}, Sascha-Mario Vallant ³, Nicolas Wolfgang Schaden ^{3 4 6}, Christian Fialka ^{3 7}, Rainer Mittermayr ^{3 4 6}

Clinical experience of extracorporeal shockwave treatment on diaphyseal forearm non-union on healing and bone density
A Notarnicola ^{1 2}, M Baglioni ¹, I Covelli ^{1 2}, F P Bianchi ³, L Moretti ¹, G B Moretti ^{1 2}

Extracorporeal shockwave therapy (ESWT) ameliorates healing of tibial fracture non-union unresponsive to conventional therapy
Nicolas Haffner ¹, Vlado Antonic ², Daniel Smolien ³, Paul Slezak ³, Wolfgang Schaden ⁴, Rainer Mittermayr ⁵, Alexander Stojadinovic ⁶

Our case history

Data collected at the CKF Di Giorno centers between 2021 and 2023

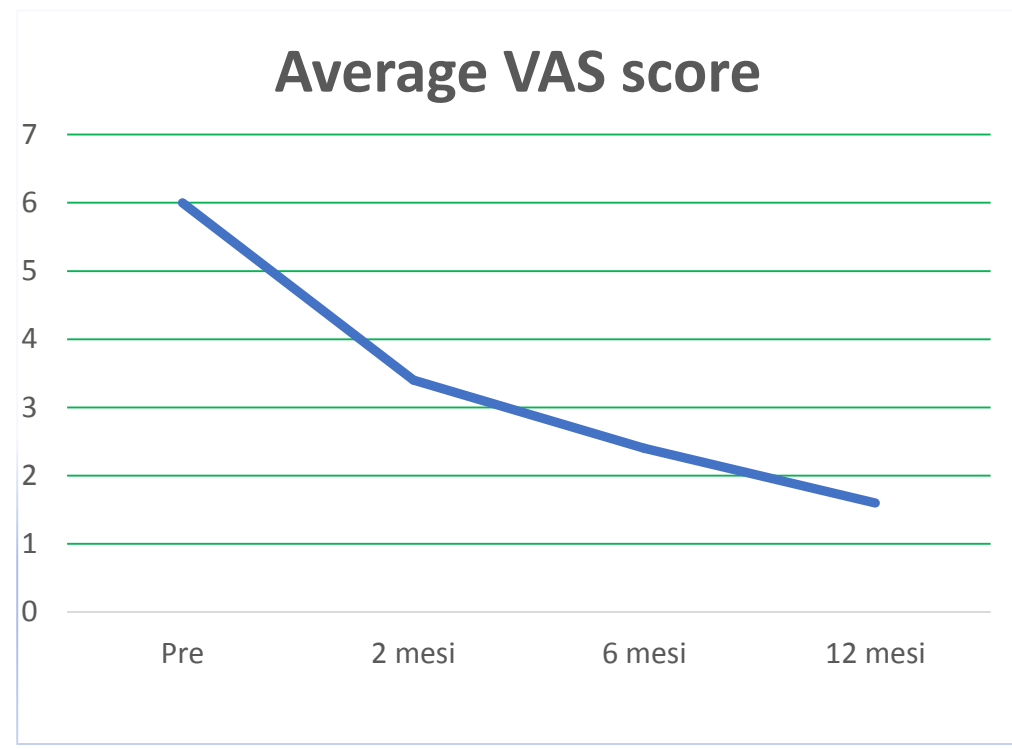
<i>M/F</i>	<i>Average age</i>	<i>smokers/ non smokers</i>	<i>Open fracture</i>	<i>Infection</i>
2/1	39,7	2/5	1/15	1/5

<i>Average number of sessions</i>	<i>VAS 1st session</i>	<i>VAS after 2 months</i>	<i>VAS after 6 months</i>	<i>VAS after 12 months</i>
8	6	3,4	2,5	1,6

93.3% of patients had an improvement in pain symptoms.

