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# Extracorporeal Shock Wave Therapy (ESWT) for Hip Osteoarthritis

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## INTRODUCTION

Extracorporeal Shock Wave Therapy is a relatively new treatment modality for dogs. Since more than 25 years shockwave lithotripsy has been used for stone management in the ureter, kidney and bladder. When investigating potential side effects of shockwaves on tissue during urological applications, researchers discovered the potential of stimulating osteogenesis: the beginning of orthopedic applications of shockwaves.

In human medicine ESWT is used since more than ten years for the treatment of musculoskeletal disorders such as tennis elbow and plantar fasciitis. More recently veterinarians discovered the potential of using shockwaves to treat tendinopathies in horses.

In canine orthopedics ESWT presents a new treatment option for various orthopedic conditions in dogs. Good results with ESWT have been reported by several veterinarians, but the number of controlled clinical studies is still very limited today.

Shockwaves are soundwaves that are characterized by a very fast and steep rise in pressure followed by a negative pressure period. As shockwaves travel well in liquids, a coupling media is used to transfer these soundwaves into the tissue.

## TECHNIQUES

Shockwaves can be transferred into the tissue in a focused and in a radial pattern. Different energy sources are available to generate shockwaves.

❑ **Focused** shockwaves can be generated by:

- electro-hydraulic energy
- electro-magnetic energy
- piezo-electric energy

❑ **Radial** shockwaves can be generated by:

- *pneumatic energy*
  - Medical compressed air is used to accelerate with a high speed a projectile in a handpiece within a very short time period. Once the projectile hits on the applicator inside the handpiece, a shockwave will be created and transfer along the applicator into the tissue.
  - The focus of this shockwave is on the tip of the applicator. From there the shockwave is transferred radially (spherically) into the tissue.
  - Thanks to the radial pattern, the energy density and the pressure decrease with deeper penetration depth.

Even if the mode of action of shockwave therapy is not completely clear yet, the following hypothesis have been postulated by researchers:

- A short-term pain reduction may be based on a release of endorphins.
- A long-term pain relief may be caused by mechanical and chemical effects on a cellular level where shockwaves start healing processes and modulate pain signals.

## INDICATIONS

Orthopedic conditions suitable for shockwave therapy:

- ❑ osteoarthritis, i.e.
  - hip dysplasia, hip osteoarthritis
  - elbow osteoarthritis
  - knee osteoarthritis
  - shoulder osteoarthritis
- ❑ tendinopathies

Shockwaves are contra-indicated for the use:

- directly after surgery (the treatment should not start earlier then 8 weeks post surgery)
- close to implants
- in acute conditions
- in acute forms of arthritis

- in tumor patients
- in the growth plate
- in patients with coagulation disorders

### APPLICATION

The Clinic of Surgery and Ophthalmology at the University of Vienna uses a Radial Shock Wave Therapy system (Swiss DolorClast Vet<sup>®</sup>; EMS Electro Medical Systems, Nyon, Switzerland) allowing a treatment of canine patients without any sedation or general anesthesia.

After having shaved the treatment zone, a contact gel is applied on the area of interest. The veterinarian selects the number of shockwaves, the frequency and the pressure according to the manufacturer's protocol. An example: when treating a dog suffering from hip dysplasia, the user applies 2,000 impulses with a pressure of 2.0 bar and a frequency of 10 Hertz. The canine patient should be put in a lateral position that is most comfortable for the dog.

The shockwave applicator must be held perpendicular to the treatment site. It is important to have a light application pressure while moving the handpiece slowly over the treatment area.

Most indications (including hip dysplasia) require up to three treatment with an interval of 7 up to 10 days between the sessions.

At our experience pain relief might be delayed up to four weeks after the last ESWT session.

The following side effects were observed:

- petechia
- swelling
- short-term aggravation of the problem

Generally speaking these side effects disappear within 24 up to 48 hours after shockwave application.

### CLINICAL EFFECTIVENESS OF RADIAL SHOCK WAVE THERAPY IN DOGS

The University of Vienna is currently conducting clinical studies to assess the effectiveness of Radial Shock Wave Therapy (RSWT) in dogs with hip and cubarthritis. Computerized gait analysis is used to evaluate the treatment success of this new modality. Therefore, the ground reaction forces are measured by four force plates that are mounted on a treadmill. Ground reaction forces (including peak maximal force, mean vertical force and impulses) are assessed before the start of the therapy and before every single treatment session, one week after the last RSWT session as well as 1, 3 and 6 months post RSWT.

Preliminary data show significant positive effects for both indications: most animals with cubarthritis experience an improvement of all three values already one month after Radial Shock Wave Therapy. The majority of patients with hip dysplasia have got better impulse and mean vertical force values, especially one month after the last treatment session.

### CONCLUSION

Even if more scientific studies with more patients and a long term follow up are needed to evaluate the effectiveness of this new modality, our preliminary treatment results suggest that Radial Shock Wave Therapy is a good alternative treatment modality for dogs suffering from osteoarthritis.