

# **A novel approach to ESWT for Achilles tendinopathy, guided and evaluated by means of Ultrasound Tissue Characterization (UTC)**

**Hans T.M. van Schie, DVM, PhD**

## **Introduction:**

ESWT treatment might benefit from an “inward view” into diseased tendons.

Ultrasonography suffers from poor reproducibility and allows only qualitative assessment. In contrast, ultrasound tissue characterization (UTC) was developed for tomographic visualization and quantification of ultra-structure.

## **Methods:**

Patients (n=53) suffering chronic (> 9 months) refractory Achilles tendinopathy were included. Inclusion consisted of clinical examination and UTC.

UTC data collection is standardized with the ultrasound probe fixed in a motorized tracking device that collects images at even distances of 0.2 mm.

Tendons are visualized tomographically and in 3-D, and UTC algorithms facilitate discrimination of 4 echo-types:

- I. generated by intact, aligned tendon bundles;
- II. generated by discontinuous, waving tendon bundles;
- III. related to interfering echoes from mainly fibrillar tissue;
- IV. related to interfering echoes from mainly cells and fluid in amorphous tissue.

ESWT (electro-hydraulically generated) is based on localization, volume and tissue characteristics of lesion: focal depth 5 mm, pulses ranging from 600 to 1500 each treatment, energy flux density (EFD) from 0.11 to 0.15 mJ/mm<sup>2</sup>.

Evaluations and, if necessary, re-treatments were done at 8 weeks intervals; in most cases 3 to 4 times until patient satisfaction and improved ultra-structure was reached or until further treatment was abandoned due to lack of improvement.

**Results:**

A. Overall success rate, the sum of clinical improvement, decrease of swelling and significant improvement of ultra-structure on UTC, was 78.9% after an average of 1.51 treatments.

B. Prognosis varied remarkably with localization and tissue characteristics: (1) mid-portion, diffuse, fibrosis and mid-portion partial ruptures had a good prognosis, (2) “recent” relapses had a good prognosis too but these lesions are frequently surrounded by chronic fibrosis, requiring adjusted dosage and a less progressive rehab-protocol, (3) mid-portion postero-medial degeneration (with fibro-myxoid or amorphous aspect on UTC), frequently combined with swollen and irregular paratenon, had a less favorable prognosis, (4) insertional changes had a fair/good prognosis, however, cases with partial ruptures and/or intra-tendinous calcification just proximal to the insertional region are far less favorable.

**Discussion:**

At end-stage, an excellent relationship was observed between clinical improvement and UTC parameters, except in patients with amorphous tissue on UTC, frequently seen as fatty degeneration in older patients.

At 8 weeks after first treatment clinical improvement is frequently, but not always, accompanied by improvement of ultra-structure. In these cases, exercise levels based on UTC may prevent relapses (do not start exercise too early).

This pilot study revealed benefits of the UTC-guided protocol, offering opportunities for long-term evaluation of ESWT in multi-center randomized trials.

**Conclusion:**

UTC imaging appeared to be utmost useful for ESWT of Achilles tendinopathy for prognostics, targeted application, objective evaluation and guided rehabilitation.