Our case history

Data collected at the CKF Di Giorno centers between 2021 and 2023



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Our case history

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Non-union scoring system (Calori et al. Injury 2008):

- Non-union personality: Bone, soft tissue, patient (infection, smoking).
- 15 parameters: score from 0-100

The bone		Score	Max. score
Bone quality	Good	0	3
	Moderate	1	
	Poor	2	
	Very poor	3	
Primary injury – open or closed fracture	Closed	0	5
	Open grade I	1	
	Open grade II – IIIA	3	
	Open grade IIIB and IIIC	5	
Number of previous interventions on the bone to procure healing	None	1	4
	<2	2	
	2-4	3	
	>4	4	
Invasiveness of previous interventions	Minimally invasive – closed surgery	0	3
	Internal intra-medullary nailing	1	
	Internal extra-medullary	2	
	Any osteosynthesis which include bone grafting	3	
Adequacy of primary surgery	Inadequate stability	0	1
	Adequate stability	1	
Weber & Cech group	Hypertrophic	1	5
	Oligotrophic	3	
	Atrophic	5	
Bone alignment	Non-anatomical alignment	0	1
	Anatomical alignment	1	
Bone defect – gap	0.5-1 cm	2	5
	1-3 cm	3	
	>3 cm	5	

Non-union scoring system: Calori et al. Injury 2008

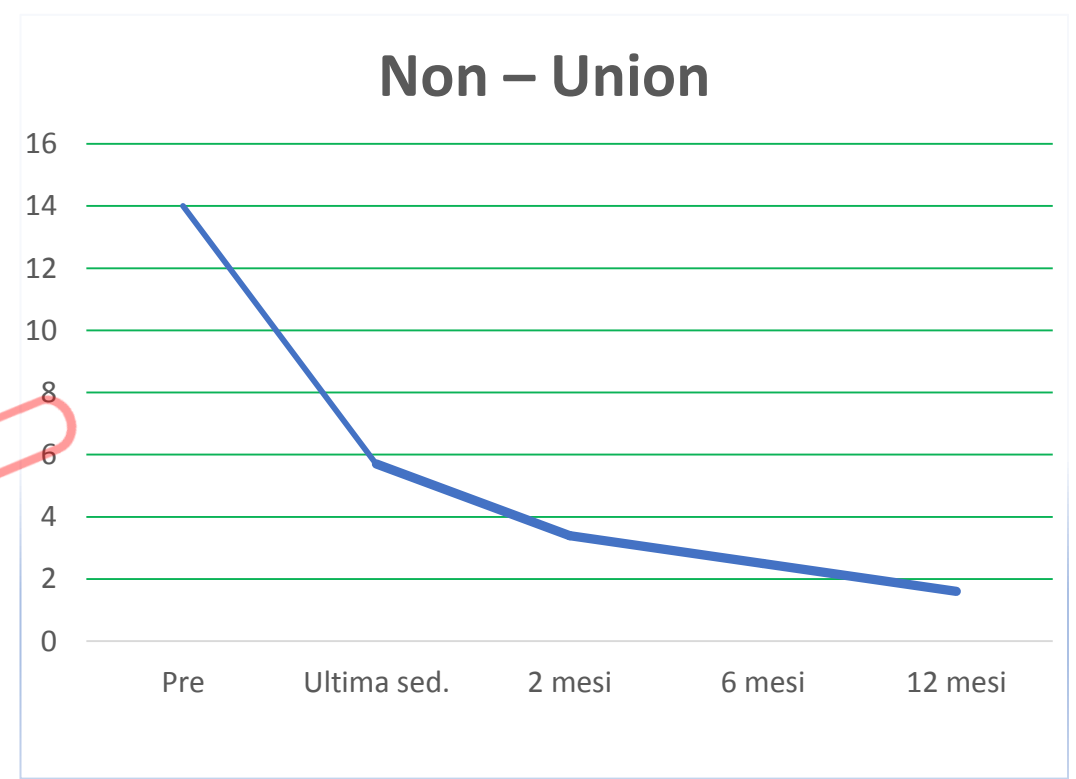
Soft tissues		Score	Max. score
Soft tissue status	Intact	0	6
	Minor scarring	2	
	Previous treatment of soft tissue defect	3	
	Previous free flap	4	
	Poor vascularity	5	
	Presence of skin lesion / defect	6	
The patient		Score	Max. score
ASA grade	1 or 2	0	1
	3 or 4	1	
Diabetes	No	0	2
	Yes – well controlled	1	
	Yes – poorly controlled	2	
Blood tests: FBC, ESR, CRP	FBC: WCC > 12	1	3
	ESR > 20	1	
	CRP > 20	1	
Clinical infection status	Clean	0	4
	Previously infected or suspicion of infection	1	
	Septic	4	
Drugs	Steroids	1	2
	NSAIDs	1	
Smoking	No	0	5
	Yes	5	

Non – Union Scoring System.

