Growing together!
K1MED

Professional & Essential friend in physiotherapy

SinesonPiezo

What is E.S.W.T (Extracorporeal Shock Wave Therapy)

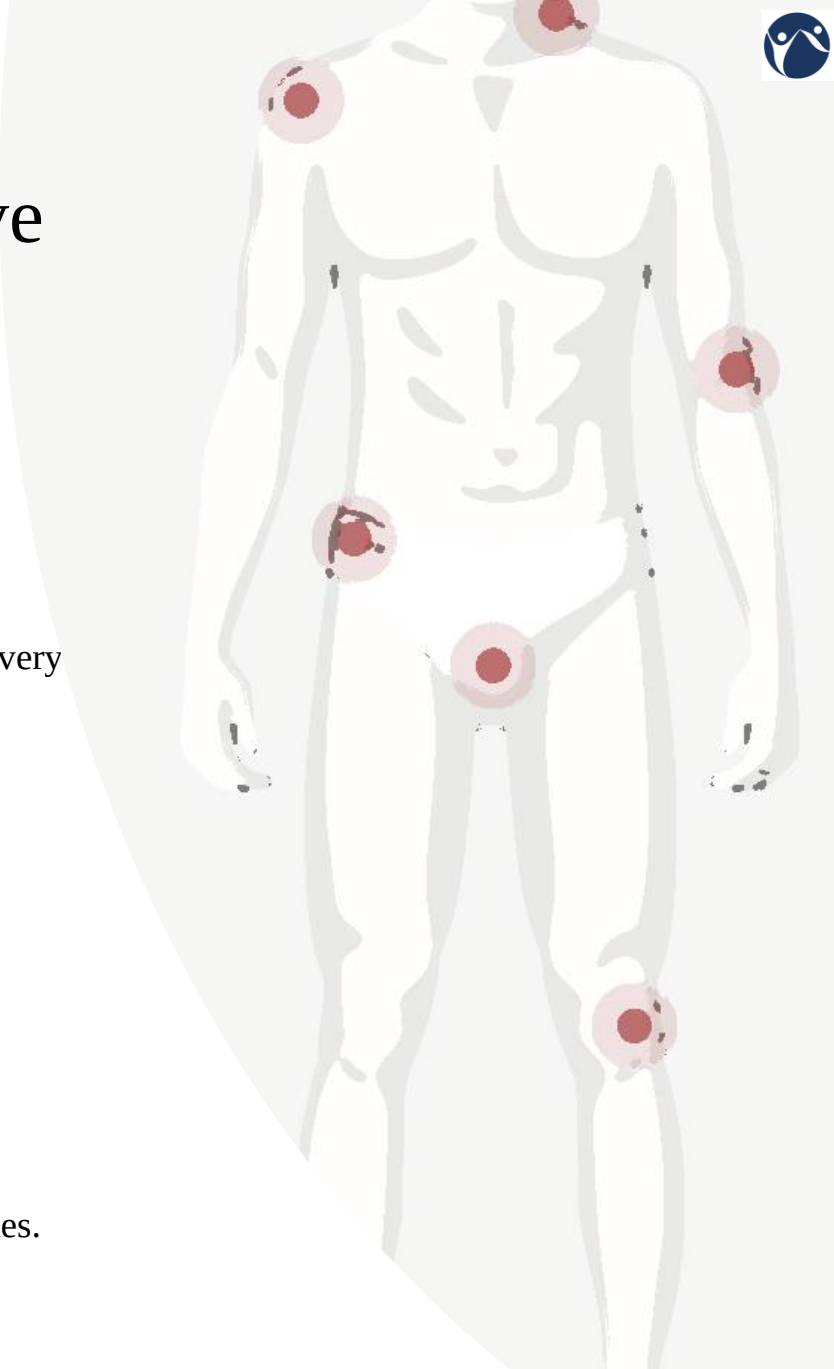
E.S.W.T treats a variety of conditions using shock waves outside the body.
The treatment is non-surgical and non-invasive.
This quick, effective procedure harnesses intense but very short energy waves to heal many chronic painful orthopedic conditions.

· Extracorporeal = Outside body

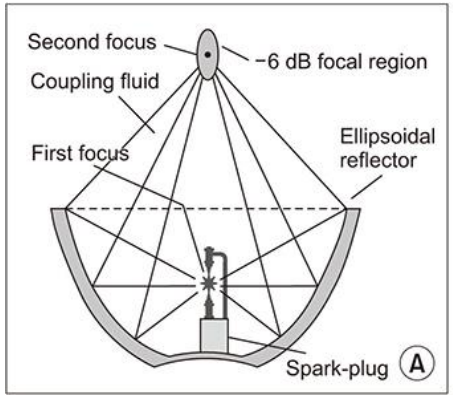
· Shockwave – intense, short energy wave travelling faster than speed of sound

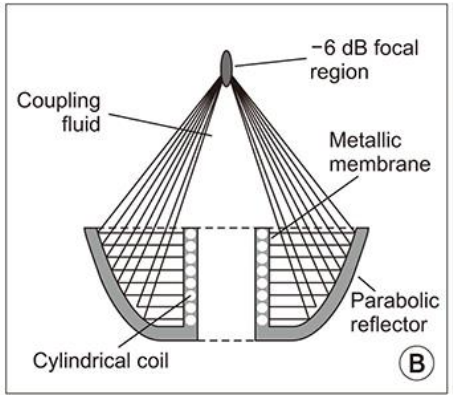
· Based on the principles of lithotripsy

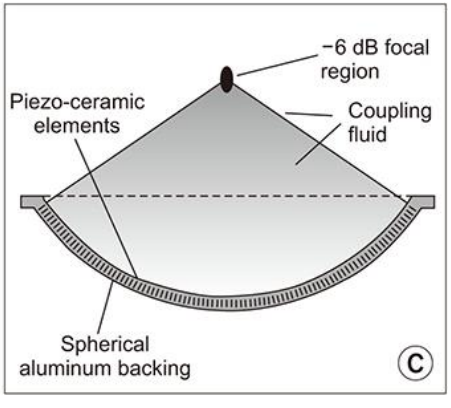
- Use acoustic sound waves to break up kidney stones.



