SWISS
DOLORCLAST®
METHOD
TECHNOLOGY | CLINICAL PROOF | EDUCATION

*ESWT: EXTRACORPOREAL SHOCK WAVE THERAPY
EMS is a Swiss Medical company which, in 1997, patented a ballistic technology that generates shock waves.

By purposing Radial and Focused Shock Wave technology, EMS invented a solution for patients suffering from musculoskeletal and dermatological pathologies.

And so, in 1999, The Swiss DolorClast® Method was born. Today, more than 10,000 units are in use worldwide and more than 2.5 million treatment sessions healing 500,000 happy patients a year are performed.

The high value of our solutions makes us a partner of choice in ESWT.
INTRODUCTION

THE SWISS DOLORCLAST® METHOD
SAFELY AND EFFICIENTLY TREAT MUSCULOSKELETAL AND DERMATOLOGICAL INDICATIONS WITH SHOCK WAVE THERAPY

MUSCULOSKELETAL INDICATIONS

TENDINOPATHIES
- Plantar fasciopathies, Achilles tendinopathies, rotator cuff tendinopathies, tennis elbow, etc.

MUSCLE ACHES AND PAINS
- Trigger points, myofascial pain syndrome, etc.

OSTEOARTHRITIS

DELAYED UNIONS AND NONUNION FRACTURES

SPASTICITY

DERMATOLOGICAL INDICATIONS

CELLULITE

SOFT-TISSUE WOUNDS

LYMPHEDEMA

TECHNOLOGY

Innovative and reliable solutions

CLINICAL PROOF

Positive clinical outcomes: safe and effective

EDUCATION

Practitioner training and shared knowledge
The shock wave begins by a compression phase, creating shear stress in the tissue.

02 > Is followed by a depression phase or tensile phase, generating cavitation bubbles.

01 > The shock wave begins by a compression phase, creating shear stress in the tissue.

The energy flux density (ED or EFD) is the squared area below the pressure curve.

The compression phase (P+ penetrating the skin, weakens in the tissue.

A tensile phase (P−) generates cavitation bubbles.

These bubbles collapse, causing secondary shock waves.

The energy flux density (ED or EFD) is the squared area below the pressure curve.
FOCUSED ESWT ➔

PIEZOCERAMIC GENERATION ➔

> High voltage is applied to 1,000 piezoceramic crystals generating 1,000 pressure waves. These 1,000 waves converge into a shock wave at the midpoint focus due to the crystal's ellipsoid alignment.

FOCUSED SHOCK WAVE PRESSURE CHARACTERISTICS ➔

01 > The compression phase in focused ESWT is usually shorter than in radial ESWT and maximum pressure $P_+$ is usually higher.

> Both focused and radial ESWT can reach an ED, of 0.4 mJ/mm², which has been clinically proven to be sufficient for almost all ESWT indications on the musculoskeletal system and the skin.

Early-Phase Visualization

- Midpoint Shock Wave Focus
- Compression Phase $P_+$
- Tensile Phase ➔
- Secondary Shock Waves caused by the collapse of cavitation bubbles ➔

Late-Phase Visualization

- Cavitation Bubbles ➔
- Secondary Shock Waves caused by the collapse of cavitation bubbles ➔

Pressure (Mpa)

0 ➔ Positive Energy Density
Compression phase ➔ Causes shear stress in the tissue

Time ➔ Total Energy Density

0 ➔ Negative Energy Density
Tensile phase ➔ Causes cavitation bubbles
**SWISS DOLORCLAST® METHOD = BEST TREATMENT OUTCOME**

**HIGH AIRFLOW**

The external compressor of the Swiss DolorClast® delivers 3.8 times more airflow at maximum pressure than the internal pump used by competitors.

High airflow is important to generate energetic shocks.

<table>
<thead>
<tr>
<th>EXTERNAL COMPRESSOR</th>
<th>INTERNAL PUMP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Werther AA100 Air tank 38L/min. at 4 bar</td>
<td>KNF NPK09, two heads 10L/min. at 5 bar</td>
</tr>
</tbody>
</table>

**EFFICIENT ENERGY CONVERSION**

The Power+ handpiece delivers the highest energy density of all radial ESWT handpieces while the EVO BLUE® handpiece keeps the energy density constant at all frequencies.

Mastering energy conversion is key to maximize energy density and cavitation levels.

