RESEARCH ARTICLE

Ultrasound findings in lateral elbow tendinopathy: A retrospective analysis of radiological tendon features [version 1; peer review: 2 approved with reservations]

Guillermo Droppelmann ¹⁻³, Felipe Feijoo⁴, Cristobal Greene¹, Manuel Tello ⁴, Julio Rosales¹, Roberto Yáñez¹, Carlos Jorquera⁵, David Prieto^{6,7}

¹Centro de Investigación en Medicina Ejercicio Deporte y Salud, Clínica MEDS, Santiago, RM, 7691236, Chile

²Health Sciences PhD program, Universidad Católica de Murcia (UCAM), Campus de los Jerónimos nº135, Murcia, Guadalupe 30107, Spain

³Principles and Practice of Clinical Research (PPCR), Harvard T.H. Chan School of Public Health, Boston, MA, 02115, USA

⁴School of Industrial Engineering, Pontificia Universidad Católica de Valparaíso, Valparaíso, 2374631, Chile

⁵Facultad de Ciencias, Escuela de Nutrición y Dietética, Universidad Mayor, Santiago, RM, 8580745, Chile

⁶Applied Statistical Methods in Medical Research Group, Universidad Católica San Antonio de Murcia, Campus de los Jerónimos nº135, Murcia, Guadalupe 30107, Spain

⁷Faculty of Epidemiology and Population Health, London School of Hygiene and Tropical Medicine, London, WC1E 7HT, UK

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Abstract

Background: Lateral elbow tendinopathy (LET) is prevalent in the upper extremity, with various therapeutic options. Understanding the types and the relations between the radiological tendon features would help to develop more specific treatments. This study reviewed ultrasound exams of LET to investigate the types of degenerative findings and the relationships between them in one of the most prominent sports medicine clinics in Latin America.

Methods: A retrospective study was performed. We evaluated 4335 ultrasonographic exams with LET from 2017 and 2018. Five principal degenerative ultrasound criteria with subtypes were selected: hypoechogenicity, neovascularity, calcification, enthesopathy, and intrasubstance tear. A multiple linear regression model was conducted to explore the association between the findings, sex, and age.

Results: Overall, 4324 ultrasound exams were analyzed; 2607 (60.29%) were males. Multiple degenerative tendon findings were found in adults (≥ 18 years) with LET. Hypoechogenicity (67.77%) and neovascularity (37.8%) were the most frequent. The mean length of a tendon tear in both sexes was 4.44 (± 2.81) millimeters. Mild hypoechogenicity ($P < .001$), and depth intrasubstance tear ($P < .01$) were statistically significant between them. Severe hypoechogenicity was associated with an increase in all tendon tear dimensions for length 1.37 ([95% Confidence interval (CI), 0.57, 2.17]; $P < .001$), for

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1. **Rodrigo Antonio Guzmán-Venegas** ,
Universidad de los Andes, Santiago, Chile

2. **Stefanos Karanasios** , University of West
Attica, Egaleo, Greece

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width 1.10 ([95% CI, 0.33, 1.87]; $P < .01$) and for depth 1.64 ([95% CI, 0.40, 2.88]; $P < .01$). Additional findings associated with an increase in the length dimension were 0.42 associated with focal neovascularity ([95% CI, 0.19, 0.65]; $P < .001$), and 0.71 associated with multiple neovascularity ([95% CI, 0.27, 1.15]; $P < .01$).

Conclusions: Hypoechogenicity and neovascularity findings presented a positive association with the size of tendon tear in patients with LET. This study reaffirms the increased predominance of tendon tear during the 4th to 6th decades of life.

Keywords

Extensor carpi radialis brevis, tendon tear, tennis elbow, ultrasound.

