

Acoustic Wave Therapy for Treating Cosmetic Disorders

Novak P.

Storz Medical AG, Tägerwilen, Switzerland

Summary

Cosmetic disorders, like cellulite, diet resistant fat deposits, scars or stretch marks can be successfully treated by Acoustic Wave Therapy, AWT[®]. Acoustic waves are short pressure pulses which are generated extracorporeally. They propagate from the skin surface into the treated tissue and stimulate their healing and regenerative processes without causing any micro lesions. The key effect is the release of endothelial nitric oxide and multiple tissue growth factors and the increase in microcirculation and metabolism. There are practically no side effects.

Introduction

Acoustic wave therapy, AWT[®] originates from the shock waves technology used successfully over 30 years in urology, ESWL (Extracorporeal Shock Wave Lithotripsy). The key difference is the much lower intensity used which is not destructive, but stimulates the healing and regeneration process within the tissue (Fig.1).

Acoustic waves consist of a train of pulses. Originally only pulses of short duration and high amplitude were supposed to have a therapeutic effect. Meanwhile it could be shown that also much slower pulses with lower amplitudes are effective for some indications. Thus, the pulse pattern seems to be one of the key properties resulting in the beneficial tissue effects and accordingly the term Extracorporeal Pulse Activation Technology, EPAT[®] is the common denominator.

With AWT[®], independently from the mode of operation, mechanical energy without any heating effect is applied to the patient's tissue. The acoustic waves propagate from the skin surface into the subcutaneous tissue, stimulate the cells, increase the microcirculation and metabolism and activate the release of messenger substances. These biological processes have been scientifically investigated and validated in animal trials:

- Energy release at acoustic boundaries ¹
- Cavitation ²
- Increase of cell wall permeability ³
- Stimulation of microcirculation (Blood, Lymph) ⁵

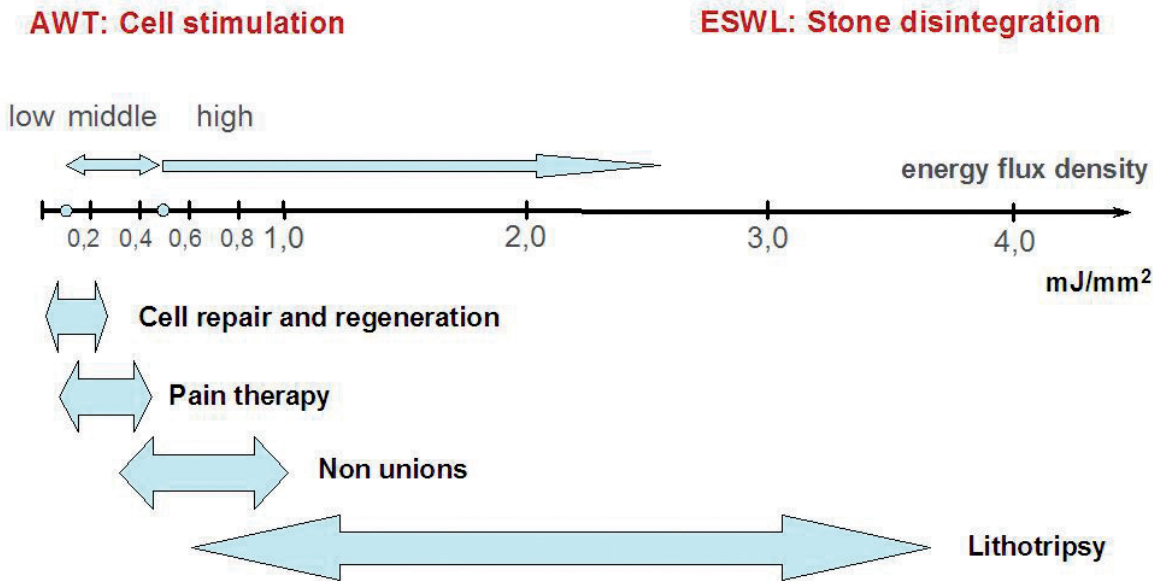


Fig.1: The range of shock waves intensity (energy flux density) as used in medicine.

- Release of substance P ⁴
- Reduction of unmyelinated nerves
- Release of nitric oxide (vasodilation, increased cell metabolism, neoangiogenesis, anti-inflammatory effect) ^{5,6}
- Antibacterial effect ⁷
- Stimulation of growth factors (neogenesis of blood vessels, bone and collagen) ^{6,8}
- Stimulation of stem cells ^{8,9}

Energy release at acoustic boundaries and cavitation are mainly responsible for the destructive effects of shock waves used for urinary stone disintegration (ESWL). The release of substance P and the reduction of the slowly pain guiding nerve fibers are mainly used in orthopedic pain therapy. The other effects contribute to the positive healing and regeneration processes as observed in the aesthetic medicine.

