Value of Ultrasonography on Diagnosis and Assessment of Pain and Grip Strength in Patients with Lateral Epicondylitis

Lateral Epikondilitli Hastalarda Ultrasonografinin Tanı ve Ağrı ve Kavrama Gücü Değerlendirmesinde Önemi

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Abstract

Objective: Lateral epicondylitis (LE) is generally diagnosed clinically. Ultrasonography (US) can provide useful information about the location, extent, and severity of LE. Our objective was to use US to confirm LE and to investigate the relationships between pain, grip strength, physical examination, and disability in these patients.

Material and Methods: Fifty-two patients with unilateral LE were examined by US. Pain and functional status were assessed using a visual analog scale (VAS), physical functioning and bodily pain scales of the Medical Outcomes Study 36-Item Short-Form Health Survey (SF-36), and a patient-rated forearm evaluation questionnaire (PRFEQ). Grip strength and manual tests for LE were evaluated.

Results: Clinical diagnosis of LE was confirmed by US in 28 (53.8%) patients. Our results showed close associations between clinical examination findings and SF-36 and PRFEQ assessments with pain in patients who had sonographic abnormalities. Grip strength was also correlated with clinical and functional evaluations in these cases.

Conclusion: We concluded that evaluation of disability in LE requires methods different from those included in the traditional clinical examination. Pain and grip strength measurements provide numerical and quantitative data for evaluation of severity and disability in patients with sonographic findings of LE.

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Key words: Clinical examination, functional disability, lateral epicondylitis, ultrasonography

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Özet

Amaç: Lateral epikondilit (LE) esasen klinik olarak tanınır. Ultrasonografi (US) LE'nin şiddeti, boyutu ve yerleşimi hakkında yararlı bilgi sağlayabilir. Amaç, LE'nin doğrulanması için US'nin kullanılması ve bu hastalarda ağrı, kavrama gücü, fizik bakı ve engellilik arasındaki ilişkileri incelemekti.

Yöntem ve Gereçler: Unilateral LE'li 52 hasta US ile incelendi. Ağrı ve fonksiyonel durum görsel analog ölçütü, Yaşam Kalitesi Short Form-36 (SF-36), patient-rated forearm evaluation questionnaire (PRFEQ) kullanılarak belirlendi. Kavrama gücü ve LE için manüel testler değerlendirildi.

Bulgular: Hastaların 28'inde (%53.8) LE'nin klinik tanısı US ile doğrulandı. Sonuçlarımız sonografisi anormal hastalarda, klinik muayene bulgularıyla SF-36 ve PRFEQ ağrı değerlendirmeleri arasında yakın ilişkiyi gösterdi. Bu hastalarda kavrama gücüyle de klinik ve fonksiyonel değerlendirmeler arasında karşılıklı ilişki vardı.

Sonuç: LE'de engellilik değerlendirmesinde geleneksel klinik muayeneden başka yöntemlere ihtiyaç olduğu kanısına vardık. LE'nin sonografik bulguları olan hastalarda, ağrı ve kavrama gücü ölçümleri şiddet ve engelliğin değerlendirilmesinde sayısal ve nicel bilgi verir.

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Anahtar sözcükler: Klinik muayene, fonksiyonel engellik, kavrama gücü, lateral epikondilit, ultrasonografi

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Introduction

Lateral epicondylitis (LE) is a troublesome disorder of the arm and is generally diagnosed clinically, on the basis of a typical history and manual provocation tests. Although there are several other lesions that have been reported, some authors have presented enthesopathy as the unifying cause (1). Some neurological syndromes, namely cervical spine disease with radiculopathy and posterior interosseus nerve entrapment, may mimic LE. Bursitis has also been associated with LE (1-3). Nevertheless, the definition of soft tissue pathology on clinical examination remains difficult.

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Ultrasonography (US) is an operator-dependent examination that is relatively inexpensive, accessible, and radiation-free. The advent of high-frequency probes has resulted in improved resolution, allowing the application to extraarticular soft tissues for which US is increasingly used as an alternative to magnetic resonance imaging (MRI) (4). US of the common extensor origin can be used to confirm LE in patients with lateral elbow pain and provides information about the severity of the disease (1, 4, 5).