Corresponding author: Guillermo Droppelmann (guillermo.droppelmann@meds.cl)

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Introduction

Tendinopathies are a crucial global burden of musculoskeletal disorders.¹ Specifically, lateral elbow tendinopathy (LET), or tennis elbow,² is one of the most prevalent degenerative conditions in the upper extremity.³ It has been shown that LET affects both sexes, between 35 to 54 years⁴ with severe pain,⁵ and functional disability in wrist extension and handgrip activities.^{6,7} The LET symptoms can persist for more than 12 months,⁸ directly impacting a patient's quality of life,⁹ sports activities,¹⁰ occupational settings¹¹ and the health system.¹²

The LET pathogeneses are similar to other tendinopathies. These includes collagen disorganization, neurovascular ingrowth,¹³ tissue necrosis with myxoid and hyaline degeneration and fibrosis.¹⁴ Most of the degenerative process is concentrated on the extensor carpi radialis brevis (ECRB) tendon.^{15,16} These histological changes were first described in 1979.¹⁷ In 2009, two researchers proposed an alternative model to describe continuous tendon changes based on three states of its structure: reactive, disrepair and degenerative.¹⁸ Additionally, in 2016, another investigation included a final phase with gross structural disruption and tendon tear.¹⁹

These structural tendon changes can be identified with imaging methods,²⁰ ultrasound (US) findings in the degenerative stage has been well documented²¹ and can be a useful tool to detect signs such as hypoechoic areas, neovascularization, calcifications, enthesopathy, and intrasubstance tears²² with better sensitivity and accuracy than magnetic resonance imaging (MRI).^{23,24}

In this context, there is no consensus in the literature about the main ultrasound findings in LET. For example, a study evaluated 240 patients with this condition with the highlighted presence of calcifications,²⁵ but another article identified hypoechoic areas, partial and total tears principally.²⁶

Currently, articles have been published with standardized graduations of US findings, allowing to subclassify the magnitude of the tendon's structural changes.^{21,27} For instance, hypoechogenicity and hyperemia have been divided in severity values of 0% to 30%, between 30 to 50% and more than 50%.²⁸ Intrasubstance tears of the tendon have also been added.²⁹ However, the dimensions and magnitudes have not yet been specified.²² Still, most of the articles have reported individual degenerative tendon characteristics without studying the relationship and occurrence of more than one degenerative characteristic simultaneously. And this is vital because abnormalities in the tendon structure are considered a risk factor for developing symptoms of LET.³⁰ For example, an author suggested vascular in-growth into tendons may be the cause of tendon weakness and tears.³¹ Another article confirmed that 97% of tendon tears have degenerative changes.³² More recently, a meta-analysis indicated that there was a higher relative risk for developing clinical tendinopathy when multiple US findings were considered.³³

We know that the tendon tear is the final phase of the degenerative process in this tissue and the number of US findings could determine the severity of the tendinopathy. However, the frequency of degenerative findings, the size of tendon tears, and the association between them in LET are poorly known. Indeed, to date, no studies have investigated the types of degenerative findings and the relationships between them. Hence the main aim of this study was to identify the frequency and evaluate associations between standardized degenerative tendon findings with tendon tears in three sizes dimensions (length, width, and depth). This is a unique study with one of the most extensive collections of ultrasound exams analyzed to the best of the authors' knowledge.

Methods

Ethics statement

This study has been performed in keeping with the latest version of the Declaration of Helsinki, in accordance with Chilean legislation. The study was approved by the Comité de Ética Científico Adulto del Servicio Metropolitano Oriente de la ciudad de Santiago de Chile (SSMO). The ethical committee required no informed consent from patients given the retrospective nature of the study. The project was approved on August 17, 2018. No approval number was recorded.

Study design

This research was designed as a descriptive, retrospective, multicentric study and was written in accordance to the Strengthening the Reporting of Observation studies in Epidemiology (STROBE) guideline.³⁴ This study started on January 14, 2019. All patients with documentation of elbow ultrasound at MEDS Clinic in Santiago, Región Metropolitana, Chile, from January 1, 2017, to December 31, 2018, were selected for the study. The included patients had LET suspicion with any unilateral or bilateral signs or symptoms in this period. If the patient had multiple episodes of LET at different times, each episode was included. Our Medical Imaging Software (Carestream RIS, v.11) allows a word search of the whole electronic ultrasound exams record database between 2017 to 2018. Authors GD, FF, and MT had access to the database. Any structural tendon change of all the patients with exams of any search containing the word LET were

included. The exams were diagnosed by five musculoskeletal radiologists with more than ten years of experience. Of these, only JR was an author of this article. The professionals used an Aplio 500 US system (Toshiba America Medical Systems, Inc, Tustin, CA) equipped with a multifrequency linear transducer with a frequency of 18 MHz to inform the LET condition. Demographics such as sex, age, and size of the injury were recorded. The exams with a history of musculoskeletal ultrasound guided treatment, such as injections, or any surgery, were excluded from the analysis. Physical activity, pain score, and time of symptoms were not reported.

