

# »Physical Tissue Stimulation« with ESWT and EMTT®: Successes, Strength of Evidence and Future Development

Prof. Ludger Gerdesmeyer, MD



Prof. Ludger Gerdesmeyer, MD, is a specialist in orthopaedics, trauma surgery, paediatric orthopaedics and sports medicine. He is Chief Physician of the Oncological and Rheumatological Orthopaedics Section of the Clinic for Trauma Surgery at the University Hospital Schleswig-Holstein (Kiel campus), an executive board member of DIGEST (the German-speaking International Society for Extracorporeal Shock Wave Therapy) and president of DIGEMTT® (the German-speaking International Society for Extracorporeal Magnetotransduction Therapy).

**Prof. Ludger Gerdesmeyer, MD, is one of the leading experts in the field of »Physical Tissue Stimulation«, also known as »Soft Tissue Engineering«. In an interview, he explains the significance of extracorporeal shock wave therapy (ESWT) and the newly available Extracorporeal Magnetotransduction Therapy (EMTT®).**

### **Prof. Gerdesmeyer, how do you assess the current evidence of the ESWT?**

We have an evidence level 1 situation in almost all areas. The classic indications with very good evidence include heel spur, achilles tendon disease, shoulder tendon disease, frozen shoulder and bone treatments. ESWT is therefore one of the best studied forms of treatment, far ahead of any infiltration therapy or operation. Unfortunately it is still not seen as a first-line option, despite the excellent data position.

### **How has the quality of ESWT treatment improved in recent years?**

Treatment options have improved on two levels. First, at the application level: Under the leadership of the professional societies DIGEST and ISMST (International Society for Medical Shock Wave Treatment), training curricula have been developed in which standardized treatment protocols were worked out for the individual indications. These and the guidelines for the treatment of different indications are based on existing evidence. This concerns the frequency application, the energy intensity as well as the time between applications and also implies, among other things, when radial treatment can be performed, and when focused treatment. The second improvement has been implemented at equipment level: Today, we have specific device components with very precise focus applications and reproducible applications of the individual therapies. We can apply them very precisely and determine how much energy is used in the treatment, and how precisely which area is targeted.

### **A new therapeutic option in the field of »Physical Tissue Stimulation« is Extracorporeal Magnetotransduction Therapy (EMTT®). You are already using the method and doing research into it. How do you assess the procedure?**

Magnetotransduction therapy generates a high-energy magnetic field that can typically have an intensity of up to 80 mT and a very high oscillation frequency. According to our investigations into human cell cultures, these specific characteristics are necessary to produce any biological effect at all. We know from the available data that purely static magnetic fields cannot achieve a biological effect. A single intense magnetic field, such as is used in magnetic resonance imaging, has a single effect and is not clinically relevant. Only high frequency and re-

petitive therapy beyond single magnetic fields leads to a summation of these biological effects. These effects include all magnetically inducible electrical processes we have in the body. Another important aspect is that, with EMTT®, we can generate a non-contact induction of these metabolically active processes. This is not possible with conventional devices. I myself initially used EMTT® for pure pain therapy treatment in the musculoskeletal area. Here, it has been shown that the level of pain decreased significantly even after individual applications. This was the reason for proving efficacy by means of studies.

### **Can you briefly classify the results of the EMTT® studies you have conducted so far?**

In the past four years, we have conducted several placebo-controlled studies on individual indications in the field of musculoskeletal degenerative diseases as well as basic work on human cell lines. As a result, we see a high potential for EMTT® both as a stand-alone therapy and as an adjuvant therapy with other methods such as ESWT. In this way, we were able to show that EMTT® works additively with ESWT: In the treatment of shoulder diseases, it was possible to significantly increase the established effect of ESWT with EMTT®.<sup>5</sup> We were surprised at the size of the effect. One possible explanation for this is the differential effect of both methods on metabolic processes. ESWT works as a mechanotransduction therapy, while high-energy magnetic field therapy works as a magnetotransduction therapy. Both effects seem to have an additive effect. This work could set the trend in the field of »Soft Tissue Engineering«. We will see more work in the future showing such additive effects.

### **Do EMTT® and ESWT treat the same indications or are there differences?**

EMTT® has a different treatment approach – it initially targets degenerative diseases. While



Extracorporeal Magnetotransduction Therapy generates a high-energy magnetic field.

ESWT is aimed at local inflammatory diseases such as enthesiopathy, tendon attachment disease or pseudarthroses, EMTT® takes a more regenerative approach to degeneration, i.e. joint diseases or degenerative muscle tendon diseases. Even in the overlapping indication areas, such as enthesiopathy of the rotator cuff, it will probably even be possible to achieve additive effects by taking a different approach if both forms of therapy are applied in parallel. In basic research, it has been possible to establish in cell-biological terms that magnetotransduction therapy has a very good effect on inflammatory processes, e.g. interleukin systems. Inflammatory promoters in the interleukin system are reduced, while anti-inflammatory reactions seem to be favoured. Here it could be shown

that – in the sense of anti-inflammatory therapy – the inflammation process as a whole is very favourably influenced by the magnetotransduction therapy. This could result in inflammatory processes in particular becoming the target of EMTT® treatment in clinical applications. These include, for example, all rheumatoid diseases. This concerns tendon insertion diseases, rheumatic diseases, diseases of the small joints (fingers, toes) or the resulting synovial diseases such as bursa disease of the knee, hip or finger joints. If the anti-inflammatory reactions in relation to the interleukin system can also be reproduced clinically, EMTT® may provide a form of therapy for which there is a wide range of indications in the field of rheumatology. Medication consumption might be significantly reduced if

EMTT® can be used to bear down on the soft tissue and inflammatory components.

### How do you assess the future significance of ESWT in the field of »Physical Tissue Stimulation« and what do you expect from EMTT®?

Within the complex treatment strategy in the sense of what I call »Soft Tissue Engineering«, ESWT represents an established area with a very good evidence base. However, it only corresponded to some of the possibilities within the framework of this concept. We will see complex therapies here with multiple therapeutic approaches in the future. I think EMTT® is a very important therapeutic component. This allows significantly larger areas to be effectively influenced physiologically. This is mathematically possible up to a depth of 15 cm, so that not only the local pathology but also the accompanying inflammatory processes can be addressed. I believe that EMTT® will play an important role in the treatment of soft tissue diseases in the future. It remains to be seen to what extent other indications such as inflammatory processes or bone treatments will play a role and which additive forms of therapy are appropriate. Today, EMTT® is already being successfully used in various practice systems and clinics. There are now almost 20 treatment centres in Germany. The DIGEMTT® (the German-speaking International Society for Extracorporeal Magnetotransduction Therapy) emerged from this association. It has set itself the goal of standardizing the form of therapy, drawing up treatment protocols and subjecting further indications to clinical testing.

### Thank you for the interview.



EMTT® targets degenerative diseases.



ESWT is used for local inflammatory diseases.

#### At a Glance

- ESWT: Evidence level 1 situation in almost all areas
- EMTT® technology generates a high-energy magnetic field (typically up to 80 mT).
- EMTT® studies: High potential as stand-alone therapy as well as adjuvant therapy with other procedures such as ESWT
- EMTT® works additively to ESWT
- »Physical Tissue Stimulation« includes multiple therapeutic approaches, ESWT and EMTT® are important components.