In contrast to many physicians who regard LE as a benign self-limiting condition, it may be the source of prolonged pain and persistent impairment in activities for many months (6). Therefore, it is interesting to evaluate the possible changes in pain and muscle strength measures as indicators of treatment effectiveness in this common and troublesome disorder and to study how these measures correlate with the traditional manual tests used in physical examinations for LE (7). Data about construct validity of pain and grip strength in LE is scarce. Pienimaki et al. (7) showed that patients with LE have greater disability in terms of decreased grip strength or scores on a pain and disability questionnaire when the number of positive clinical manual tests increases. However, they could not find an association between pain drawings and clinical manual tests. It would be desirable to obtain an exact diagnosis of LE in order to evaluate disability and pain. US allows real-time imaging of joint structures and may be used to complement clinical examination in LE. To our knowledge, there is no such study that evaluates the relationship among pain, muscle strength, physical examinations, and functional status in patients with LE diagnosis confirmed using US.

The aim of this study was to investigate the relationships between physical examination or functional status and pain and grip strength in patients with LE. For this purpose, US was used as the reference criterion for a diagnosis of LE, and the impact of US on the results is discussed.

Materials and Methods

Patients with pain in the lateral aspect of the elbow who were referred to our Physical Medicine and Rehabilitation Department for evaluation and agreed to undergo US only for the purpose of this prospective study were enrolled consecutively. Participants were considered to have a diagnosis of unilateral LE. Eligibility criteria for participation included fulfillment of the diagnostic criteria for LE, i.e. the presence of pain in the elbow region and direct and indirect tenderness at or within 2 cm of the lateral humeral epicondyle on resisted extension of the wrist and/or the third finger (8). Patients were at least three weeks from the onset of symptoms, and their condition was flared with activity versus exhibiting constant pain. Participants who had a history of elbow fracture or surgery, congenital or acquired deformities of the elbow, bilateral symptoms, or a known inflammatory rheumatic disorder were excluded (8). The study was approved by the university ethics committee, and informed consent was obtained from each patient.

All clinical assessments including physical examination findings, pain-free grip strength and functional and pain assessments were performed by the same clinician (ZU). Information was obtained regarding age, sex, duration of symptoms, the elbow involved, the dominant arm, and the presence of cervical symptoms. The cervical spine was examined by assessing all active movements through available range with the addition of over pressure to determine end-feel and pain provocation. Passive intervertebral movements into flexion, extension, side flexion, and rotation were then assessed between C4 and T1. Passive intervertebral movements were determined to be abnormal if the following three signs were present: pain was provoked, there was an abnormal quality of resistance to movement, and an abnormal end-feel was palpated. Finally, combined movements into extension-rotation and flexion-rotation were assessed to determine end-feel and pain provocation. A joint was determined to be symptomatic if at least one active movement was painful and exhibited an abnormal end-feel or a combined movement was painful and exhibited an abnormal end-feel, and corresponding passive intervertebral movements were abnormal as determined by the previously described decision (9).

We assessed severity of average pain during the day and pain under strain (visual analog scale (VAS); 0: no pain - 100 mm: maximum pain); local tenderness of the lateral epicondyle after firm pressure was applied to the painful area (0-3 point scale: absent, mild, moderate, severe) (10); pain on resisted extension of middle finger and wrist with the arm extended (0-3 point scale: absent, mild, moderate, severe); pain-free grip strength in the affected arm (average of two readings with a Jamar hand-held dynamometer-Sammons Preston, AbilityOne, US) in each patient (11). Grip strength of the uninvolved limb was also evaluated. Grip strength was measured in kilograms with the elbow extended and the forearm pronated since this position was thought to be the most sensitive for testing (12).

Pain and functional disability were also assessed using physical functioning and bodily pain scales of the Medical Outcomes Study 36-Item Short-Form Health Survey (SF-36) (13) and a patient-rated forearm evaluation questionnaire (PRFEQ) for use in LE (14). The PRFEQ is reliable, reproducible, and sensitive for assessment of LE. It is at least as sensitive to change as the SF-36 (15). The overall score of the SF-36 scales, each ranging from 0-100, in which the higher scores indicated ''better'' function, was used. The PRFEQ was designed to assess average arm pain and function over a one-week period. Five items were used to assess pain and 10 items to assess function. The items on the pain subscale of the PRFEQ were scored

using a 10-cm visual numeric rating scale with anchors of 0 (no pain) and 10 (worst pain imaginable). The items on the function subscale were also scored using a 10-cm visual numeric rating scale with anchors of 0 (no difficulty) and 10 (unable to do). No other descriptors were placed along the line. Mean scores for the pain and function sections and the overall PRFEQ score were calculated.