**SWISS DOLORCLAST® POWER+**

FR-140B converts 4 bar into 0.40 mJ/mm²

**SWISS DOLORCLAST® EVO BLUE**

FR-119A converts 4 bar into 0.18 mJ/mm²

**MAXIMUM ENERGY OUTPUT**

At maximum pressure and between 8 to 15Hz, the Power+ handpiece delivers three times and the EVO BLUE® handpiece two times more positive energy density than a competitor.

Positive energy density was measured for a single shot with a laser hydrophone FOPH 2000 and the measure in frequency was done with an accelerometer omega DPX-101-5K at an EMS laboratory. All measurements were performed at maximum pressure settings of the devices.

**HIGH CAVITATION LEVEL**

These pictures show the cavitation level of RSWT® handpieces at maximum pressure/energy settings at 15Hz.

The pictures represent the maximum level of cavitation (black dots) for different handpieces at maximum pressure. The graphs above are the number of pixels caused by cavitation as a function time.

**COMPETITOR 1 (Storz Medical D-Actor 200 with external compressor)**

**COMPETITOR 2 (BTL 5000SWT with external compressor)**

**COMPETITOR 3 (Zimmer en Puls V. 2.0)**

*High-speed imaging of cavitation bubbles generated with radial extracorporeal shock wave device* by Nikolaus B. M. Császár et al., "Radial Shock Wave Devices Generate Cavitation", 2015. (http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0140541#sec020), used under CC-BY-4.0 (https://creativecommons.org/licenses/by/4.0/legalcode)
In 80% of the studies, the Swiss DolorClast® resulted in better clinical outcome than the control group.

### ALL STUDIES HAVE BEEN PERFORMED WITH EXTERNAL COMPRESSORS

<table>
<thead>
<tr>
<th>INDICATION</th>
<th>STUDY</th>
<th>PEDro SCORE</th>
<th>DEVICE</th>
<th>ENERGY DENSITY</th>
<th>SESSIONS INTERVAL</th>
<th>IMPULSES</th>
<th>COMMENTS</th>
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<tbody>
<tr>
<td>Calcifying tendinosis of the shoulder</td>
<td>Krauvaag et al. (2017)</td>
<td>9</td>
<td>Swiss DolorClast® (EMS)</td>
<td>Up to 0.24 (ED+)</td>
<td>4</td>
<td>7</td>
<td>2,000</td>
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<td></td>
<td>Cacchio et al. (2006)</td>
<td>9</td>
<td>Physio SW Therapy (Pagan)</td>
<td>0.10 (ED+)</td>
<td>4</td>
<td>7</td>
<td>2,500</td>
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<td></td>
<td>Kolk et al. (2013)</td>
<td>7</td>
<td>Swiss DolorClast® (EMS)</td>
<td>0.11 (ED+)</td>
<td>3</td>
<td>12</td>
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<tr>
<td>Subacromial pain</td>
<td>Engelbrechtin et al. (2006)</td>
<td>8</td>
<td>Swiss DolorClast® (EMS)</td>
<td>0.1 – 0.16 (ED+)</td>
<td>4 – 6</td>
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<td>Adhesive capsule of the shoulder</td>
<td>Husein &amp; Donkaleit (2015)</td>
<td>9</td>
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<td>0.16 (ED+)</td>
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<td>Primary long bicipital tenosynovitis</td>
<td>Liu et al. (2012)</td>
<td>5</td>
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<td>0.12 (ED+)</td>
<td>4</td>
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<td>Lateral epicondylitis</td>
<td>Spaccia et al. (2005)</td>
<td>8</td>
<td>Physio SW Therapy (Pagan)</td>
<td>&quot;1.2 bar&quot; and &quot;1.6 bar&quot;</td>
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<td>Gündüz et al. (2012)</td>
<td>7</td>
<td>Not specified</td>
<td>&quot;1.4 bar&quot;</td>
<td>10</td>
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<td>Yang et al. (2017)</td>
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<td>Swiss DolorClast® (EMS)</td>
<td>&quot;2 – 3.5 bar&quot;</td>
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<td>Capan et al. (2016)</td>
<td>6</td>
<td>ShockMaster 500 (Symma)</td>
<td>&quot;1.8 bar&quot;</td>
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<td>Sarkar et al. (2013)</td>
<td>5</td>
<td>Masterpuls MP 100 (Storz)</td>
<td>0.06 (1)</td>
<td>3</td>
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<td>Lee et al. (2012)</td>
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<td>Swiss DolorClast® (EMS)</td>
<td>0.06 – 0.12 (ED+)</td>
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<td>Melnia et al. (2003)</td>
<td>4</td>
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<td>0.10 (ED+)</td>
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<tr>
<td>Carpal tunnel syndrome</td>
<td>Wu et al. (2016)</td>
<td>7</td>
<td>Physio SW Therapy (Pagan)</td>
<td>&quot;4 bar&quot;</td>
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<td>Coccylodynia</td>
<td>Lin et al. (2013)</td>
<td>6</td>
<td>BTI-5000 (BTI)</td>
<td>&quot;3 to 4 bar&quot;</td>
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<td>Proximal hamstring tendinopathy</td>
<td>Cacchio et al. (2006)</td>
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<td>Greater trochanteric pain syndrome</td>
<td>Wedelstaltest et al. (2016)</td>
<td>6</td>
<td>Masterpuls MP 100 (Storz)</td>
<td>0.1 – 0.4 (ED+) (2-4 bar)</td>
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<td>Lee &amp; Han (2013)</td>
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<td>Immers et al. (2015)</td>
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<td>Rompe et al. (2008)</td>
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<td>Rompe et al. (2009)</td>
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<td>Ibrahim et al. (2010)</td>
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<td>Lohrer et al. (2010)</td>
<td>8</td>
<td>Duro4 SD 1 radial part (Storz)</td>
<td>0.17 (ED+)</td>
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<td>Chow &amp; Cheing (2007)</td>
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<td>Swiss DolorClast® (EMS)</td>
<td>0.05 – max. tolerable ED</td>
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<td>Rompe et al. (2013)</td>
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<td></td>
<td>Eslaman et al. (2016)</td>
<td>7</td>
<td>Swiss DolorClast® (EMS)</td>
<td>0.2 (?) (ED+)</td>
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<td>Konjan et al. (2015)</td>
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<td>Swiss DolorClast® (EMS)</td>
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<td>Usayou et al. (2017)</td>
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<td>BTI-5000 (BTI)</td>
<td>&quot;2.5 bar&quot;</td>
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<td></td>
<td>Greco et al. (2011)</td>
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<td>Swiss DolorClast® (EMS)</td>
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<td></td>
<td>Akinoglu et al. (2017)</td>
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<td>0.2 and 0.3 μm/m²</td>
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<td>Kukowska et al. (2016)</td>
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<tr>
<td>Trigger points / myofascial pain syndrome</td>
<td>Cho et al. (2012)</td>
<td>5</td>
<td>JEST-2000 (Journée Medical)</td>
<td>0.12 (1)</td>
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<td>1,000</td>
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<td></td>
<td>Damian &amp; Zairepo (2011)</td>
<td>4</td>
<td>Masterpuls MP 100 (Storz)</td>
<td>Not specified</td>
<td>1</td>
<td>7</td>
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<td>Vidal et al. (2011)</td>
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</tbody>
</table>

