

SPORT & MEDICINE TODAY

Shock Waves In Top Sports

In 1996, for the first time, a shock wave device (MINILITH SL1, STORZ MEDICAL AG, Switzerland) was used by the German Olympic Team during the Olympics in Atlanta. At the Soccer World Championship 1998 in France, three of the participating teams including winner France and Italy made use of ESWT machines to keep the athletes on their top performance level on time.

Introduction

Extracorporeal shock waves are frequently used as the method of choice for kidney and ureteral stone fragmentation. The indication range has been extended to nearly all types of body concretions. On top of stone fragmentation shock waves are discovered to possess a therapeutic effect in a number of specific sports injuries such as tennis elbow, calcified shoulder and, in general, close to bone tissue pain. In the orthopaedic field, first investigational applications were published by Haupt¹ et. al. in 1987, Graff² in 1989 and Ekkernkamp³ et al. in 1991. Valchanov and Michailov⁴ first applied ESWT in humans in 1991. While treating non union fractures, an analgesic effect was observed accidentally. Later, several groups used shock waves of different energy levels in orthopaedics, traumatology and rheumatology.^{5, 6, 7}

Today, extracorporeal shock wave therapy ESWT, is not only frequently used in the above mentioned „standard“ indications but also in several specific indications of sports traumatology in top athletes.

Shock waves for medical use

Shock waves in medicine are usually focused high pressure acoustical waves of very short duration (pulse length < 1 Mikrosecond). The focal pressure reaches very high values of several 10 up to 100 Megapascal (100 – 1000 bar). The shock waves are generated outside the human body in water and transmitted widely spread over a large skin transmission area onto the target region where the acoustic energy is concentrated to a focal area of 2 – 8 mm diameter. Modern ESWT devices make use of coupling cushions instead of an open water bath to couple the shock waves into the body without significant losses. Targeting of the treatment region is done either by an isocentrically attached co-axial ultrasound transducer or by a fluoroscopic localisation device.

Treatment of the affected tissue region is done by a sequence of 1000 – 4000 shock wave pulses fired with a repetition frequency of 1 – 4 pulses per second. The whole treatment lasts 15 – 30 minutes and is usually performed without or with very little local anaesthetic drugs.

The most advanced shock wave generator device features a cylindrical coil arrangement with a parabolic reflector. The precision of shock wave delivery and control is unmatched and it simultaneously provides the appropriate space on the central axis for implementation of either co-axial (inline) ultrasound or X-ray localisation.

¹ Haupt, G./Haupt, A./Chvapil, M.: Shock waves enhance fracture healing; Surgical Biology Research Meeting, University of Arizona, 1987

² Graff, J.: Die Wirkung hochenergetischer Stosswellen auf Knochen und Weichteilgewebe; Habilitationsschrift, Ruhr Universität Bochum, 1989

³ Ekkernkamp, A./Haupt, G./Knopf, H. J./Püllenber, P./Muhr/Senge, Th.: Effects of extracorporeal shock waves on standarsized fractures in shees; Journal of Urology, 145:257 A, 1991

⁴ Valchanov, V./Michailov, P.: High energy shock waves in the treatment of delayed and non union fractures; International Orthopaedics, 15:181, 1991

⁵ Dahmen, G. P./Meiss, L./Nam, V. C./Skruodies, B.: Extrakorporale Stosswellentherapie (ESWT) im knochennahen Weichteilbereich der Schulter; Extracta Orthopaedica, 11:25, 1992, pp. 25 - 27

⁶ Schleberger, R./Senge, Th.: Non-invasive treatment of long bone pseudarthrosis by shock waves; Arch. Orthop. Trauma Surg. 111 (4), 1992, pp. 224 - 227

⁷ Loew, M./Jurgowski, W.: Extrakorporale Stosswellen-Lithotripsie bei der Tendinosis calcarea; Zeitschrift für Orthopädie, 131, 1993, pp. 470 - 473

Medical aspects

Top athletes need to be fit on time and do not like to undergo time consuming conservative therapies unless absolutely required. ESWT offers a simple, fast and effective therapeutic procedure which allows for continuation of sports activities usually the following day after treatment. ESWT is a non-invasive therapy without significant side effects.

The following indications were treated:

- Patella tendon syndrome
- Plantar and dorsal heel spur
- Golfers and tennis elbow
- Supraspinatus tendon syndrome
- Tendinosis calcarea
- Stress fractures
- Tibia pain
- Osteochondrosis and others

The earlier the better

Generally, the results are good to very good (60-80%), varying slightly with indication, meaning being completely cured without any pain left or featuring a significant reduction of pain. Of specific importance of ESWT in top sports is the fact, that the percentage of completely painless patients (very good result) increases from 40% in case of chronic pain persistent over more than 6 month to 62% in patients with persisting pain shorter than 6 month. This fact clearly favours an nondelayed treatment by shock waves whereas usually for reimbursement reasons only, 6 month of unsuccessful conservative treatment is required before ESWT.

Conclusion

Extracorporeal shock wave treatment has proven a new and promising treatment modality in a number of specific sports injuries. It cures non-invasively without significant side effects and speeds up the recovery time of the athletes allowing training the following day. The field of indications is just opened and potential future applications will be evaluated.