Materials and Methods

The planar acoustic waves can be generated e.g. by an electromagnetic source. There are systems using flat or cylindrical coil design. The cylindrical coil design has the advantage of higher efficacy. The radial pressure pulses are using a totally different source of energy, typically a pneumatically driven system.

The Cellactor[®] SC1 offers three AWT[®] treatment modes (Fig. 2): The D-Actor[®] handpiece provides pneumatically generated radial pressure pulses which activate the subcutaneous muscle and tissue, the C-Actor[®] handpiece provides electromagnetically generated planar pressure waves with increased cell activation capability and deeper penetration depth. The treatment effect can be optionally enhanced by the use of a third handpiece, the V-Actor[®] providing local body vibration.

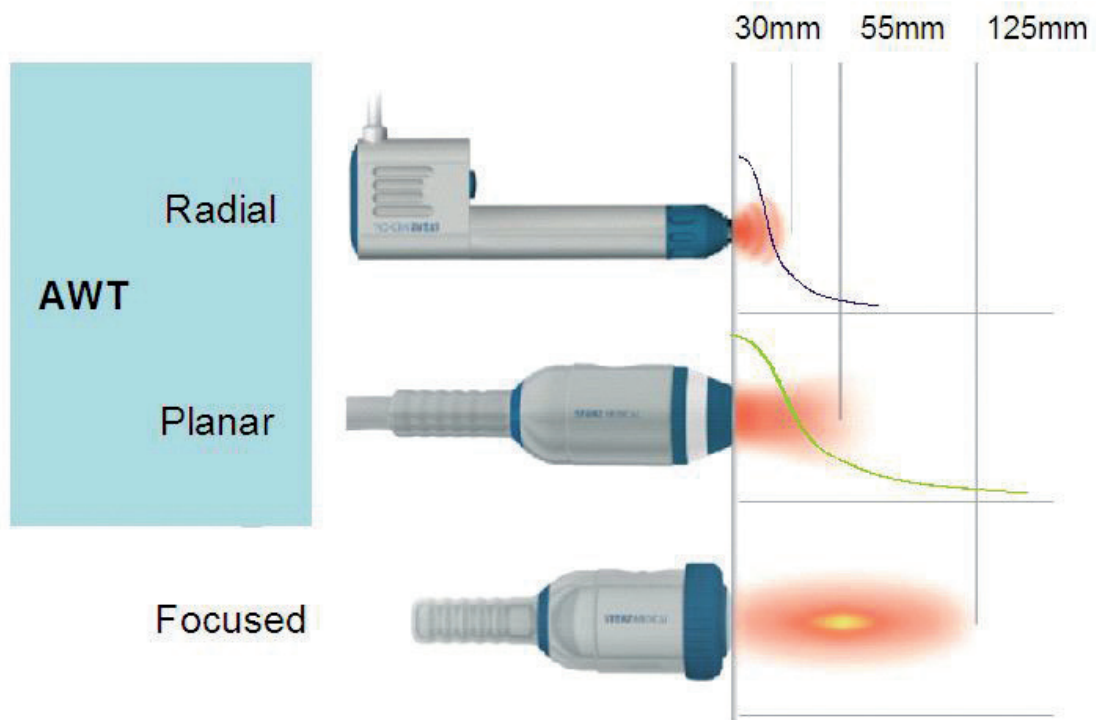


Fig.2: Typical therapeutic penetrations depths of AWT® handpieces.