Degenerative ultrasound findings and classification

We proposed a standardized categorization to assess the presence of five principal US criteria with subdivisions based on previous reports in the literature.^{16,21,26,35,36} A normal tendon was defined as no changes in the tendon structure. Hypoechogenicity was defined as being rounded and not associated with tendon disruption and was evaluated depending on the tendon extension structure, with an ordinal score from 0 to 3, with 0 representing a normal tendon echogenicity, mild level (HE1) is 1% to 30%, moderate level (HE2) is 31% to 50% and severe level (HE3) is over 50%. Neovascularity was assessed with the maximum number of color pixels occupying the tendon origin, an ordinal score from 0 to 2, where 0 represents no neovascularity presence, 1 represents focal neovascularity (NV1) with 30% blood vessels, and 2 refers to multiple neovascularity (NV2) consisting of more than 31% blood vessels. A linear intrasubstance tear was defined as a linear hypoechoic focus associated with discontinuity of tendon fibers. The number of tendon tears was recorded as a focal intrasubstance tear (IST1) or multiple intrasubstance tear (IST2). The size of the abnormality was measured in millimeters. The site of the abnormality was examined in two planes and assigned as predominantly affecting the superficial, mid, or deep fibers and the anterior, mid, or posterior fibers. Calcification (C) was defined as calcium deposits in the substance of the tendon and enthesopathy (E) was defined as the pathologies that affect the entheses. Both findings were categorized as a binary score (absent and present).

Statistical analysis

Data was reported with frequencies, means, and standard deviations (SD), when corresponding. The Chi-square test was used to compare categorical data and T-test for continuous variables. Univariate comparisons between the tear's size in each dimension and degenerative findings were performed using the Kruskal Wallis test. A separate multiple linear regression model was fit to analyze the association between sex, age, and degenerative findings with tendon tear in each dimension (length, width, and depth).

Neither final exposure variables nor outcome data presented missing values. Missing data analysis showed that missingness were at random; multivariate regression imputation was employed as required. P value < .05 was considered a statistically significant, two-tailed statistics were used. All graphs and analyses were performed using R (The R Foundation for Statistical Computing, v. 3.6.2) and (RStudio, v.4.1.0).

Results

A total of 4335 US exams from 2926 patients with suspicion of LET were included in our analysis. Of these, 11 exams were excluded as they did not present any final report. Summary data from ultrasonographic exams are available in *Underlying data*.⁴⁵ The age of patients with LET presented a minimum value of 18 years and a maximum of 91 years. The data shows that women have a mean age 47.18 ± 11.00 ($P < .001$), and are on average, one year older than males. In 70% of the patients, the affected side was the right elbow.

The HE1 was the most frequent structural change detected on US (53.07%), followed by enthesopathy (35.01%), focal neovascularity (33.55%), and focal intrasubstance tear (31.91%). However, when the results considered the subtypes classification, the frequency distribution changed. Frequency (number of cases diagnosed) for most of the degenerative findings were very similar between females and males. More than a third of exams with LET showed an intrasubstance tear in the tendon, see [Table 1](#).

Additionally, men with focal and multiple intrasubstance tears, in all three dimensions (length, width, depth), presented a larger tear size than women. Overall, the variables age ($P < .001$), HE1 ($P < .001$), and depth IST1 ($P < .01$) were statistically significant between females and males. A synthesis is provided in [Table 1](#).

Relationship between tendon tear and degenerative findings

The category of hypoechogenicity depends on the size of the intrasubstance tear. The length compared with width and depth dimensions presented the most significant variability among hypoechogenicity levels. Also, an increase in the median length of the tear occurs when the tendon presented higher levels of hypoechogenicity (HE3).