¹The PEDro database (www.pedro.org.au) is a freely available database of over 37,000 randomized controlled trials (RCTs). ²Evidence-Based Medicine Level. ³As of September 09, 2017, systematic reviews and clinical practice guidelines in physical and rehabilitation medicine. For each RCT, review or guideline, the PEDro database provides the citation details, the abstract, and a link to the full text where possible. All RCTs listed in the PEDro database are independently assessed for quality (the assessment criteria are summarized in Schmidt et al. (2015)). All RCTs were randomized controlled trials. The PEDro score items are based on the Depilati et al. (1996). The PEDro database is currently the largest independent database on topics related to physical and rehabilitation medicine. It was developed by The George Institute for Global Health affiliated with the University of Sydney, Australia. Positive outcome in a subgroup of n=46 patients with calcifying tendonitis of the shoulder. Positive outcome in a subgroup of n=46 patients with calcifying tendonitis of the shoulder. Positive outcome in a subgroup of n=46 patients with calcifying tendonitis of the shoulder. Positive outcome in a subgroup of n=46 patients with calcifying tendonitis of the shoulder. Positive outcome in a subgroup of n=46 patients with calcifying tendonitis of the shoulder.
SWISS DOLORCLAST® METHOD ACTS ON THE MUSCULOSKELETAL SYSTEM VIA A MULTITUDE OF MOLECULAR AND CELLULAR MECHANISMS

NERVES

1. Hyperstimulation of nerves, activating the gate control mechanism
2. Removal of substance P from C-fibers
3. Blockade of neurogenic inflammation

TENDONS

1. Improved movement of tendon gliding thanks to Lubricin
2. Stimulation of tendon remodeling

BONES

1. Stimulation of proliferation and differentiation of osteoblasts
2. New bone remodeling thanks to increased microcracks / new bone formation

MUSCLES

1. Removal of substance P from trigger points
2. Functional angiogenesis – improved blood circulation
3. Mechanical muscle relaxation

CARTILAGE

1. Decreased cartilage degradation
2. Reduced progression of osteoarthritis

LAT. CAPSICUM ANNUUM

- Red chili peppers contain capsaicin. At first this substance overwhelms the so-called C nerve fibers responsible for transmitting pain but then disables them for an extended period of time. Everybody knows the feeling – first, the mouth is on fire, then it feels completely numb.

