Diffusion Tensor Imaging And Muscle Fiber Tracking for the Assessment of Achilles Tendon Ruptures Healing

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My disclosure is in the Final AOFAS Program Book. I have no potential conflicts with this presentation.
INTRODUCTION

• Diagnostic and preoperative imaging of ATR is well documented,

• But radiographic evaluation of postoperative intratendinous healing and microstructure is lacking,

• Diffusion Tensor Imaging (DTI) used for quantitative assessment of intratendinous healing and fiber continuity postoperatively in patients with Achilles Tendon Rupture (ATR)
INTRODUCTION

• Diffusion tensor imaging (DTI) is a new MRI technique,
• A non-invasive tool to describe microstructure characteristics and organization of anisotropic tissues (e.g., muscle fibers and nerves) by means of directionality.
METHODS

• Sixteen patients, operated between the years 2005-2012
• Both Achilles of all subjects assessed on DT images.
• Device: 3T scanner (Philips Achievea Intera Release 2.3.6.7 Einthoven, the Netherlands)
• Key data acquisition parameters for DTI were TR/TE of 7343/55 ms, b-values of 0 and 1000 ms, 15 sampling directions, FOV of 191x230 mm, matrix of 98x132, and a slice thickness of 3 mm with no gap.
METHODS

• Regions of interest (ROIs) were placed over Achilles tendon with maximum diameter covering the whole tendon avoiding partial volume effect.
• ROIs were first identified in the high-resolution T2-weighted images and then transferred to the DT images.
• Achilles tendon diameter, thickness and volumes were measured on high-resolution T2-weighted images. Microstructure of Achilles tendons were assessed by means of muscle fiber tracking, tendon continuity, and fractional anisotropy (FA) and mean diffusivity (MD) values via DTI.
RESULTS

• Post-processing work station (Release 2.5.3.0 2007-12-03 Philips Medical Systems Nederland B.V).

• Average FA and MD values were measured from Achilles tendon from both sides. ROI’ were drawn by a radiologist.

• ROIs were selected as the biggest diameter covering the whole anatomic area without causing partial volume effect.

• Tendinous portion of the Achilles tendon complex could be viewed clearly on healthy side.
RESULTS

• Continuity of the operated side could be demonstrated and microstructures could be evaluated.
• Discontinuity of tendon fibers could be traced clearly on the operated side in early periods of the treatment.
• Tendon integrity and volume mostly improves as the postoperative period increases in years.
• Tendon integrity, volume, thickness, diameter as well as FA values of operated Achilles were decreased compared with that of the normal sides.
• Oppositely MD values were found to be increased in the operated side.
CONCLUSION

• Quantifying DTI and fiber tractography certainly offers an innovative and strong tool, which might be able to detect micro structural abnormalities that are not appreciable using conventional MRI techniques.

• The current study demonstrated the radiological properties of postoperative Achilles tendon with respect to volumetric recovery, trajectory and intratendinous fiber continuity by using DTI with fiber tracking technique, which has not mentioned in the previous studies in English language literature.
REFERENCES


