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ESWT

Extracorporeal Shockwave Therapy

Background Information

Development of Shock Wave Treatment

The promising developments in the newest medical fields are based on long experience with shock waves – to be effective and with minimal risk of side effects. For 30 years, extracorporeal shock wave treatment has been successfully applied for disintegrating urinary tract concrements, using primarily the high mechanical energy of the shock wave. Shock waves pass through soft tissue without damaging it. The remnant stone particles are secreted via the urinary tract.

From Kidney Stone Disintegration to Bone Treatment

The concept of treating bone and tendon pathologies arose from observations of shock wave treatments of deeper positioned stones in the ureter and bladder. In order to disintegrate these concrements, shock waves must pass through the ala of the ileum (pelvic bone). Monitoring radiography showed that a thickening of the treated patients' pelvic bone occurred, and this definitive growth-enhancing effect of shock waves on bony tissue soon attracted the attention of orthopedic and trauma surgeons.

After appropriate clinical studies and animal experiments, use of shock wave therapy increased worldwide in cases of delayed fracture healing and non-unions as well as tendon pathologies (tennis elbow, plantar heel pain; "heel spurs", calcification of shoulder tendon). All observations indicated that shock waves not only enhanced the growth in bony tissue, but also healing in other tissues (skin, tendons, muscle etc.).

Shock Wave Treatment successfully used for more than 15 years for orthopedic conditions

Extracorporeal shockwave treatment expanded worldwide for the “classical” orthopedic indications:

1. Calcific Tendinopathy of the shoulder
2. Pseudarthrosis (non-union/non healing fractures)
3. Fasciitis plantaris (heel spur)
4. Epicondylitis of the elbow (tennis elbow)

Due to extensive basic research and increased knowledge of the regenerative and stimulating working mechanism of this technology the range of indications increased fast over the past years including achillodynia, patella tendonitis (jumper’s knee), greater trochanteric pain syndrome (GTPS), adductor syndrome and many more chronic tendinopathies and muscle pathologies. Especially for physically active people and high profile athletes ESWT offered a non-invasive treatment option.

“Positive” side-effects lead to new fields of application

By documenting “positive” side-effects like faster wound healing after shock wave treatment, this technology expanded quickly into completely new medical fields. ESWT gains more and more importance in the treatment of acute and chronic skin lesions such as: bedsores, chronic diabetic arterial and venous ulcers, burn injuries, post traumatic and post surgical healing disorders etc. Clinical results of the application on skeletal muscles are a reduction of pain and a restoration of muscle dysfunction, developing new therapy options within the locomotor system. Animal trials and first clinical studies could also prove a regenerative effect on damaged heart muscle tissue. Recent studies even showed accelerate recovery of peripheral nerve lesions after shock wave application in animal trials.

Mechanisms of Shock Waves

Originally, a “mechanistic” model of the shock wave has been adopted where shock waves, after passing through the soft tissue without damaging it, cause micro-lesions in the target area thereby triggering the healing impulse in the bone. But recent findings in basic research prove that the original assumption of a mechanical effect has to be considered inaccurate.

From the Mechanistic Model to the “Body’s Innate Bioengineering”

Several groups of researchers all over the world performed basic research in shock wave therapy demonstrating that shock waves trigger a “biological response” in treated tissue. Under the influence of shock waves, genes in the cell nucleus are activated starting the production of various proteins responsible for healing processes (so called “growth factors”).

This causes an increased integration of newly formed blood vessels as well as new growth of tissue, thereby triggering the healing process – better circulation of the myocardial muscle, new bone formation or the formation of new skin within lesions. Very recent studies could also prove that tissue preconditioned with ESWT influences the migration of the body's own stem cells (attracts stem cells). Even differentiation of stem cells (forming original tissue/avoiding scar formation) seems to be positively influenced by shock waves. Thus, it was demonstrated that under the influence of shock waves a "body's innate bioengineering" and the process of self-healing will be initiated.

Effective Initiation of Self-Healing – Relevant in Many Medical Fields

For physicians, this active principle provides scores of new possibilities. Instead of applying biologically active substances, which are produced in laboratories at high cost and with high risks, shock waves can be applied to activate the body's innate system to create these substances naturally. This new hypothesis of the micro-biological mechanism of shock waves has been confirmed in various animal experiments and has attracted the interest of other medical fields. It has also been corroborated by the first successful clinical applications of shock wave treatment in cases of circulation problems of the myocardial muscle as well as of chronic and acute skin lesions.

These findings set the foundation for shock wave therapy to be applied in other medical fields.

This Information about ESWT is published by the ISMST Managing Board.

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On behalf of the ISMST Managing Board:



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