Table 1. Demographic characteristics and degenerative findings in ultrasound exam with lateral elbow tendinopathy.^a

Demographic characteristics/ degenerative findings	Female (n = 1717)	Male (n = 2607)	p- value	Total (n = 4324)
Age	47.18 ±11.00	45.99 ±11.03	< .001 ^b	46.46±11.03
Right side of the injury	1179 (68.66)	1790 (68.66)	.98	2969 (68.66)
HE0	516 (30.05)	877 (33.64)	.014	1393 (32.21)
HE1	961 (55.96)	1334 (51.16)	< .001 ^b	2295 (53.07)
HE2	222 (12.92)	373 (14.30)	.19	595 (13.76)
HE3	18 (1.04)	23 (0.88)	.58	41 (0.94)
NV0	1081 (62.95)	1608 (61.68)	.41	2689 (62.18)
NV1	558 (32.49)	893 (34.25)	.22	1.451 (33.55)
NV2	78 (4.54)	106 (4.06)	.45	184 (4.25)
IST0	1135 (66.10)	1727 (66.24)	.94	2862 (66.18)
IST1	552 (32.14)	828 (31.76)	.79	1380 (31.91)
Length, mm	3.84 ± 1.72	4.78 ± 3.24	.91	4.44 ± 2.81
Width, mm	1.54 ± 0.86	2.35 ± 1.95	.88	2.04 ± 1.66
Depth, mm	1.66 ± 0.83	3.02 ± 3.84	< .01 ^b	2.83 ± 3.58
IST2	30 (1.74)	52 (1.99)	.55	82 (1.89)
Length, mm	3.30 ± 1.58	3.39 ± 1.87	.20	3.36 ± 1.76
Width, mm	2.28 ± 1.46	2.36 ± 1.63	.13	2.33 ± 1.56
Depth, mm	2.10 ± 1.13	2.52 ± 1.28	.57	2.36 ± 1.24
C0	1604 (93.41)	2452 (94.05)	.43	4056 (93.80)
C	113 (6.58)	155 (5.94)	.39	268 (6.19)
E0	1118 (65.11)	1692 (64.90)	.91	2810 (64.98)
E	599 (34.88)	915 (35.09)	.87	1514 (35.01)

^aValues are presented as mean ±SD or No. (%). HE0, no hypoechogenicity; HE1, mild hypoechogenicity; HE2, moderate hypoechogenicity; HE3, severe hypoechogenicity; NV0, no neovascularity; NV1, focal neovascularity; NV2, multiple neovascularity; ISR0, no intrasubstance tear; IST1, focal intrasubstance tear; IST2, multiple intrasubstance tear; C0, no calcification; C, calcification; E0, no enthesopathy; E, enthesopathy.

^bStatistical significance between the groups, $P < .05$.

Particularly, [Figure 1](#) shows that the length of the tear for HE3 cases, when compared with HE2, is significantly different ($P = .035$). Nevertheless, when the width of the tendon tear and different levels of hypoechogenicity were considered, the biggest difference ($P < .001$) occurred between HE1 to HE2 (not shown in the figure).

Similarly, in [Figure 2](#), we show the relationship for the width dimension of tendon tear with the presence of two neovascularity levels (NV1 and NV2). Again, higher values of width tear dimensions were associated with the presence of the greater neovascularity level ($P < .005$). However, only NV0 to NV1 transitions demonstrated a significant difference ($P < .004$). Something similar happened with the depth of tear. This case did not show statistically significant differences among neovascularity levels. This may be due to the low frequency of cases in the deep dimension (not shown in figure).

Finally, [Figure 3](#) shows that the depth dimension presented the highest statistical difference ($P = .007$) between HE0 and HE1, with no essential differences among hypoechogenicity HE1 and HE2 levels. Also, HE2 compared to HE3 shows statistical significance ($P = .025$). However, the number of cases with depth tear and HE3 is deficient, hence it might not be representative.

Subsequently, we examined if the three dimensions of tendon tear presented statistical differences with the presence of other degenerative findings. We performed linear regression models for each tear dimension as shown in [Table 2](#). Hypoechogenicity had an effect in all tendon tear dimensions with an average increase from H0 to H3 of 1.37

Figure 1. Relationship between length of intrasubstance tear in millimeters and hypoechoogenicity. The highest hypoechoogenicity levels show the most length of intrasubstance tear. HE0, no hypoechoogenicity; HE1, mild hypoechoogenicity; HE2, moderate hypoechoogenicity; HE3, severe hypoechoogenicity.