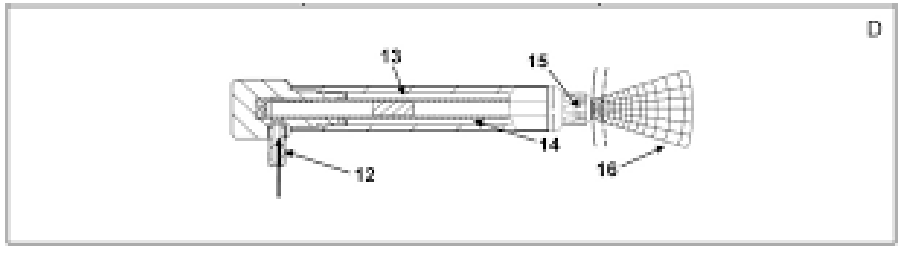
Types of E.S.W.T
(Extracorporeal Shock Wave Therapy)







· Electrohydraulic · Electromagnetic · **Piezoelectric**



· Electro-pneumatic

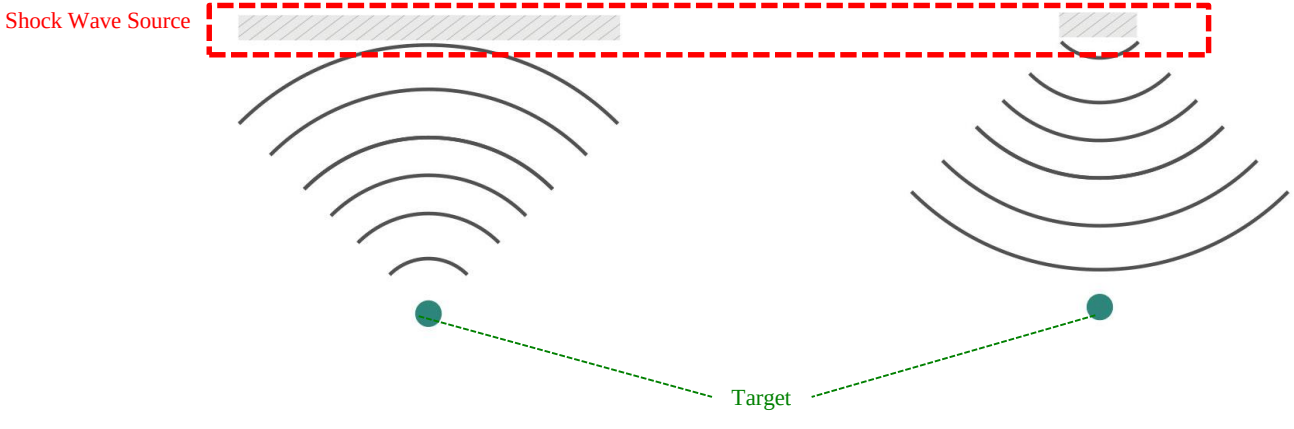
Types of E.S.W.T(Extracorporeal Shock Wave Therapy)

Focused Type

- Electrohydraulic
- Electromagnetic
- **Piezoelectric**

Radial Type

- Electro-pneumatic



Focused type
(Shock Wave)

Radial type
(Pressure Wave)

Types of E.S.W.T(Extracorporeal Shock Wave Therapy)

Focused Type

· Electrohydraulic

· Electromagnetic

· Piezoelectric

· Achilles tendonitis

· Lateral epicondylitis

· Shoulder tendonitis

· Patellar tendonitis

· Plantar fasciitis

Radial Type

· Electro-pneumatic

· Relaxing muscle

· Soft tissue

· Trigger point pain

Advantages of E.S.W.T(Extracorporeal Shock Wave Therapy)

Focused Type

· Entire Shock wave is focused

· **Energy delivery is precisely controlled.**

· **Deeper energy depth than radial type**

· Long lifespan (1~5 million pulses)

on hand piece but expensive handle cost.

*** SIENSON PIEZO'S lifespan**

(5 million pulses)

Radial Type

· Less painful

· Covers a larger area than focused type.

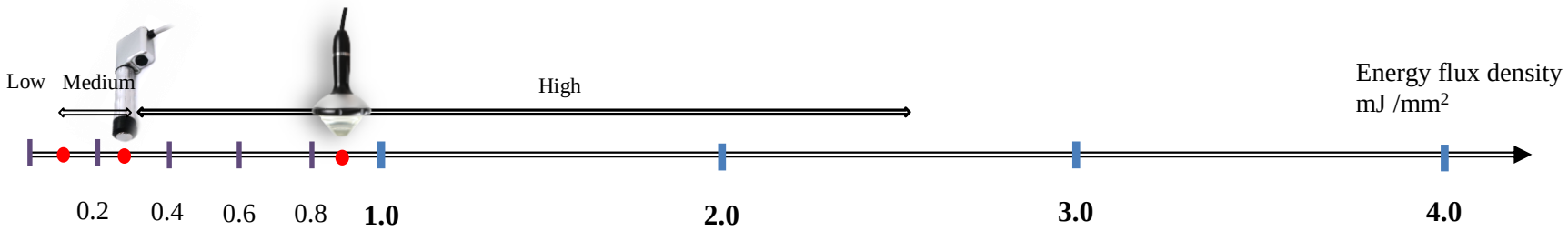
(Especially beneficial for muscle and large tissue areas)

· Less expensive than focused type.

· Easy maintenance with less expense than

focused type (0.5 ~ 1million pulses)

Energy Flux Density



Cell regeneration

Pain Therapy

Non-unions

Lithotripsy

Energy Flux Density :
Maximum amount of acoustical energy , which is transmitted through an area of 1 square mm per pulse (mJ/mm^2)

Low <0.08 mJ/mm^2
Medium <0.28 mJ/mm^2
High <0.6 mJ/mm^2

*Radial type 0.22~0.28 mJ/mm^2

***SINESON PIEZO 0.853** mJ/mm^2

Source : Rompe et al

Energy Flux Density

Radial E.S.W.T Working Pressure (Bar)	Energy Flux Density (mJ/mm^2)
1.5	0.03
2.0	0.06
2.5	0.11
3.0	0.13
3.5	0.16
4.0	0.18
4.5	0.20
5.0	0.22