Ultrasonography evaluation: All patients were examined with commercial, real-time equipment (Sonoline G50, Siemens, Seattle, WA, USA) using an 8-12 MHz linear phased array transducer by an experienced radiologist with over 10 years' experience in US (ST). The radiologist was blinded to the clinical details of the patient. They were positioned comfortably in a chair with the elbow placed on the examination table in a flexed position. The common extensor origin was examined in both longitudinal and transverse planes with respect to morphology and echotexture. The examination included comprehensive imaging of the four muscles that form the common extensor origin. Comparison was made with the opposite elbow in all patients.

Tendon echotexture was accepted to be normal if a uniform fibrillar pattern could be traced between the muscle and the attachment to the lateral condyle. Tendinopathy was described if there was a loss of this normal fibrillar pattern that is seen as focal areas of hypoechogenicity. A partial tear was defined as a focal anechoic area with no fibers intact or an echogenic irregular band that could run either horizontally or longitudinally in the common extensor origin. A complete tear was defined as a distinct complete interval traversing or extending through the full width of the common extensor origin. Confirmation of the abnormality was performed by imaging at least the two planes. Enthesopathy was diagnosed if the proximal part of the common extensor origin was enlarged and there were echogenicity alterations. Focal areas of calcification and thickening of the peritendinous lining (peritendinitis) were recorded, and bursitis on the inferior surface of the extensor carpi radialis brevis tendon was noted (1, 4, 16).

Consecutive patients were divided into two groups according to sonographic appearance: Group 1 (US examination showed no sonographic evidence of LE) and Group 2 (US examination depicted abnormalities that confirmed the clinical diagnosis).

Sample size: The sample size required for the study was calculated based on the primary outcome variable, that is, grip strength difference between the control and the painful arm. Power analysis identified 52 patients (24 and 28 patients in Groups 1, 2, respectively) as the total sample size required to detect a 15% difference in grip strength between the arms between groups, with a power of 80% at 5% significance level.

Statistical analysis

We compared groups with chi-square test for nominal variables. Ordinal variables were compared by Mann-Whitney U two-sample nonparametric tests. The correlations between physical examination, SF-36 and PRFEQ parameters and pain or grip strength were determined by the Spearman test of rank correlation. The critical value for statistical significance for all tests was set at $p<0.05$. Analyses were carried out with SPSS version 10.0.

Results

Fifty-two patients (39 women, 13 men; mean age: 47.5 years [SD 9.6]) with LE participated in this study. US examinations in 24 (46.2%) patients were normal (Group 1). Initial clinical diagnosis of LE was confirmed by US in 28 (53.8%) patients (Group 2). US pathologic findings were: tendinopathy (n: 25, 89.2%), partial tear (n: 5, 17.9%), enthesopathy (n: 4, 14.3%), focal areas of calcification (n: 5, 17.9%), peritendinitis (n: 3, 10.7%), and bursitis (n: 3, 10.7%) in Group 2 patients (Figures 1, 2, 3). Three patients had partial tear or enthesopathy or peritendinitis alone without tendinopathy. All of the bursitis was accompanied with a partial tear. We did not detect a complete tear of the common extensor origin.

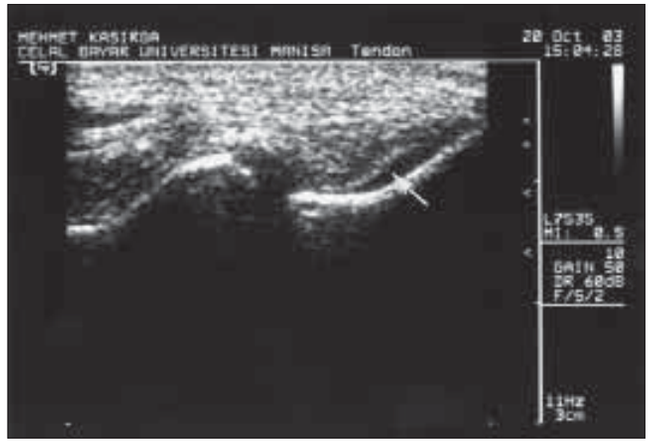

Figure 1. A bursa (arrow) is evident under the inferior aspect of the common extensor origin

