

Shock Wave Therapy



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What I Will Cover...

- What are shock waves?
- How they work
- Applications
- Research
- Case example
- Potential complications
- The future...



What are shock waves?



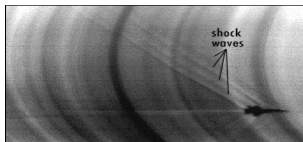
What are shock waves?

A large amplitude compression wave, such as that produced by an explosion or by supersonic motion of a body in a medium



What are shock waves?

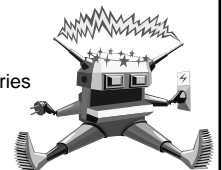
The generation of a pressure wave outside of the body, which is then directed at a specific area of the body for treatment



What are shock waves?

Extracorporeal Shock Wave Therapy (ESWT)

- Pressure waves
 - Generated outside the body
 - Focused on specific site
 - Non-invasive treatment of injuries



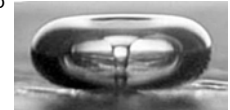
How are shock waves created?

- **Piezoelectric**- Crystal-like material
 - High voltage stimulation
 - Pressure wave
- **Electromagnetic**- Opposite magnetic fields
 - Submerged membrane moves
 - Pressure wave
- **Electrohydraulic**- High voltage stimulation
 - Bubble compresses a liquid
 - Pressure wave



How do they work?

- Waves travel through fluid and soft tissue in horse
- Effects at areas where there are different densities in tissues
- Different types of force develop
- Cavitation bubbles



How do they work?

- Energy is released
- Fast flows of fluid
- High temperatures
- Bubbles implode adjacent to the surface of material
- Collapse occurs resulting in change to the surface



Applications...

Human medicine

- Lithotripsy
 - Kidney stone removal
- Orthopedics
 - Soft tissue injuries (tennis elbow)
 - Plantar fasciitis (heel spurs)
- Cancer research



Applications...

Veterinary medicine

- Suspensory ligament injuries
- Bowed tendons
- Back soreness
- Bucked shins
- "Navicular disease"
- Arthritis



2 Types of Machines Available...

Unfocussed (radial pressure wave therapy)

- Swiss DolorClast® (EMS Medical, Switzerland)
- Air-driven projectile mechanism generates shock wave
- Not as much research



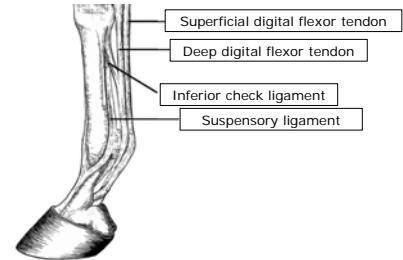
2 Types of Machines Available...

Focused (extracorporeal shock wave therapy)

- HMT VersaTron® (High Medical Technologies, USA)
- Electrohydraulic method of shock wave generation
- Most veterinary research has focused on this machine

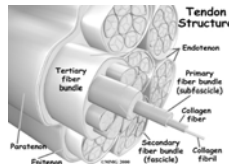
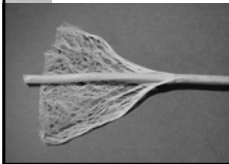


Anatomy

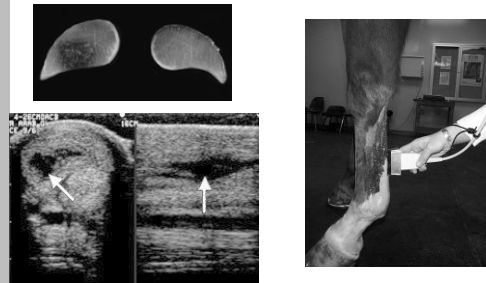


Tendons & Ligaments...

- 70% water
- 30% collagen
- Rope-like structure
- When fibers tear, fluid is released



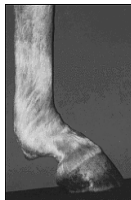
Tendon & Ligament Injury



Effects on soft tissue...

Suspensory Ligament Injury

- One forelimb – No treatment ("control")
- Other forelimb – Focused ESWT
- One shock wave treatment every 3 weeks
- Total of 3 treatments
- Ultrasound examinations
 - 3 weeks after lesion was made
 - Subsequent 3 weeks intervals up to 15 weeks



McClure, et al 2004

Effects on soft tissue...



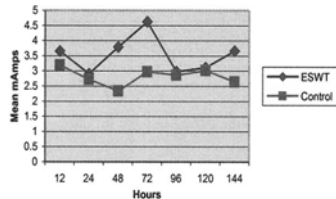
- When compared to the "control" or untreated group of horses, the shock wave treated horses had...
 - An improved collagen fiber pattern
 - Decreased fluid content of the tear in the ligament
 - Smaller tear size
- Rate of healing was faster in treated horses compared to untreated horses

McClure, et al, 2004

Pain relief...



Decreased skin sensitivity over front of cannon bone in shock wave treated sites for the first 3 days after treatment



McClure et al.
2006

Case example...



3 year old Thoroughbred stallion

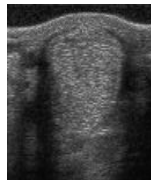
- Racing
- Thickened right forelimb suspensory ligament
- Painful when palpated
- Three shock wave treatments at 3 week intervals using the HMT VersaTron® machine
- Sequential ultrasounds...

Case example...

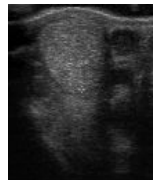
6 weeks



12 weeks



17 weeks



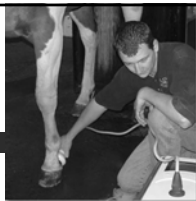
Case example...



Results?

- Trotting at 6 months after initial injury
- Racing at 8-12 months
- Faster return to performance than without shock wave therapy?

Treatment course...



- 3 treatments at 2-3 weeks intervals
- Each treatment lasts approximately 5 minutes
- Horse is sedated
- Outpatient service (same day)
- Cost: approximately \$350 per treatment (approximately \$1400 total)
- Monitor response to treatment with ultrasound exam

Important things to remember!



Exercise restriction and a controlled, GRADUAL return to activity is still the most important aspect of rehabilitating tendon and ligament injuries!

- Shock wave therapy promotes the healing process – it does not heal injuries by itself

Potential complications...



- Skin bruising at treatment site
- Tissue death
- Decreased bone growth
- Increased rate of cancer cell growth
- Tissue damage of gas-filled organs (lung & intestine)

The future...

- What do cavitation bubbles really do?
- How much is too much?
- What is stimulating bone formation & growth?



Questions?



References...

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7. McClure SR, et al, The effects of extracorporeal shock wave therapy on the ultrasonographic and histologic appearance of collagenase-induced equine forelimb suspensory ligament desmitis, Ultrasound in Medicine & Biology 2004, 30(4):461-467.
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