([95% CI, 0.57, 2.17]; $P < .001$) in length, of 1.10 ([95% CI, 0.33, 1.87]; $P < .01$) in width and of 1.64 ([95% CI, 0.40, 2.88]; $P < .01$) in depth. For the length dimension, neovascularity showed an average increase of 0.42 ([95% CI, 0.19, 0.65]; $P < .001$) and multiple neovascularity of 0.71 ([95% CI, 0.27, 1.15]; $P < .01$). Enthesopathy reduced the average width by -0.37 ([95% CI, -0.62, -0.13]; $P < .01$) and increased the average width by 0.57 ([95% CI, 0.19, 0.95]; $P < .01$) respectively.

For practically all the dimensions, neovascularity and both moderate and severe hypoechoogenicity findings presented positive coefficients. The higher the presence of these findings, the greater the size of the tear. However, the presence of calcifications and enthesopathy are mostly associated with a decrease in the size of the tear.

We found that the size of tendon tear, for all three dimensions, increased with age. Patients above 60 years show higher length tendon tear 0.88 ([95% CI, 0.40, 1.35]; $P < .001$) and width tendon tear 0.61 ([95% CI, 0.09, 1.14]; $P < .05$) both with significant p-values. Although male patients have an increased size of tear in all dimensions compared to women, this was only barely significant in the depth of the tear 0.32 ([95% CI, 0.00, 0.65]; $P < .05$). Note that patients in age-groups 0-20 and over 81 years old did not present tendon tear.

Finally, it was evaluated whether interactions between the exposure variables could improve the models in any of the three proposed dimensions of tendon tear. However, none of the interactions among the different types of degenerative findings presented statistical significance.

Discussion

The presence of tendinopathies is a frequent problem for the general population and athletes. Notably, LET is the most commonly diagnosed elbow musculoskeletal disorder and still represents an unresolved problem for public health.³⁷ Multiple studies have discussed the structural changes that can be found exclusively in LET such as tissue thickening,

Figure 2. Relationship between width of intrasubstance tear in millimeters and neovascularity. Vascularity presence shows higher values of width tear. NV0, no neovascularity; NV1, focal neovascularity; NV2, multiple neovascularity.

hypoechoic areas, neovascularization areas, fibrillary disruption, and bone abnormalities.^{21,26,34} As demonstrated in this research, it is infrequent that the degenerative findings are present in isolation and unrelated. Our study allows us to determine the presence of four large groups of degenerative findings and the presence of gradual lesions, which can determine the presence of tear within the tendon.

In a large sample of ultrasounds exams obtained over two years, our analysis indicates that the age and tendon degenerative findings of patients were the most critical factors associated with increased tendon tear in any dimension. Particularly, we found a positive relationship between the presence of hypoechogenicity levels and the length of tear and neovascularity levels with the tear width. This result suggests that if the goal is to reduce the magnitude and the variability of tendon tear in patients with LET, hypoechogenicity, and neovascularity should influence the importance of degenerative findings, so preventive ultrasound exams could be useful to avoid potential tendon tears.³⁸ Furthermore, this information can be used to assess lateral elbow tendinopathy severity. For example, investigators concluded that the size of intrasubstance tear on an ultrasound could determine which patients respond to nonoperative treatment and the correlation with functional disability.³⁹ However, the tendon tear description did not include the magnitude of the tear dimension, HE, and NV findings. Therefore, it is essential to have this information in future studies.

On the other hand, there are several possible explanations for the positive association of hypoechogenicity and neovascularity with the dimension of the tendon tear. Firstly, the ECRB is the central tendon involved in a degenerative process of LET, and in this study, we only considered the exhaustive descriptions and analysis for degenerative ultrasound findings in the interior of this tendon. However, most of the existing publications describe the relation between LET and different anatomical aspects⁴⁰ or other adjacent tissues such as nerve, ligaments, muscles, bone structures or more tendons⁴¹ and even other health conditions that are not unique to the alteration of the origin of the wrist extensors.

Figure 3. Relationship between depth of intrasubstance tear in millimeters and hypoechoogenicity. Hypoechoogenicity presence could influence the depth of intrasubstance tear. HE0, no hypoechoogenicity; HE1, mild hypoechoogenicity; HE2, moderate hypoechoogenicity; HE3, severe hypoechoogenicity.