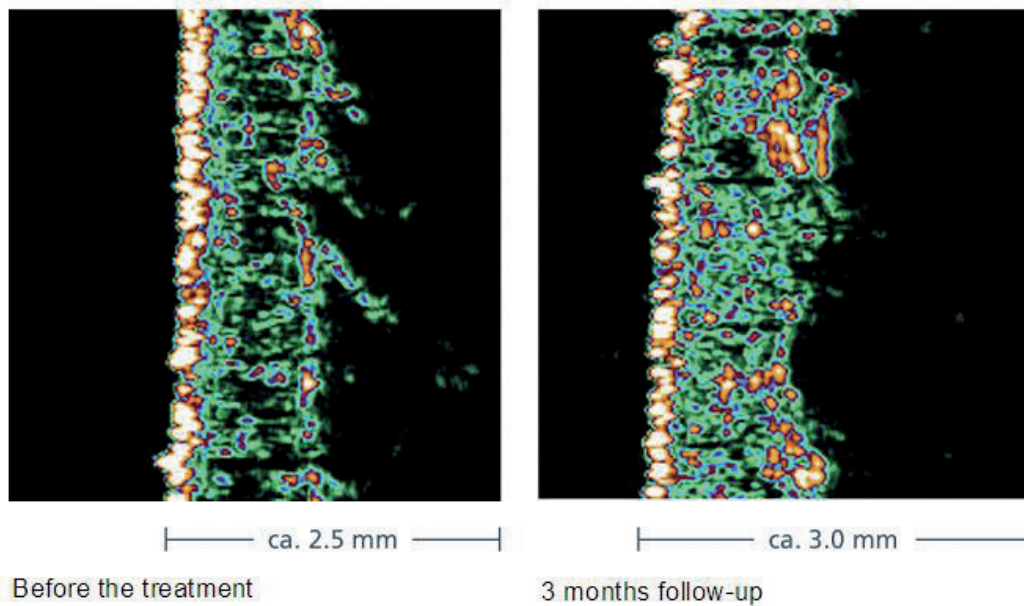


Fig.3: Typical case (female, 60 years old) of cellulite treatment with AWT®

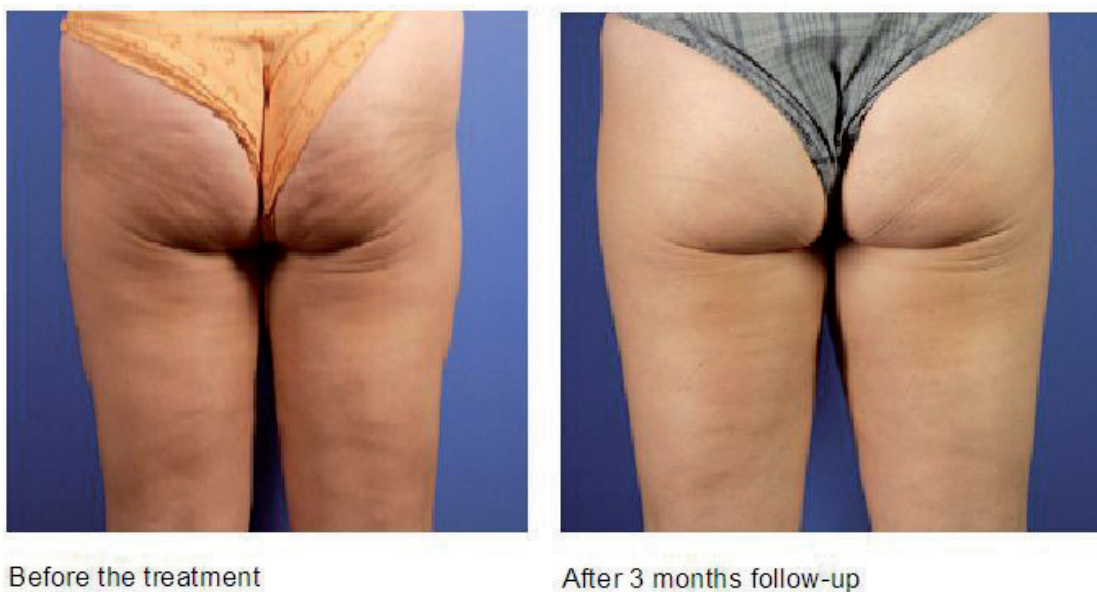


Fig.4: High resolution ultrasound scans (20MHz) showing the increase in skin tissue density due to collagen neogenesis after AWT[®] treatment.

Results

The above described biological effects of acoustic waves result in the following treatment relevant processes:

- Short termed increase in blood due to massage and vasodilation
- Long term increase in blood flow due to angiogenesis
- Lymph drainage effect, removal of water and waste products
- Mechanical and biochemical lipolysis
- Softening of fibrotic structures (scar tissue, septi)
- Strengthening of connective tissue (collagen neogenesis) resulting in increased skin elasticity and firmness
- Cell regeneration process (Cell rejuvenation)

The positive, long termed and statistically significant effects on improved cellulite appearance (Fig. 3), increased skin elasticity (Fig. 4) and body shaping (Fig. 5) or sculpting respectively have been shown in multiple studies^{10,11,12,13}. The application is not limited only to the treatment of cellulite, but is effective also for skin smoothing, scar softening, stretch marks reduction and wound healing. Due to the stimulation effect on the healing process, there is usually not immediate reaction visible. The tissue regeneration needs time. Thus the improvements do not stop after the treatment (typically 8-10 sessions) is completed, but continue also afterwards. This process can last for 3-6 months¹⁰.

The application of AWT[®] has practically no negative side effects. In general, only light pain during and after the treatment and temporary skin reddening might be observed. The success rate is in the range of 85% and the therapy is very well accepted by the patients.



Fig.5: Typical case of body sculpting with AWT®

Conclusions

The Acoustic Wave Therapy has a significant beneficial impact on treatment of various cosmetic disorders in aesthetic and anti-aging medicine. The AWT application leads to build-up of connective tissue, fat reduction and tissue and skin rejuvenation. The optimal dosage and patient's selection will lead to further improved efficacy in the future.

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