

# 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?



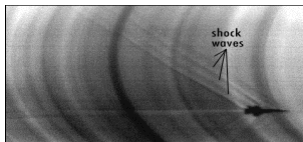
## What are shock waves?

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?

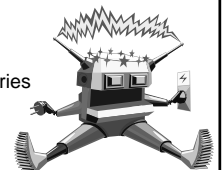
The generation of a pressure wave outside of the body, which is then directed at a specific area of the body for treatment



## What are shock waves?

### Extracorporeal Shock Wave Therapy (ESWT)

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



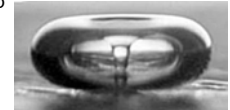
## How are shock waves created?

- **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



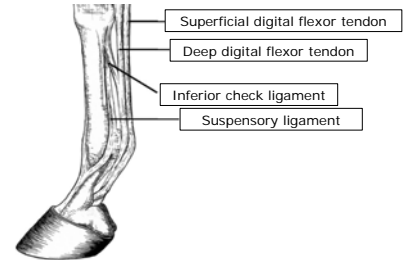
## 2 Types of Machines Available...

### **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

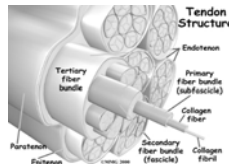
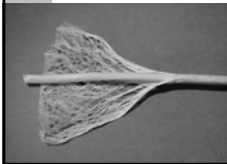


## Anatomy

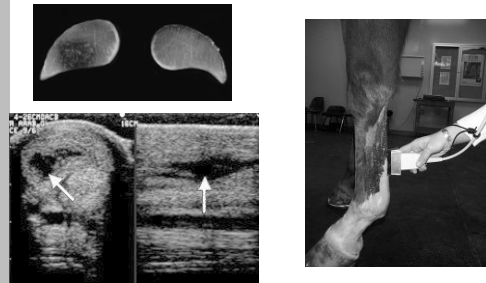


## Tendons & ligaments...

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



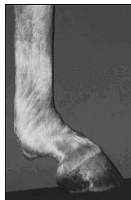
## Tendon & Ligament Injury



## 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...



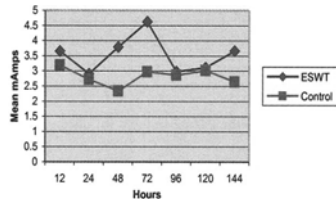
- When compared to the "control" or untreated group of horses, the shock wave treated horses had...
  - An improved collagen fiber pattern
  - Decreased fluid content of the tear in the ligament
  - Smaller tear size
- Rate of healing was faster in treated horses compared to untreated horses

McClure, et al, 2004

## Pain relief...

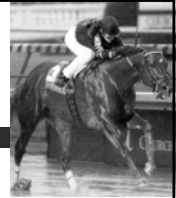


Decreased skin sensitivity over front of cannon bone in shock wave treated sites for the first 3 days after treatment



McClure et al.  
2006

## Case example...

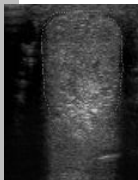


### 3 year old Thoroughbred stallion

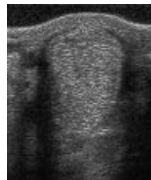
- Racing
- Thickened right forelimb suspensory ligament
- Painful when palpated
- Three shock wave treatments at 3 week intervals using the HMT VersaTron® machine
- Sequential ultrasounds...

## Case example...

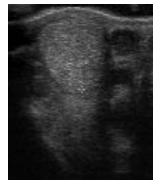
6 weeks



12 weeks



17 weeks



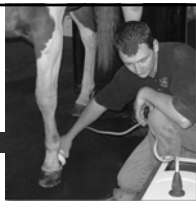
## Case example...



### 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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