- Research has indicated that shock wave therapy works the same way. When activated, the C nerve fibers release a specific substance (substance P) in the tissue as well as in the spinal cord. This substance is responsible for causing slight discomfort during and after shock wave treatment. However, with prolonged activation, C nerve fibers become incapable for some time of releasing substance P and causing pain. The reduced substance P in the tissue leads to reduced pain, but there is more: Less substance P also causes so-called neurogenic inflammation to decline. A decline in neurogenic inflammation may in turn foster healing – together with the release of growth factors and the activation of stem cells in the treated tissue.

- A decline in neurogenic inflammation may in turn foster healing – together with the release of growth factors and the activation of stem cells in the treated tissue.

Refer to the Literature on page 22 to learn more on the clinical studies.
4 STEPS FOR SUCCESS ➔

AFTER A PROPER DIAGNOSIS IS PERFORMED AND THE CONTRAINDICATIONS ARE EXCLUDED, POSITION YOUR PATIENT ON THE TREATMENT BENCH

01 PALPATE AND MARK
Locate the area of pain through palpation and biofeedback and mark the area of pain

02 APPLY THE GEL
Apply coupling gel to transmit shock waves to the tissue

03 TREAT WITH SHOCK WAVES
Deliver shock waves to the area of pain while keeping the applicator firmly in place on the skin

04 RELAX MUSCLES
If tense, relax surrounding muscles by applying radial shock waves with the 36 mm applicator
FC LIVERPOOL PLAYERS
FROM LEFT TO RIGHT

Sadio Mané (19)
Jordan Henderson (14)
Alex Oxlade-Chamberlain (21)
Joe Gomez (12)
Mohamed Salah (11)
SHOCK WAVE EDUCATION MAKES YOUR PRACTICE SUCCESSFUL

EDUCATING TOMORROW’S EXPERTS IN ESWT

- The Swiss DolorClast® Academy – SDCA – offers flexible shock wave training programs globally to spread knowledge about the Swiss DolorClast® Method with a view to improving patient care. Wherever you are, working from a remote location, in a small town or a big city, you can access our high-quality tailored courses in your area and in your language.

- The SDCA has a large network of shock wave experts encouraging users and future trainers to popularize the Swiss DolorClast® Method worldwide.

INCREASING YOUR EXPOSURE

- The SDCA helps you increase your exposure and drive business for your practice by adding you to the online directory of certified shock wave centers.

- The SDCA is the perfect organization to keep you up to date on the latest clinical advances.

Q & A

CAN I TREAT ACUTE PATHOLOGIES WITH ESWT?
- In general this is possible. With regard to tendon pathology it is critical to note that there are no acute tendinopathies, only newly diagnosed ones. Safety and efficacy of radial ESWT for newly diagnosed tendinopathies have already been demonstrated in the international peer-review literature for plantar fasciopathy, primary long bicipital tenosynovitis and lateral or medial epicondylitis.

CAN I COMBINE ESWT WITH OTHER TREATMENTS?
- Yes, you can. In case of chronic midportion Achilles tendinopathy it has been shown that the combination of radial ESWT and eccentric loading resulted in statistically significantly better clinical outcome than eccentric loading alone, with radial ESWT being as effective as eccentric loading for this indication.

WHAT ARE THE CONTRAINDICATIONS OF THE SWISS DOLORCLAST® METHOD?
- Treatment over air-filled tissue (lung, gut) | Treatment of preruptured tendons | Treatment of pregnant women | Treatment of patients under the age of 18 (except for the treatment of Osgood-Schlatter disease) | Treatment of patients with blood-clotting disorders (including local thrombosis) | Treatment of patients treated with oral anticoagulants | Treatment of tissue with local tumors or local bacterial and/or viral infections | Treatment of patients treated with local cortisone injections (within the six-week period following the last local cortisone injection).

More Q&A at www.sdc-academy.com

Refer to the Literature on page 22 to learn more on the clinical studies

SDC-ACADEMY.COM