SIENSON PIEZO LEVEL	Energy Flux Density (mJ/mm^2)	
0.1 ~ 1	0.032 ~ 0.092	· Relaxing muscle
2	0.113	
3	0.138	· Soft tissue
4	0.153	
5	0.182	· Trigger point pain
6	**0.220**	
7	0.238	
8	0.270	· Achilles tendonitis
9	0.320	
10	0.351	· Lateral epicondylitis
11	0.388	
12	0.456	· Shoulder tendonitis
13	0.478	
14	0.516	· Patellar tendonitis
15	0.581	
16	0.601	· Plantar fasciitis
17	0.646	
18	0.648	
19	0.770	
20	0.822	
21	0.828	
22	0.832	
23	0.839	
24	0.844	
25	0.853	

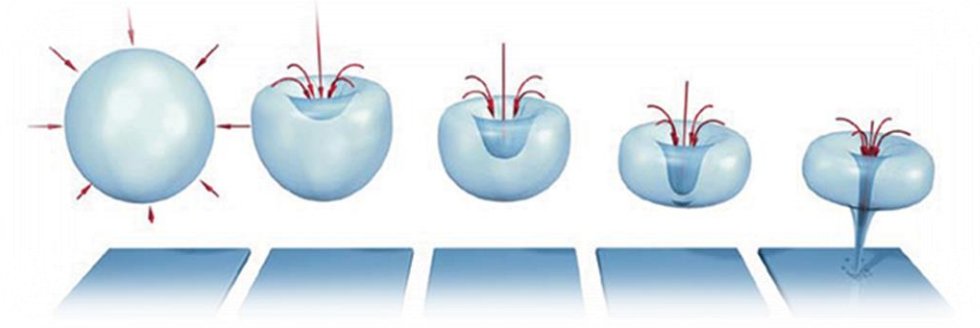
Source : ISMST (international Society for Medical Shockwave Treatment)

Basic therapeutic effect of E.S.W.T

Cavitation :

Generation and movement of bubbles in a fluid or tissue, which may cause tissue damage.

A shock wave hits a cavitation bubble and the bubble collapses, there is an inflow of water (Jet stream : velocity 400~700 m/s).



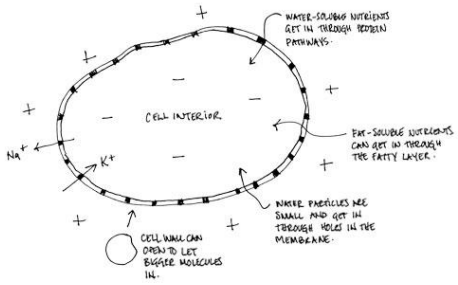
- The collapse of the bubbles produce local effects that result in hemorrhages (bleeding) in tissue.
- At a cellular level, free radicals produced by cavitation may affect the cellular antioxidative defense status or damage the issue, particularly cell membranes

Basic therapeutic effect of E.S.W.T

Mechanical effect :

Ionize the molecules by extracellular cavitation

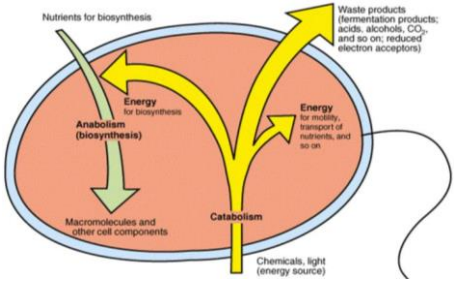
→ increase of membrane permeability.



Physical-chemical:

Interaction of diffusible radicals with biomolecules

→ affect lysosomes and mitochondria & interfere with metabolism in the cell.

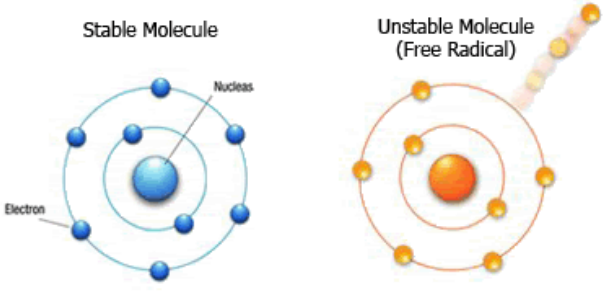


Chemical:

Intracellular reactions and molecular changes ,

Local high temperature during cavitation

→lead to the development of radicals.



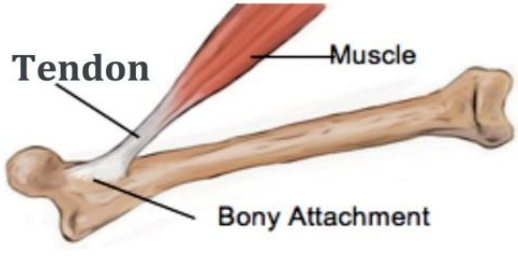
How does E.S.W.T work?

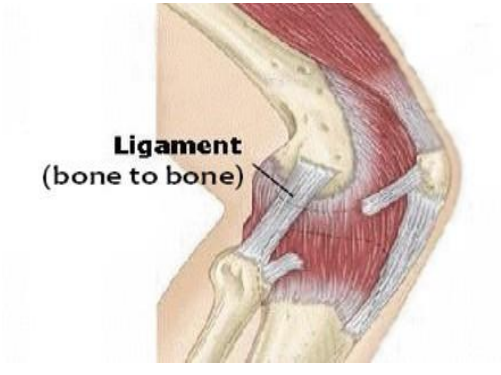
· Mechanical pressure increases cell membrane permeability.

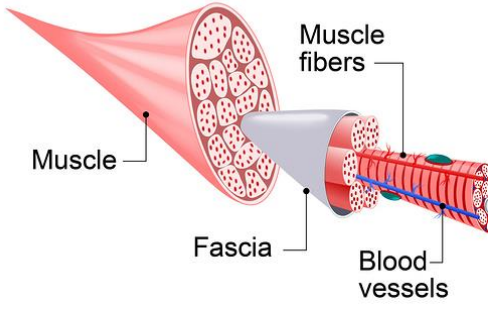
· Acoustic waves cause small capillaries in tissue to rupture, which increases growth factors to the area.