Our case history

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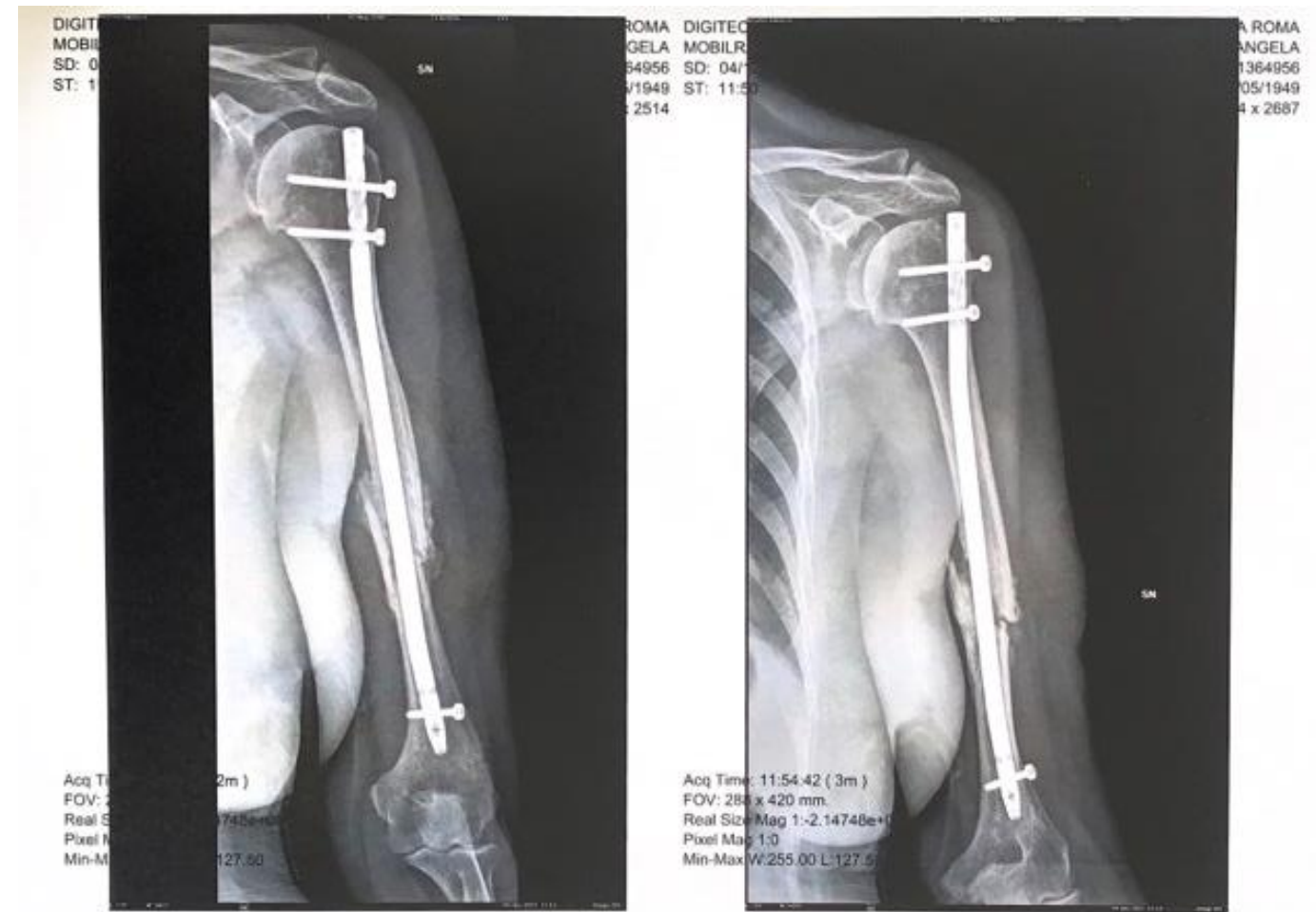
Average Non Union Pre	Average Non Union last session	Average Non Union after 2 months	Average Non Union after 6 months	Average Non Union after 12 months
14	5,7	3,4	2,5	1,6