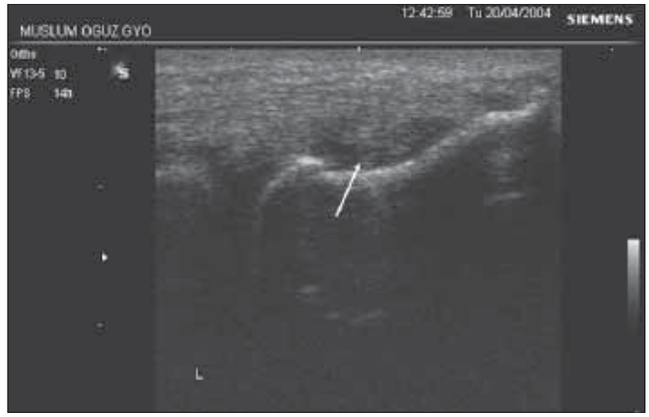

Figure 2. Longitudinal sonogram reveals an anechoic focus (arrow) in deep fibers of the common extensor origin compatible with a partial tear

Group 2 (US-confirmed group) included more male patients than Group 1 (US- negative) (39.3% vs. 8.3%) (p=0.01). Characteristics of the study population are summarized in Table 1. The dominant arm was reported as the right side for both groups and US-confirmed LE was found more often on the dominant arm in Group 2 patients. The majority of the patients (58.3%) in Group 1 had symptomatic cervical signs (Table 1).

Group 2 patients had more pain than Group 1 patients and the differences in pain under strain and pain subscale of the PRFRQ were statistically significant (p=0.04 and p=0.01, respectively). In addition, the lateral epicondyle region was significantly more tender in Group 2 patients when compared to Group 1 (p=0.01). The difference between the control and the painful arm was not calculated if the grip strength was found to be stronger in the painful arm. The grip strength in the control arm and the difference between the arms were significantly higher in Group 2 patients (p=0.01 and p=0.04, respectively). The total scores of PRFEQ in Group 2 patients also indicated significantly more impairments than in Group 1 patients (p=0.02); however, there was no significant difference in pain or functional disability scores of the SF-36 scales between the groups (p=0.45 and p=0.84) (Table 2).

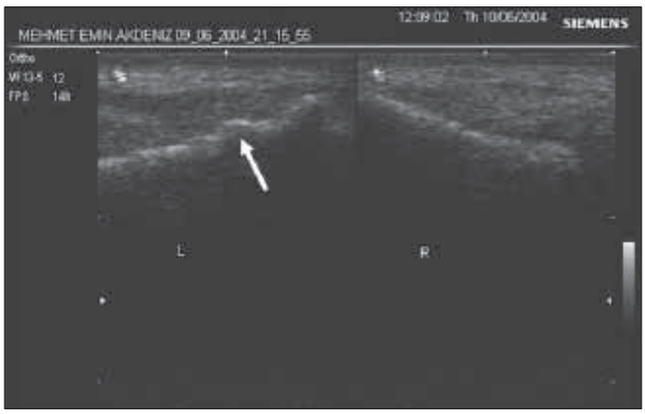

Figure 3. Comparison of normal and pathologic sides; longitudinal sonogram of the common extensor origin shows echogenicity alterations at the attachment of the left lateral epicondyle with cortical irregularity characteristics of enthesopathy (arrow)

There were significant correlations between the physical examination findings and pain (pain during the day and pain under strain) and grip strength (affected arm and the difference between the arms) in the patients whose diagnoses were confirmed with US (Group 2) (p=0.02, p=0.000, p=0.000 for pain during the day; p=0.01, p=0.02, p=0.01 for pain under strain; p=0.01 for power in the involved arm; and p=0.04, p=0.000, p=0.000 for power difference between the arms) (Table 3). Pain and grip strength evaluations showed significant correlations with each other in these patients (p=0.002 and p=0.004 for pain during the day; p=0.005 and p=0.02 for pain under strain). Especially pain during the day was correlated with the physical examination findings in patients who had normal sonographic findings (Group 1) (p=0.02, p=0.04 and p=0.01, respectively). Both pain and grip strength showed more statistically significant correlations in Group 2 patients than in Group 1 (Table 3).

Pain evaluations were strongly associated with bodily pain scales of SF-36 and all parts of PRFEQ in Group 2 patients (p=0.000 for pain during the day; p=0.004, p=0.003 and p=0.001 for pain under strain) (Table 4). Similarly, grip strength in the affected arm was associated with the physical functioning scale of SF-36 and all parts of PRFEQ in Group 2 patients (p=0.03, p=0.009, p=0.01, and p=0.01, respectively). In contrast to Group 2 patients, there was no relationship between grip strength and SF-36 subscales or PRFEQ assessments in Group 1 patients. Especially pain under strain was lower and showed less significant correlation in Group 1 patients (Table 4).