· Neovascularization or new blood supply
More blood = more oxygen = better healing

· Stimulates fibroblasts for connective tissue healing
Tendon, Ligament, Fascia

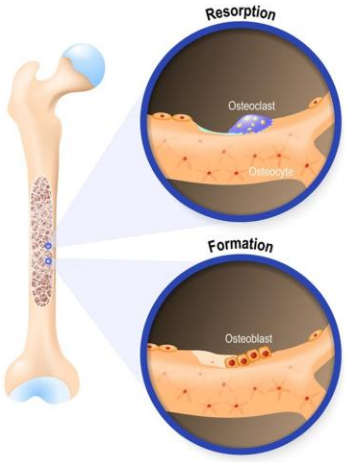




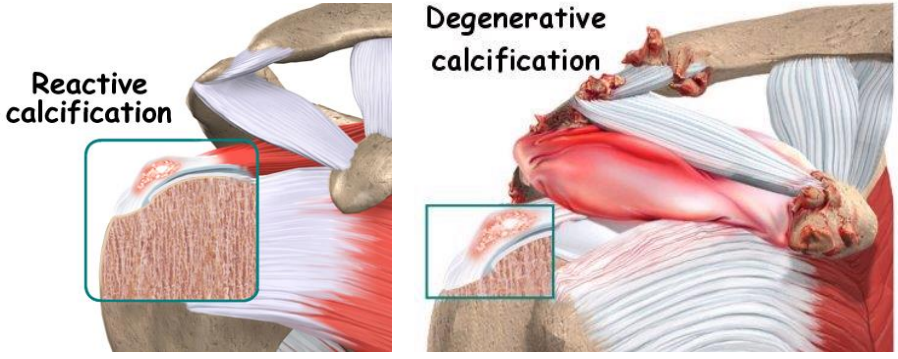


How does E.S.W.T work?

· Stimulates osteoblasts for healing and new bone production

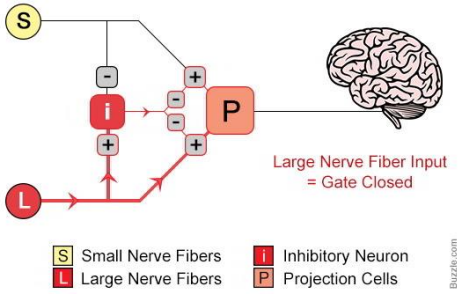


· Destroys calcifications



· Decreases pain (Hypotheses)

- Destroy nerve ending
- Reduces effects of substance P neurotransmitter
- Gate-control Theory



Application with E.S.W.T

· Plantar Fasciitis

· Achilles Tendinopathy

· Epicondylitis

· Calcific Tendinopathy of the shoulder

· Patellar Tendinopathy

· Non-Union Fractures

· Trigger Points

· Frozen Shoulder

Is E.S.W.T Safe?

Mile side effects but it usually come and go within 3 to 5 days.

· Redness

· Swelling

· Petechiae (res sp

Contraindication

· Bleeding conditions

· Pacemakers

· Medications that prolong blood clotting

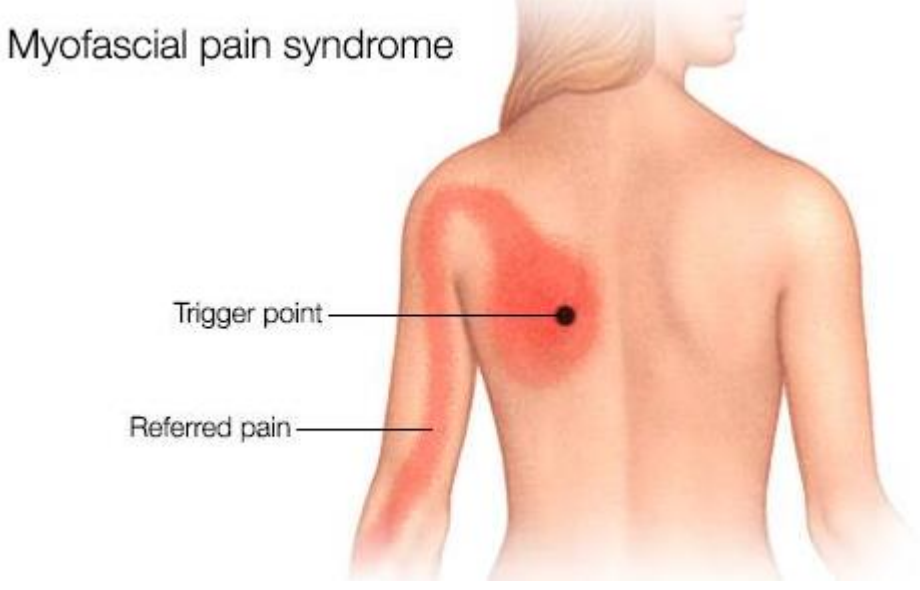
· Open growth plates (Children)

· Pregnancy

· Acute injuries

What is Myofascial pain syndrome (Trigger points)

Myofascial pain syndrome is a chronic pain disorder. In this condition, pressure on sensitive points in your muscles (trigger points) causes pain in the muscle and sometimes in seemingly unrelated parts of your body. This is called referred pain.



This syndrome typically occurs after a muscle has been contracted repetitively. This can be caused by repetitive motions used in jobs or hobbies or by stress-related muscle tension.

While nearly everyone has experienced muscle tension pain, the discomfort associated with myofascial pain syndrome persists or worsens.

What is Plantar fasciitis (Heel spurs)

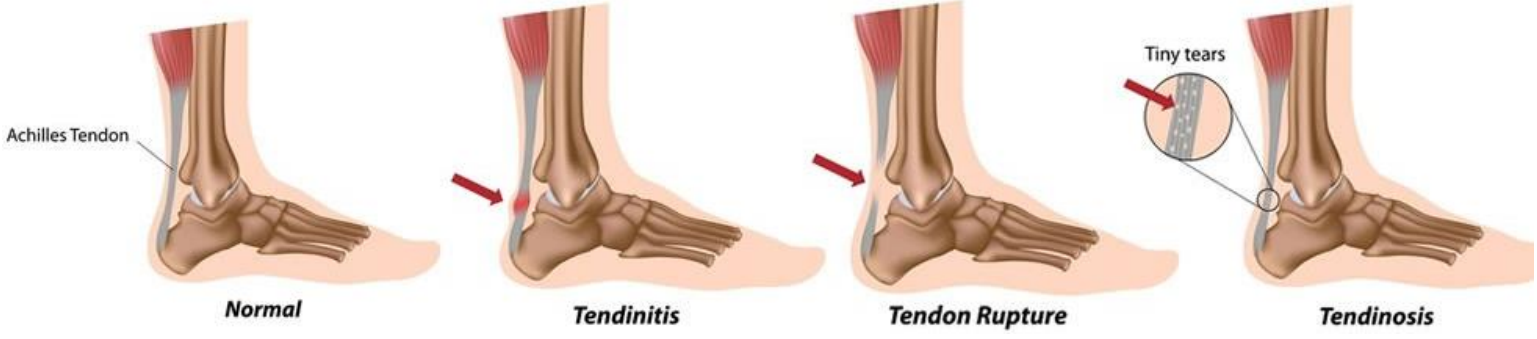
Inflammation of the connective tissue on the booth of the foot.