Clinical case n° 1

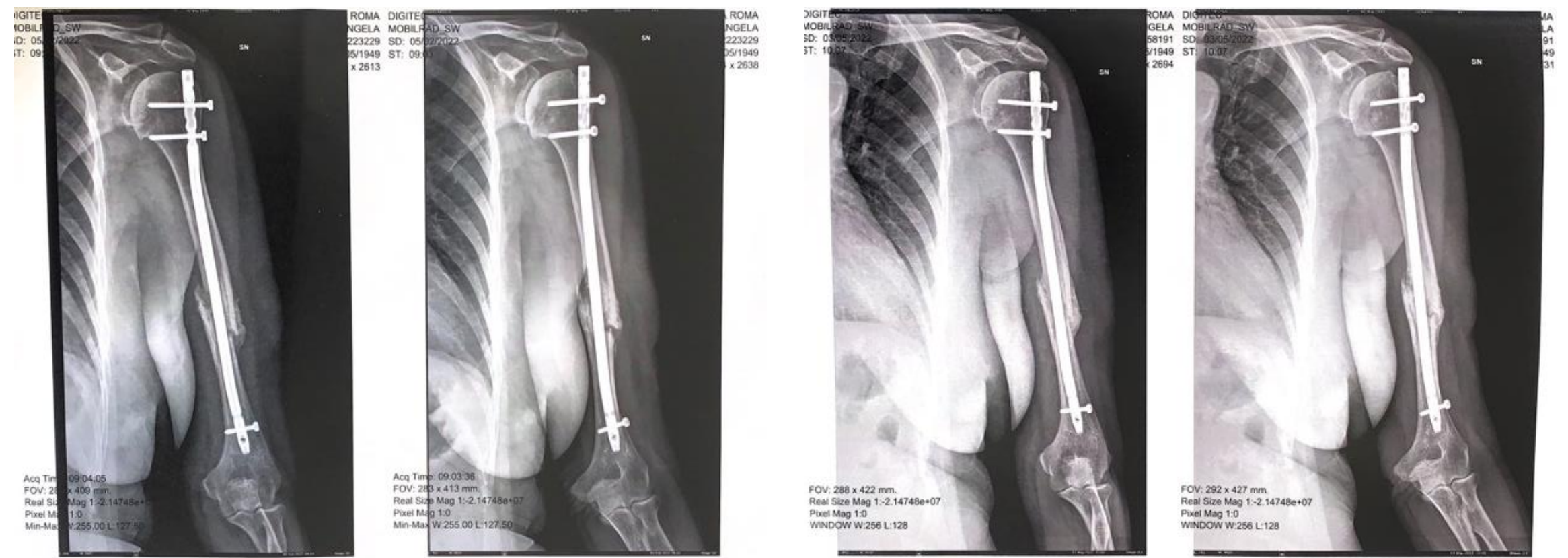
Sex: female
 Age: 73 anni
 Height: 1,65
 Weight: 65
 BMI: 23,88 kg/m²

- Well balanced diet
- Non smoker
- Sedentary life (retired)
- Fracture of the humeral shaft
- (fall on the beach)



Right humeral shaft fracture treated with intramedullary nail (2021).

Clinical case n° 1



Cycle of X shock wave sessions at the CKF center in Rome.

Clinical case n° 1

Clinical trend of pain symptoms (VAS scale)

VAS 1st session	VAS 5th session	VAS 10th session	VAS after 2 months	VAS after 6 months
8	4	7	3	1

Cycle of X shock wave sessions at the CKF center in Rome.

Clinical case n° 1



Radiographic control four months after the end of the cycle with Shock Waves.

Clinical case n° 2

Sex: female
Age: 33 anni
Heigh: 1,65
Weight: 65
BMI: 23,88 kg/m2

- Well balanced diet
- Occasional alcohol intake
- Smoker patient
- Right tibia diaphysis pseudoarthrosis



Clinical case n° 2



Cycle of XII Shock Wave Sessions at the CKF center in Rome.

Clinical case n° 2



Radiographic control at the end of the cycle with shock waves.

*Thank you
for your attention!*

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