

## Shock wave therapy as a team player – how to be better

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The current data and research findings on ESWT and EMTT (Extracorporeal Magneto-Transduction Therapy) impressively demonstrate how increasing knowledge about mechanisms of action has led to diverse changes in the discussion regarding biology, indications, treatment strategies, and technology. The transformation of views on ESWT over the past 30 years, with an almost overwhelming number of scientific publications and books, is remarkable. It has evolved from a mechanically destructive shockwave to a tissue-friendly stimulation of biological healing processes known as mechanotransduction. ESWT has long been considered and taught as a monotherapy. However, this has drastically changed in the past 5 years. Today, ESWT represents a part of a complex soft tissue treatment strategy. This approach, known as tissue engineering, involves several complementary procedures that are effectively combined with ESWT. Currently, the simplest combination is the combination of focused and radial ESWT. While one works focally, the other acts locally. This has led to the development of a combined treatment principle that significantly expands the treatment area and enhances its effectiveness.

To further enhance effectiveness, adjuvant magnet field therapy is employed. This not only covers a larger treatment field but also enables optimized tissue engineering through magnetically induced biological transduction, known as magnetotransduction.

ESWT-mediated mechanotransduction and magnetically induced magnetotransduction are not alternative methods; rather, they act synergistically and follow completely different mechanisms of action. Consequently, the combination of both methods is expected to yield superior results, as demonstrated by numerous studies.

Improved knowledge of mechanisms of action and physics has also led to drastic technical changes in magnet field therapy. It is now scientifically and clinically established that devices must reach a minimum effective magnetic transduction energy of 60kT/s and a magnetic field strength of 10-80 mT at a pulse frequency of 130 kHz to achieve the level of an EMTT device. Weaker magnetic fields are not capable of generating clinically significant effects from a physical standpoint.

A groundbreaking study on the effectiveness of a combined treatment of ESWT and EMTT is the work by Klüter et al. In this prospective Level 2a study, the sole use of ESWT for rotator cuff enthesiopathy, following the recommendations of DIGEST, was compared to a combination of ESWT and EMTT, which achieved significantly better results. Additionally, recently published fundamental studies have also been able to demonstrate the significant effects of EMTT.

The possible combinations and areas of application will be presented and discussed in the lecture