

Elastography for evaluation of patellar tendon and quadriceps tendon elasticity: effect of knee position

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Authors: N. Romano¹, A. Fischetti¹, G. Rebella², G. Salsano², M. Marino³,
A. Muda¹; ¹Genova/IT, ²Genoa/IT, ³Roma/IT
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Aims and objectives

Ultrasound elastography is a developing form of ultrasonographic diagnostic technique evaluating the tissue elasticity based on differences in stiffness between different biological tissues.

There are different types of ultrasound elastography available and one of the most widely used methods is the strain elastography, also known as static or compression elastography.

This technique is used to study tissue elasticity alterations in different tissues such as thyroid, breast, lymph node, prostate, and musculoskeletal system.

To date, in musculoskeletal applications there are several studies applying ultrasound elastography to evaluate Achilles tendon but, to our knowledge, very few studies have investigated the clinical feasibility of ultrasound elastography in the assessment of patellar and quadriceps tendons.

These tendons are components of the knee extensor mechanism and their superficial locations make them ideal for evaluation with ultrasound elastographic techniques.

The purposes of our work are to:

- 1) *establish the normal ultrasound elastography appearance of the patellar tendon and quadriceps tendon*
- 2) *determine the effect of knee position on their elasticity.*

Methods and materials

21 healthy males (25-30 y.o.) were recruited.

Each participant underwent ultrasound elastography of both patellar and quadriceps tendons. *42 patellar tendons and 42 quadriceps tendons were examined.*

Examination was performed with a linear 13 MHz ultrasound transducer (EsaoteMyLab Twice) equipped with strain elastography.

Each tendon was evaluated in passive flexion and passive extension and all tendons had a normal sonographic grey-scale appearance.

For the elastography evaluation of patellar tendon, a ROI was placed over the proximal aspect of the tendon, just distal to the inferior pole of the patella and an additional ROI of the same size was placed over the adjacent Hoffa's fat. For the elastography evaluation of quadriceps tendon, a ROI was placed over the distal aspect of the tendon, just proximal to the superior pole of the patella and an additional ROI of the same size was placed over the suprapatellar fat pad.

The ratio between the two ROI (tendon and fat) was calculated.

Images for this section:

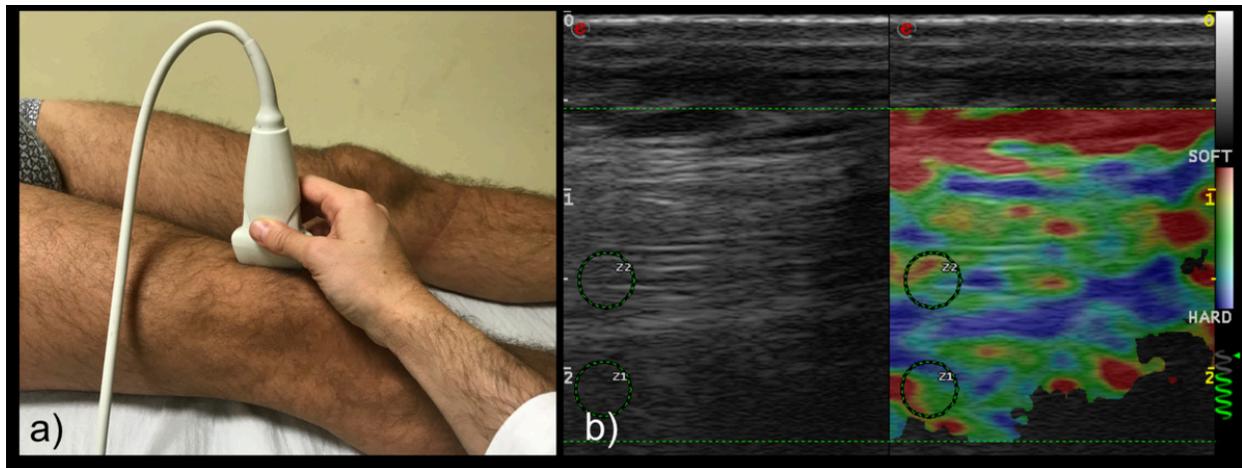


Fig. 1: Knee in passive extension (a) and ultrasound elastography evaluation of the quadriceps tendon (b)