Table 1. Patient characteristics

	Group 1 (n: 24)	Group 2 (n: 28)	p
Age (yrs), mean (SD)	44.8 (8.9)	49.8 (9.6)	0.15
Sex, n (%)			
Women	22 (91.7)	17 (60.7)	0.01
Men	2 (8.3)	11 (39.3)	
Duration of symptoms (months),	8.5 (12.0)	8.2 (13.7)	0.86
mean (SD), min-max	(1-42)	(1-72)	
Elbow involved, n (%)			
Right	5 (20.8)	22 (78.6)	<0.001
Left	19 (79.2)	6 (21.4)	
Dominant arm, n (%)			
Right	22 (91.7)	27 (96.4)	0.59
Cervical spine articular signs, n (%)	14 (58.3)	8 (28.6)	0.04

SD: Standard deviation

Table 2. Median scores of the patients with respect to pain, physical examination, grip strength, SF-36 and PRFEQ outcome scales

	Group 1	Group 2	P
Day pain (VAS score), median (IQR)	27.5 (35.0)	50.0 (42.5)	0.07
S. pain (VAS score), median (IQR)	72.5 (21.2)	87.5 (28.7)	0.04
LT, median (min-max)	2 (2-3)	3 (1-3)	0.01
RMFE, median (min-max)	2 (1-3)	2 (1-3)	0.09
RWE, median (min-max)	2 (1-3)	2.5 (1-3)	0.11
Power healthy arm, kg, median (IQR)	21.0 (10.5)	26.0 (15.5)	0.01
Power involved arm, kg, median (IQR)	16.0 (8.5)	17.5 (10.5)	0.91
Power difference, kg, median (IQR)	5.5 (8.2)	12.0 (17.7)	0.04
SF-36 Physical functioning, median (IQR)	60.0 (27.5)	50.0 (23.7)	0.84
SF-36 Bodily pain, median (IQR)	41.0 (10.7)	31.0 (29.0)	0.45
PRFEQ Pain, median (IQR)	6.0 (1.7)	6.6 (1.2)	0.01
PRFEQ Function, median (IQR)	5.5 (1.7)	6.4 (2.5)	0.05
PRFEQ Total score, median (IQR)	5.6 (1.8)	6.6 (2.2)	0.02

VAS: Visual analog scale, IQR: Interquartile range, S. Pain: Pain under strain, LT: Local tenderness, RMFE: Resisted middle finger extension, RWE: Resisted wrist extension, SF-36: Medical Outcomes Study 36-Item Short-Form Health Survey, PRFEQ: Patient-Rated Forearm Evaluation Questionnaire (PRFEQ)

Table 3. The correlations between physical examination findings and pain and grip strength in the patients (correlation coefficient, p value)

Group 1 (US findings normal)						
Day pain	**S. Pain**	**Power, I**	**Power, D**	**LT**	**RMFE**	**RWE**
Day pain	0.28	-0.16	0.53	0.45	0.42	0.51
	0.17	0.47	0.01*	0.02*	0.04*	0.01*
S. Pain		-0.18	0.13	0.25	0.23	0.47
		0.40	0.54	0.22	0.26	0.01*
Power, I			-0.30	-0.34	-0.14	-0.29
			0.16	0.11	0.53	0.17
Power, D				0.21	-0.01	0.40
				0.32	0.96	0.06
Group 2 (US findings abnormal)						
Day pain	**S. Pain**	**Power, I**	**Power, D**	**LT**	**RMFE**	**RWE**
Day pain	0.56,	-0.55,	0.53	0.42	0.68	0.64
	0.002*	0.002*	0.004*	0.02*	<0.001*	<0.001*
S. Pain		-0.51	0.41	0.46	0.43	0.47
		0.005*	0.02*	0.01*	0.02*	0.01*
Power, I			-0.47	-0.27	-0.44	-0.47
			0.01*	0.16	0.01*	0.01*
Power, D				0.38	0.75	0.63
				0.04*	<0.001*	<0.001*

S. Pain: Pain under strain, Power (I): Power in involved arm, Power (D): Power difference between healthy and involved arm, LT: Local tenderness, RMFE: Resisted middle finger extension, RWE: Resisted wrist extension, US: Ultrasonography
*: Statistically significant correlation

Discussion

Upper extremity overuse injuries may cause painful and limited arm function, such as experienced in LE (17). Pain and decreased grip strength may both affect daily activities in these patients. This study relates pain, grip strength measurements, and clinical examination and aids in the evaluation of disability in LE. Investigation of these