Secondly, researchers have proposed that the tendon pathogenesis model is continuous, arguing that there is a 3-state transition from an initial stage characterized by reactive tendinopathy, a second disruptive stage, and finally, a third degenerative stage.⁴² We believe that this last stage also presents graduation, particularly with some degenerative findings because they can be subdivided according to their degree of commitment. Furthermore, the existence of the demonstrated associations could support future predictive models that determine whether the existence of one finding anticipates the appearance of another.

Recently, a study showed that LET primarily affects middle-aged people⁴³ and that the probability of having LET decreases with older age.¹² Our study shows that age is strongly associated with the tendon tear's size, so the older the patient, the higher the magnitude of the tear independent of the dimension evaluated. The results confirm that men have LET almost a year earlier than women. However, the clinical importance lies in identifying the tendons' structural characteristics using ultrasound.

Some authors even propose that US examinations be performed even in subjects who do not present symptoms but could present degenerative findings.²⁷ As we could observe in our study, the degenerative findings could present graduations before the tendon tear, so earlier identification of these findings would allow monitoring future tendon tears and could improve the therapeutic resolution capacity. It is important to have future publications that can assign a time factor to degenerative findings to understand the natural evolution of such tendon tear.

Limitations

The study's principal limitation was the retrospective design, which is often considered inferior to prospective, randomized, and controlled clinical trials.⁴⁴ Additionally, we couldn't manage the imaging procedure and settings, and inter and intra rater reliability was not considered, losing external validity. Further limitations include assessment only of ECRB tendon, hindering results generalization. However, this is the study with the highest number of exams

Table 2. Estimated coefficients for tendon tear by dimension within demographic characteristics and degenerative finding.^a

	Length n = 1107	Width n = 705	Depth n = 226
Age			
1-40 [*]	93 (8.40)	65 (9.21)	18 (7.96)
41-60	897 (81.02)	574 (81.41)	189 (83.62)
61 +	117	66	19 (8.40)
Sex			
Female [*]	435 (39.30)	279 (39.58)	86 (38.05)
Male	672 (60.70)	426 (60.42)	140 (61.95)
Degenerative finding			
HE0 [*]	101 (9.12)	82 (11.65)	50 (22.13)
HE1	679 (61.34)	394 (55.88)	113 (50)
HE2	304 (27.46)	210 (29.78)	58 (25.66)
HE3	23 (2.07)	19 (2.69)	5 (2.21)
NV0 [*]	340 (30.71)	230 (32.64)	90 (39.83)
NV1	693 (62.60)	432 (61.27)	123 (54.42)
NV2	74 (6.68)	43 (6.09)	13 (5.75)
C0 [*]	1019 (92.06)	665 (94.33)	217 (96.02)
C	88 (7.94)	40 (5.67)	9 (3.98)
E0 [*]	652 (58.90)	380 (53.91)	112 (49.56)
E	455 (41.10)	325 (46.09)	114 (50.44)

^aValues are presented No. (%) and estimated coefficients (95% confidence intervals); HE0, no hypoechogenicity; HE1, mild hypoechogenicity; HE2, moderate hypoechogenicity; HE3, severe hypoechogenicity; NV0, no neovascularity; NV1, focal neovascularity; NV2, multiple neovascularity; C0, no calcification; C, calcification; E0, no enthesopathy; E, enthesopathy;

^{*}Comparator;

^bStatistical significance between the groups, $P < .05$.

analyzed to the best of the authors' knowledge. An additional limitation was that the images correspond to patients with different conservative treatments, pain scores, evolution times, physical activity levels, comorbidities, and clinical manifestations. This study focused solely on the characteristics of ultrasound exams, not incorporating these elements. Future studies should consider a cohort design to assess these considerations.

Conclusions

In summary, this study provides evidence of a positive association between the presence of hypoechogenicity and neovascularity findings with the increased size of a tendon tear in patients with LET. Additionally, we reaffirm the higher frequency of tendon tears between 40 to 60 years of age but a greater magnitude of the injury from 60 years of age. This article demonstrates the importance of degenerative findings in the magnitude of tendon injury.