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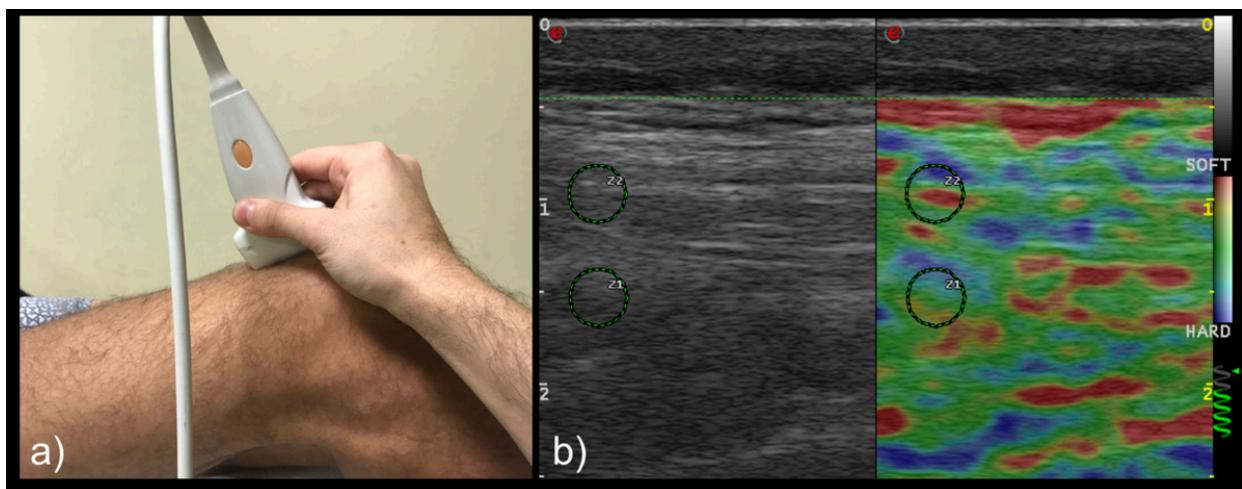


Fig. 2: Knee in passive flexion (a) and ultrasound elastography evaluation of the quadriceps tendon (b).

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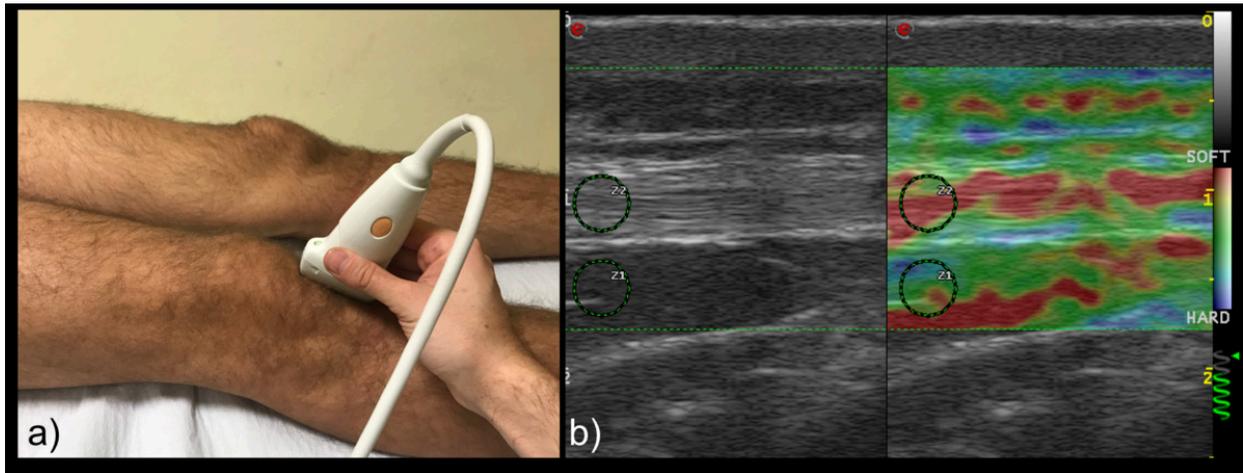