It is more likely to occur if you are overweight, if you walk a lot or stand on hard surface, if you walk or run for exercise or if you have very flat feet or very high arches.

The condition starts gradually with mild pain. Without treatment, it can become more severe, with acute pain in the first steps after walking and after exercise

What is Achilles tendonitis

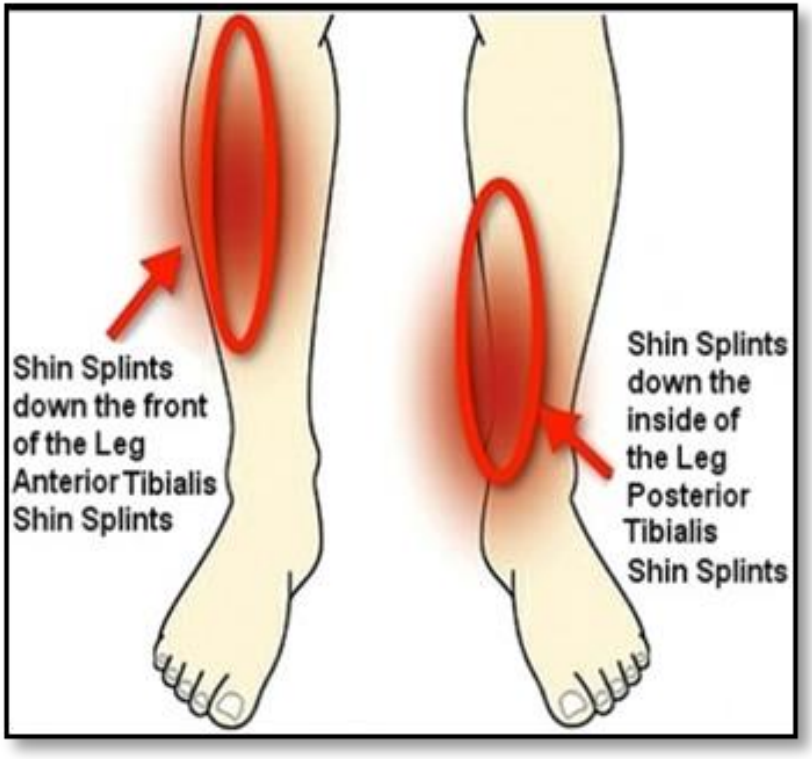
Inflammation of the tendon that connects the heel bone to the calf muscle. The Achilles tendon is the largest and strongest in the human body, and also the one most frequently ruptured. Achilles tendonitis can be brought on by runners who rapidly increase their speed and exercisers who add hill running or stair climbing to their routine.



The pain starts off mildly and gradually worsens. Sufferers can feel tenderness in the lower leg in the morning, stiffness and swelling.

What is Tibial stress syndrome

Anterior tibial stress is often experienced by new runners or walkers when pain occurs in the anterior muscles of the shin during exercise.

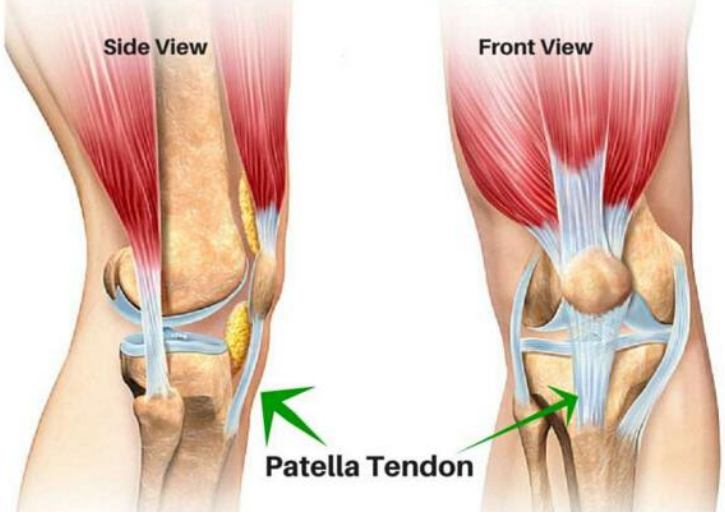


Posterior shin splints (medial tibial pain) is a more chronic condition occurring along the inside edge of the tibia. It generally occurs with overuse during sports.

Both conditions are related to excess stretching (traction) of soft tissue structures along the shin bones (tibia and fibula). Excessive subtalar joint pronation and internal tibial rotation increase the medial tractional forces upon the deep flexors and extensors of the leg. This is a common factor in muscular overuse conditions and commonly exhibits secondary periosteal swelling due to tractional forces placed upon the soft tissue structures on the tibia and fibula.

What is Patellar tendonitis (Jumper’s knee)

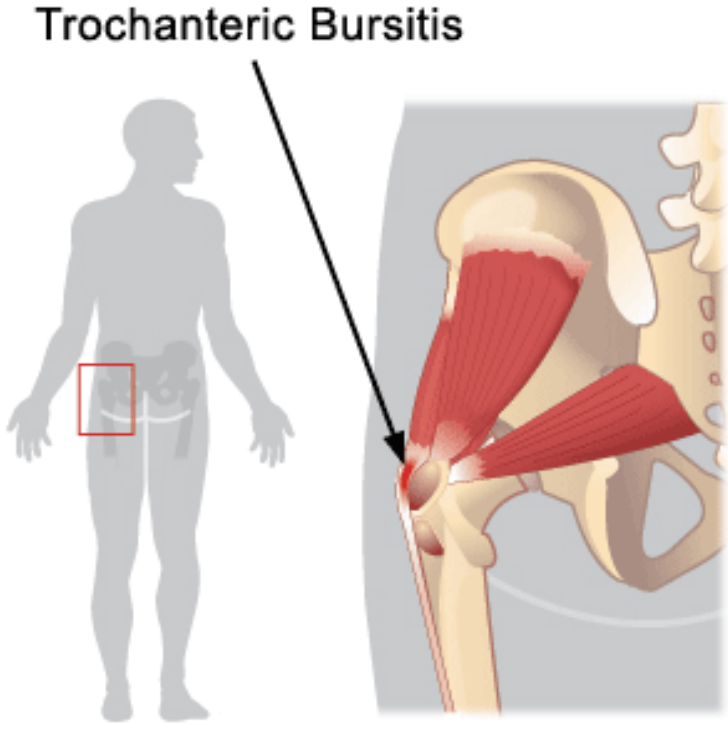
Inflammation of the tendon that connects the quadriceps muscles to the skin bone. It is more common among athletes who jump, including basketball and volleyball players.