Data availability

Underlying data

The ultrasonographic exams are not available publicly because consent for publication of raw data was not obtained, and the dataset could pose a threat to confidentiality. Researchers and reviewers interested in accessing the data will need to submit an official request letter to the Academic Unit, MEDS Clinic. They must also confirm that they will not violate the ethical standards of the ethical committee and protect the anonymity of the participants. Interested parties can contact the corresponding author, Guillermo Drippelmann (guillermo.drippelmann@meds.cl) who can facilitate this process.

Figshare: Ultrasound findings in lateral elbow tendinopathy. <https://doi.org/10.6084/m9.figshare.16713427.v4>⁴⁵

This project contains the following underlying data:

- LET - data.xlsx (summary data from ultrasonographic exams).

Data are available under the terms of the [Creative Commons Attribution 4.0 International license](#) (CC-BY 4.0).

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Version 1

Reviewer Report 07 September 2022

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Stefanos Karanasios

Physiotherapy Department, University of West Attica, Egaleo, Greece

The current study as a retrospective analysis, offers several valuable results in the field of tendon radiological evaluation in patients with lateral elbow tendinopathy (LET). Methods are clearly described and results adequately presented.

The authors discuss the interesting relationship between tendon degeneration, aging and the presence of tears which possibly adds a new perspective in the future research and clinical practice in the management of LET (tendinopathy continuum model). Authors adequately discuss the inherent limitations in a retrospective study i.e. lacking inter- intra tester reliability of ultrasonographers and correlation of patients' characteristics (pain, disability, chronicity etc.)

Some points requiring further attention include:

- *"ultrasound (US) findings in the degenerative stage has been well documented²¹ and can be a useful tool to detect signs such as hypoechoic areas, neovascularization, calcifications, enthesopathy, and intrasubstance tears²² with better sensitivity and accuracy than magnetic resonance imaging (MRI).^{23,24}"*

Contemporary evidence does not support this statement¹.

- the lack of evaluation of other ultrasound findings such as thickness, enthesopathy etc. could be discussed as a limitation

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Is the work clearly and accurately presented and does it cite the current literature?

Yes

Is the study design appropriate and is the work technically sound?

Yes

Are sufficient details of methods and analysis provided to allow replication by others?

Yes

If applicable, is the statistical analysis and its interpretation appropriate?

Yes

Are all the source data underlying the results available to ensure full reproducibility?

Yes

Are the conclusions drawn adequately supported by the results?

Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Musculoskeletal Rehabilitation

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

Reviewer Report 21 April 2022

<https://doi.org/10.5256/f1000research.77090.r128754>

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Rodrigo Antonio Guzmán-Venegas

Laboratorio LIBFE, Escuela de kinesiólogía, Facultad de Medicina, Universidad de los Andes, Santiago, Chile

The study consists of a prospective design investigation where a secondary database was analyzed. The objective of the study was to identify the frequency and evaluate associations between standardized degenerative tendon findings with tendon tears in three size dimensions.

The selected methodology made it possible to adequately achieve the objective. The exposition of the method and its details makes the reproduction of the study feasible. Statistical methods seem adequate to me and the conclusions are based on the results obtained.

There are some small details that need to be corrected:

- In the introduction, the authors refer to a process of neurovascular growth, perhaps they meant neovascular?

- If possible to do so, terms must be translated into English in the following sentence: Comité de Ética Científico Adulto del Servicio Metropolitano Oriente de la ciudad de Santiago de Chile

Is the work clearly and accurately presented and does it cite the current literature?

Yes

Is the study design appropriate and is the work technically sound?

Yes

Are sufficient details of methods and analysis provided to allow replication by others?

Yes

If applicable, is the statistical analysis and its interpretation appropriate?

Yes

Are all the source data underlying the results available to ensure full reproducibility?

Yes

Are the conclusions drawn adequately supported by the results?

Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Biomechanics & Biomechanics of tissues

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

Author Response 22 Apr 2022

GUILLERMO DROPELMANN, Clínica MEDS, Santiago, Chile

Thank you very much for your comments.

1. You must use the original or native name of the ethical committee.

2. Neovascular growth or neovascular is the same.

Thank you again for your effort and time. All the best.

Competing Interests: No competing interests were disclosed.

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