Fig. 3: Knee in passive extension (a) and ultrasound elastography evaluation of the patellar tendon (b)

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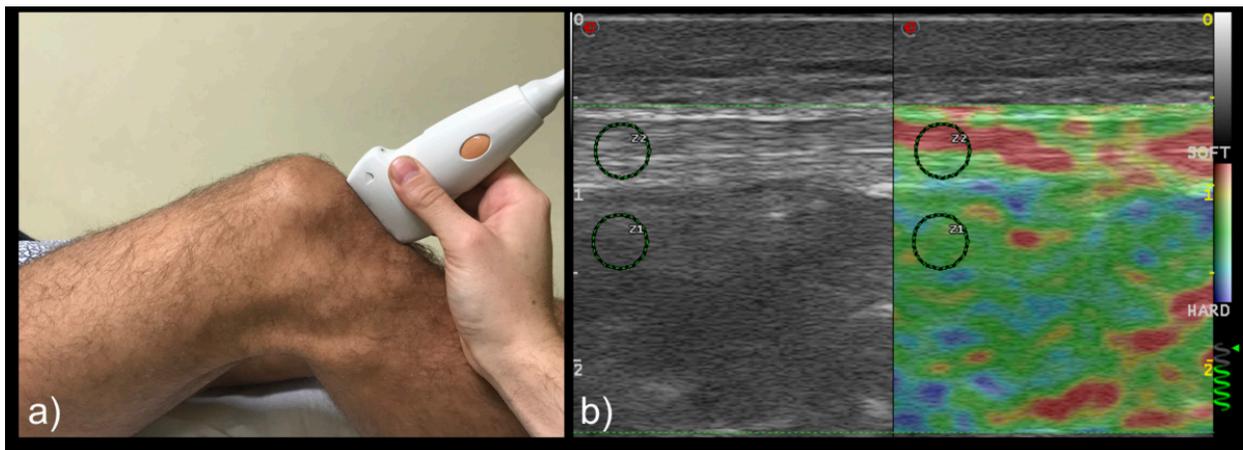


Fig. 4: Knee in passive flexion (a) and ultrasound elastography evaluation of the patellar tendon (b)

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Results

42 patellar tendons and 42 quadriceps tendon were examined.

For each tendon, the results of ratio between the two ROI were compared using the t-test.

In passive extension the elasticity of the patellar tendon was significantly lower ($p < 0.001$) than in passive flexion.

In passive extension the elasticity of the quadriceps tendon was significantly lower ($p < 0.005$) than in passive flexion.

No differences between right and left sides were evident.

Conclusion

In conclusion, the elasticity of patellar and quadriceps tendons is dependent on knee position. In particular, in passive extension the elasticity of both the patellar and quadriceps tendon is significantly lower than in passive flexion.

This knowledge is important for the standardization of knee position during ultrasound elastography examination.

Personal information

Nicola Romano:

Department of Radiology, University of Genoa, Italy

Aldo Fischetti:

Department of Radiology, University of Genoa, Italy

Giacomo Rebella:

Department of Radiology, University of Genoa, Italy

Giancarlo Salsano:

Department of Radiology, University of Genoa, Italy

Marzia Marino:

Department of Radiology, General Hospital of Loreto, ASUR2, Ancona, Italy

Alessandro Muda: Department of Radiology, Policlinico San Martino, Genoa, Italy

Corresponding author: Nicola Romano

For questions and/or comments about this poster, please contact me at:

romano.nicola@live.it

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