The pain, just below the kneecap, is often sudden, occurring just after working out, landing from a jump or going up or down stairs

What is Trochanteric tendinitis

Trochanteric bursitis is hip pain caused by inflammation of the fluid-filled sac, or bursa, on the outer edge of your hip.



Bursae provide a cushion between bones and soft tissues. They prevent bones from rubbing against tendons and muscles. Bursitis can affect any of the bursae in your body.

Trochanteric bursitis affects the outer point of the thighbone, the femur, at the edge of the hip. This bony point is called the greater trochanter. Another bursa called the iliopsoas bursa is on the inside of the hip. Inflammation of the iliopsoas bursa causes pain in the groin.

Bursitis is the leading cause of hip pain.

Repetitive activities like climbing stairs or surgery to the hip can cause the bursa to become inflamed.

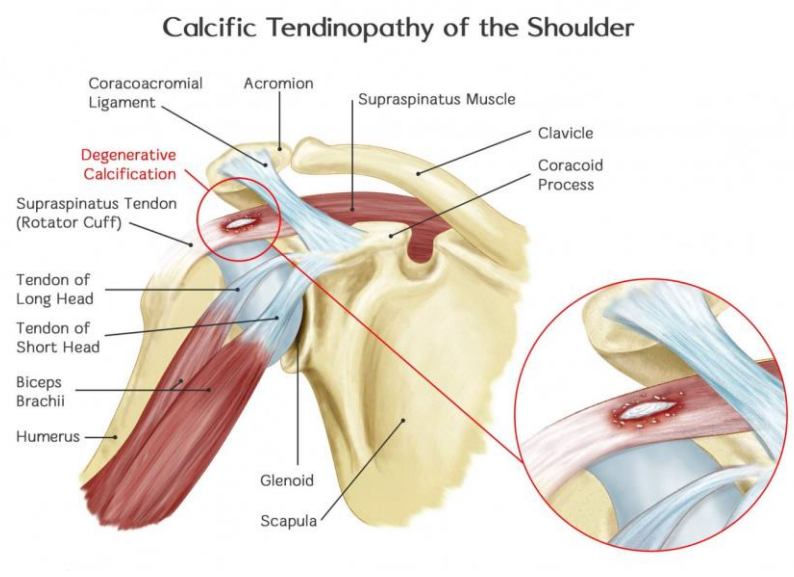
What is epicondylitis (Tennis elbow)

Degeneration of the tendon that attaches the outer side of the elbow to the muscles that extend or lift the wrist and hand. It is ours with repetitive use of forearm muscles, so it strikes works as well as athletes.

The pain can progress to a severe, burning feeling on the outside of the elbow and is exacerbated by gripping or lifting even very light objects. The pain can radiate to the forearm.

What is Calcific tendonitis (Rotator cuff)

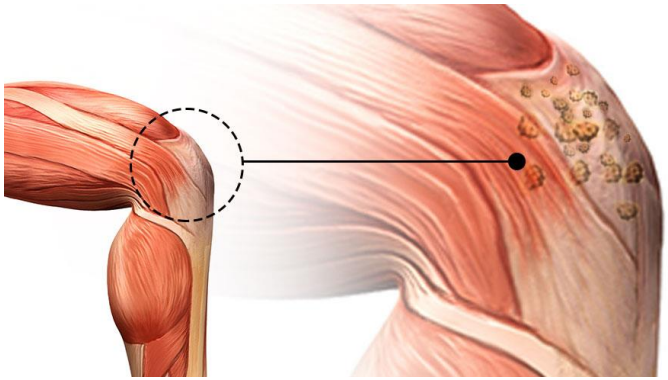
Calcific tendonitis (or tendinitis) occurs when calcium deposits build up in your muscles or tendons. Although this can happen anywhere in the body, it usually occurs in the rotator cuff.

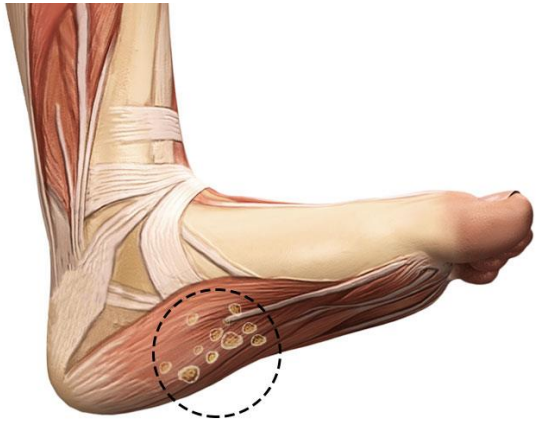


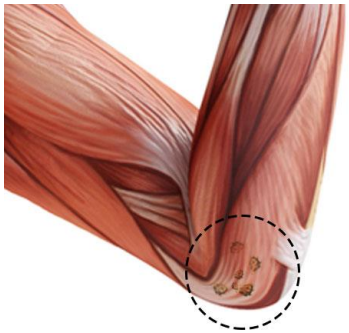
The rotator cuff is a group of muscles and tendons that connects your upper arm to your shoulder. Calcium buildup in this area can restrict the range of motion in your arm, as well as cause pain and discomfort.

Calcific tendonitis is one of the most common causes of shoulder pain. You're more likely to be affected if you perform a lot of overhead motions, such as heavy lifting, or play sports like basketball or tennis.

