Ultrasound Measurement of Cross Sectional Area of the Achilles Tendon in an Asymptomatic Elite Military Population, a Prospective Cohort Study

Kevin D. Martin, MAJ, DO; Jeffrey Wake, 2LT, ATC, B.S.; Laura Dawson, LTC, DO; J. Preston Van Buren, ENS, B.S.
Disclosure

These authors did not receive any financial payments or other benefits from any commercial entity related to the subject of this article. The views and opinions of the authors do not represent those of the United States Government, the United States Army or Evans Army Community Hospital.
Background

• Achilles tendon pathology is common
• AT dysfunction can result in disability and reduced productivity
• Increasing our knowledge base of normal AT properties can improve our ability to reduce and prevent injury
• Monitoring changes using US measured CSA has been described,\(^4\)\(^5\) however, the effects of physical activity on CSA remain unclear.\(^2\)\(^,\)\(^12\)
Objectives

• In this study we examined the cross-sectional area of the AT at multiple levels in an asymptomatic population of army rangers to determine the adaptive changes that occur with their intense training program in comparison to historical controls.
Methods

• Prospective Cohort of 41 active duty US Army Rangers, 82 AT measurements
• Eligibility included 20 hours of intense weekly training, passed APFT within 6 months, passed pre-deployment health assessment physical.
• Sagittal and coronal diameters measured bilaterally at the insertion (0), 2cm, 4cm and 6cm proximally along the AT.
• CSA was calculated using the following equation:

\[ CSA \text{ of an Oval} = \pi(a)(b) \]
Results

- Average height and weight were 70” tall and 187lbs respectively.
- Mean sagittal diameter of the AT was: 4.4mm, 4.3mm, 3.9mm, 4mm at 0, 2, 4, and 6 cm, respectively.
- Mean coronal diameter of the AT was 19.3mm, 14.7mm, 13.8mm, and 14.5mm at 0, 2, 4, 6 cm, respectively.
- The CSA was calculated as: 0.66cm², 0.5cm², 0.46cm² and 0.44cm² at 0, 2, 4, 6 cm, respectively.
- The non-dominant ankle was slightly larger at each level but the difference was not statistically significant.
Discussion

• Results are nearly equivocal to those found in a comparable cohort of college athletes from North Carolina State University, USA with similar BMI which demonstrated an average CSA throughout the AT watershed of 42+/− 8mm$^2$.\textsuperscript{4}

• Results are also similar to a study of collegiate level, elite, hand ball players in Denmark with similar heights which demonstrated an average AT diameter of 5mm at 2cm superior to the insertion.\textsuperscript{5}

• In a comparable study of college athletes Chinese subjects who exercised more frequently (6 hours per week), had significantly larger CSA of the AT than those who exercised infrequently (1 hour per week). They concluded that the mean diameter of the Achilles tendon at the level of the medial malleolus was 5.2mm.\textsuperscript{13}
Discussion

• This study provides more knowledge regarding AT baseline and gives rise to the idea that hypertrophy may be pathologic rather than normal physiologic response to stress.
• This is particularly useful to practitioners that work with sports teams/military units, in guiding the management of athlete/soldier workload in those at high risk of AT tendinopathy.
• Further research is necessary to evaluate this idea and should include a wider variety of participants to better represent the general population.
Considerations

• Use of control group would largely enhance the strength of this study.
• This study utilizes individuals that do not represent the general population.

MAJ Kevin Martin, DO; LTC Laura Dawson, DO; 2LT Jeffrey Wake, MS-3, ATC; ENS J. Preston Van Buren, MS-3

Background

- Achilles tendon pathology is common
- AT dysfunction can result in disability and reduced productivity
- Increasing our knowledge base of normal AT properties can improve our ability to reduce and prevent injury

Objectives

- In this study we examined the cross-sectional area of the AT at multiple levels in an asymptomatic population of army rangers to determine the adaptive changes that occur with their intense training program.

Methods

- Prospective Cohort of 41 active duty US Army Rangers
- Eligibility included 20 hours of intense weekly training, passed APFT within 6 months, passed pre-deployment health assessment physical.
- 82 Achilles tendon measurements
- Sagittal and coronal diameters measured bilaterally at the insertion (0), 2cm, 4cm and 6cm proximally along the tendon.

Results

- Average height and weight were 70” tall and 187lbs respectively.
- CSA was calculated using the following equation:
  \[
  CSA \text{ of an Oval} = \pi (a)(b)
  \]

Discussion

- Our data in comparison to other data suggests that increased non-sport activity may not increase the CSA of the Achilles tendon.
- Identifying the normal CSA at multiple levels throughout the most commonly injured area can potentially improve the provider’s ability to identify early disease processes and apply targeted interventions to help slow or prevent progression and possible rupture.

Considerations

- Use of control group would largely enhance the strength of this study.
- This study utilizes individuals that do not represent the general population.