TREATMENT PROTOCOL

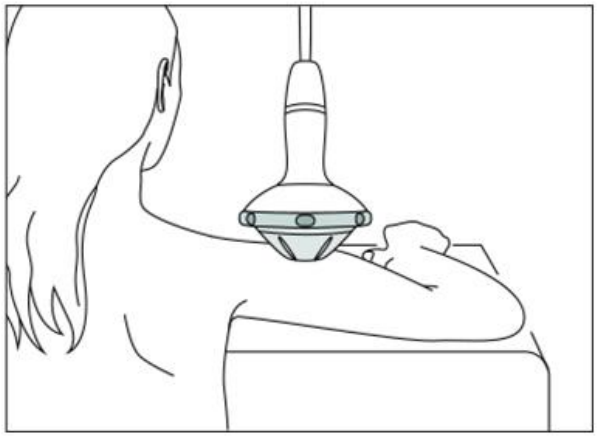






TREATMENT PROTOCOL (Myofascial pain syndrome)

Myofascial pain syndrome (Trigger points)

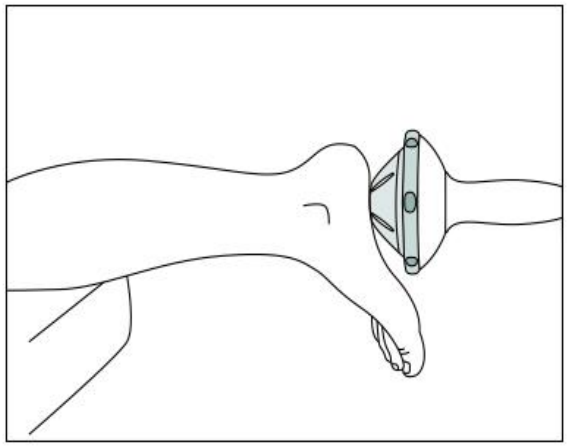


- To determine the penetration depth, palpation is necessary.
- Because there can be other factors, careful diagnosis are required to treat myofascial pain.

ITEM	Description
Pad for depth control	Based on previous diagnosis
Level	0.1 ~ 8 Start from the lowest level and increase level until patient feels shockwave slightly. Strong pain sensation should be avoided.
Shot per session	500 ~5,000
Frequency	4~5 Hz
Total session (day)	1 ~5
Required interval between sessions (day)	2~3 (Based on the patient feedback)

TREATMENT PROTOCOL (Plantar fasciitis)

Plantar fasciitis (Heel spurs)

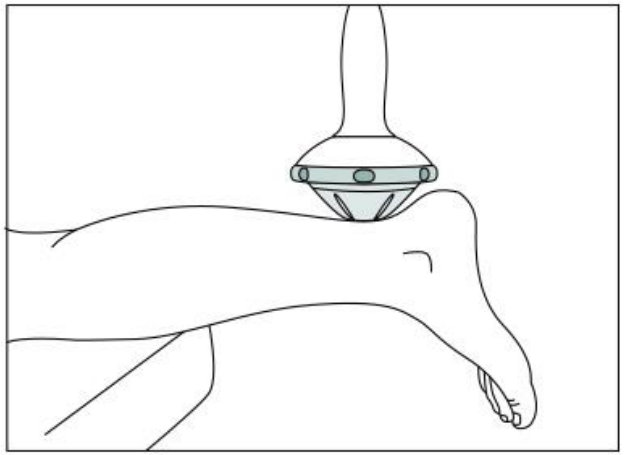


- No sports after treatment
- It is important to find trigger points in the quadratus plantae muscle and tibialis posterior muscle

ITEM	Description
Pad for depth control	10 , 20 mm
Level	0.7 ~ 11 Start from the lowest level and increase level until patient feels shockwave distinctly. Strong pain sensation should be avoided.
Shot per session	1,500 ~3,000
Frequency	2~5 Hz
Total session (day)	3 ~5
Required interval between sessions (day)	3~6 (Based on the patient feedback)

TREATMENT PROTOCOL (Achilles tendonitis)

Achilles tendonitis

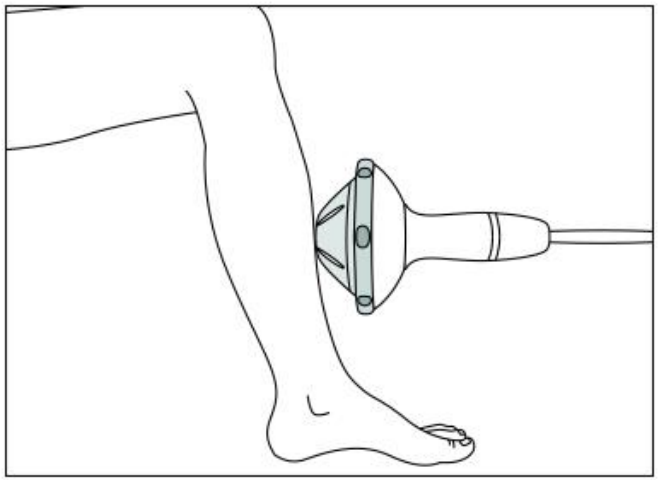


- No sports after treatment
- It is important to find trigger points in the triceps surae muscle

ITEM	Description
Pad for depth control	5, 10, 20 mm
Level	0.8 ~ 7 Start from the lowest level and increase level until patient feels shockwave distinctly. Strong pain sensation should be avoided.
Shot per session	1,000 ~3,000
Frequency	2~6 Hz
Total session (day)	3 ~5
Required interval between sessions (day)	6

TREATMENT PROTOCOL (Tibial stress syndrome)

Tibial stress syndrome

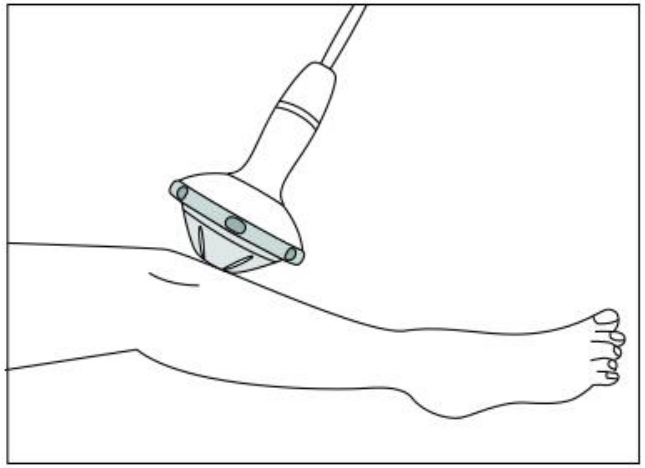


- Stretching exercises after treatment
- It is important to find trigger points in the tibialis anterior muscle

ITEM	Description
Pad for depth control	35 mm
Level	0.8 ~ 7 Start from the lowest level and increase level until patient feels shockwave slightly. Strong pain sensation should be avoided.
Shot per session	1,000 ~2,500
Frequency	2~5 Hz
Total session (day)	3 ~5
Required interval between sessions (day)	7~14 (Based on the patient feedback)

TREATMENT PROTOCOL (Patellar tendonitis)

Patellar tendonitis (Jumper's knee)

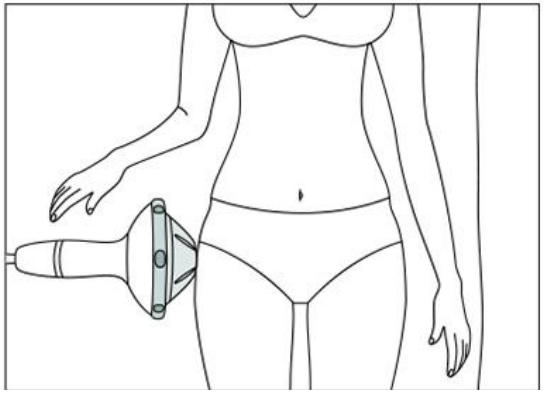


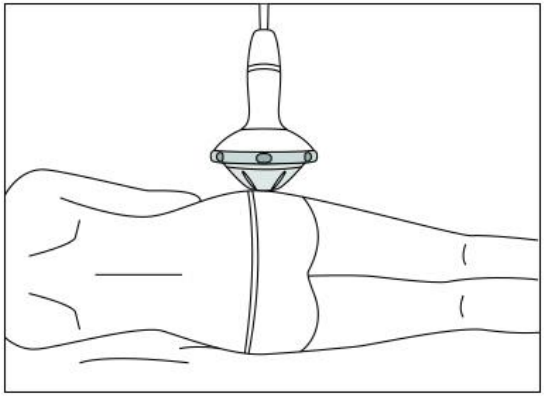
- No sports after treatment
- It is important to find trigger points in the quadriceps muscle

ITEM	Description
Pad for depth control	5, 10 mm
Level	0.8 ~ 7 Start from the lowest level and increase level until patient feels shockwave distinctly. Strong pain sensation should be avoided.
Shot per session	1,000 ~3,000
Frequency	2~6 Hz
Total session (day)	3 ~5
Required interval between sessions (day)	7~12 (Based on the patient feedback)

TREATMENT PROTOCOL (Trochanteric tendinitis)

Trochanteric tendinitis



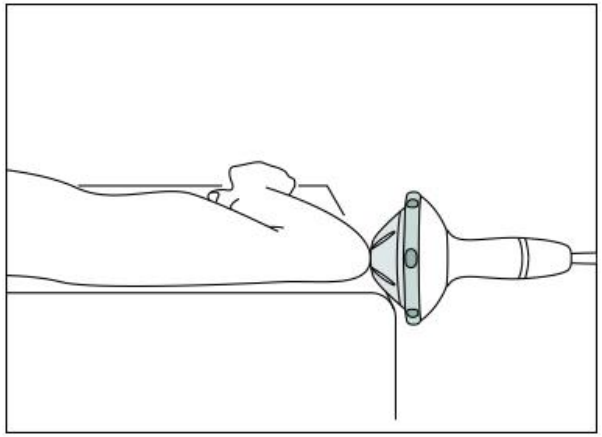


ITEM	Description
Pad for depth control	20, 30, 35 mm
Level	4 ~ 11 Start from the lowest level and increase level until patient feels shockwave slightly. Strong pain sensation should be avoided.
Shot per session	1,000 ~3,000
Frequency	2~5 Hz
Total session (day)	3 ~5
Required interval between sessions (day)	7~14 (Based on the patient feedback)

- It is important to find trigger points in the tensor fascia latae muscle

TREATMENT PROTOCOL (Epicondylitis)

Epicondylitis (Tennis elbow)

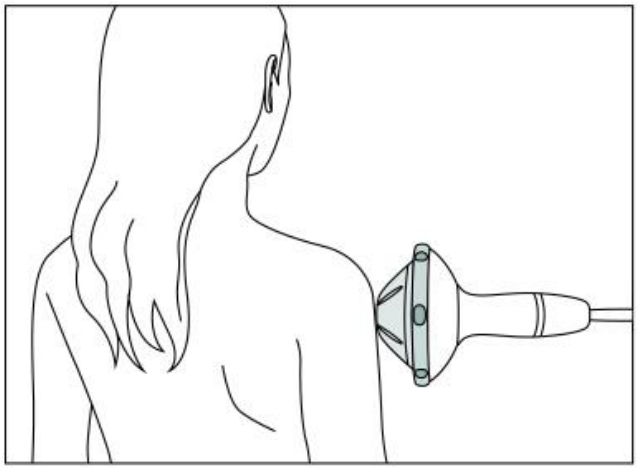


- No sports after treatment
- It is important to find trigger points in the delta and biceps muscle

ITEM	Description
Pad for depth control	10, 20 mm
Level	0.8 ~ 8 Start from the lowest level and increase level until patient feels shockwave slightly. Strong pain sensation should be avoided.
Shot per session	1,000 ~3,000
Frequency	2~5 Hz
Total session (day)	3 ~5
Required interval between sessions (day)	3~6 (Based on the patient feedback)

TREATMENT PROTOCOL (Calcific tendonitis)

Calcific tendonitis (Rotator cuff)



- Stretching exercise after treatment

ITEM	Description
Pad for depth control	10, 20, 30 mm
Level	0.7 ~ 9 Start from the lowest level and increase level until patient feels shockwave distinctly. Strong pain sensation should be avoided.
Shot per session	1,500 ~2,000
Frequency	2~5 Hz
Total session (day)	3 ~5
Required interval between sessions (day)	3~6 (Based on the patient feedback)

WARNING

Growing together!
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