Table 4. The correlations between physical examination findings and pain and grip strength in the patients (correlation coefficient, p value)

Group 1 (US findings normal)					
	SF-36 Physical functioning	**SF-36 Bodily pain**	**PRFEQ Pain**	**PRFEQ Function**	**PRFEQ Total**
Day pain	0.05	0.14	0.39	0.44	0.44
	0.81	0.48	0.05	0.02*	0.03*
S. Pain	-0.31	-0.43	0.37	0.57	0.55
	0.13	0.03*	0.06	0.003*	0.005*
Power, I	0.30	0.06	-0.18	-0.21	-0.20
	0.16	0.78	0.42	0.33	0.37
Power, D	0.12	0.14	0.05	-0.01	-0.03
	0.58	0.52	0.79	0.95	0.88
Group 2 (US findings abnormal)					
	SF-36 Physical functioning	**SF-36 Bodily pain**	**PRFEQ Pain**	**PRFEQ Function**	**PRFEQ Total**
Day pain	-0.23	-0.69	0.76	0.65	0.74
	0.23	<0.001*	<0.001*	<0.001*	<0.001*
S. Pain	-0.11	-0.37	0.53	0.54	0.57
	0.57	0.05	0.004*	0.003*	0.001*
Power, I	0.40	0.32	-0.48	-0.45	-0.46
	0.03*	0.09	0.009*	0.01*	0.01*
Power, D	-0.08	-0.32	0.34	0.36	0.35
	0.66	0.09	0.07	0.05	0.06

SF-36: Medical Outcomes Study 36-Item Short-Form Health Survey, PRFEQ: Patient-Rated Forearm Evaluation Questionnaire (PRFEQ), S. Pain: Pain under strain, Power (I): Power in involved arm, Power (D): Power difference between healthy and involved arm, US: Ultrasonography
*: Statistically significant correlation

connections has not been studied previously in patients whose clinical diagnosis was confirmed by US. The results showed close associations between clinical examination findings and SF-36 and PRFEQ assessments with pain in patients who had sonographic findings of LE. Grip strength was also correlated with clinical and functional evaluations in these cases. However, pain and grip strength showed weaker associations with clinical examination and with disability questionnaires in patients who had no abnormality on US. Our results suggest the importance of imaging and outcome measurements in LE. Pain and grip strength measures may give valuable clues about the disability in cases of "confirmed" LE, with pathological changes visualized by US. We conclude that manual examination alone in cases of LE does not yield a sufficient indication of the function and disability of the arm.

A few studies have provided useful information about the construct validity of pain and grip strength in LE. In a previous study, the decreased pain-free grip strength in cases of LE was strongly associated with functional disability (18). Recently, the same authors assessed the associations between changes in pain and grip strength and manual tests (palpation, Mills test, and resisted wrist and middle finger extension tests) among patients with LE (7). They indicated that the pain under strain was principally associated with resisted muscle tests. However, that study did not show the associations between clinical manual tests and grip strength. Only a positive resisted wrist extension test was associated with decreased grip strength and the difference in grip strength between the patients' healthy and involved arms. When positive, resisted muscle tests seem to reflect the disturbed ability to use the hand (muscle function and stretch) and are thus also associated with impairment. Our results emphasized more clearly that LE has a tendency to produce significant limitation in arm function and the limitation tends to correlate with grip strength and pain.

This study demonstrated that about half of the patients with LE did not have morphologic lesions of the common extensor origin imaged by US. Based on our findings, the first question that arises is: Is US able to visualize the common extensor origin? Although LE remains a clinical entity, US can confirm the diagnosis and gives a detailed image of the structures involved in the disease (1, 4). When performing sonography of the elbow, sonographers should consider certain technical aspects such as the use of a high resolution 10-15-MHz probe and positioning of the patient (4). US offers superior spatial resolution and is, therefore, sensitive in depicting focal areas of degeneration, macroscopic partial thickness tears, foci of calcification, and bony irregularities (4, 19). US can provide useful information about the location, extent, and severity of LE before treatment (4). The specificity of US is comparable to that of MRI in diagnosing LE. US is not as sensitive as MRI if real-time scanning, which is the major advantage of US over MRI, is precluded (5).

We observed that Group 2 patients (diagnosis confirmed by US) had more impairment and pain than those who had normal sonographic appearance. This is an indirect evidence to support the accuracy of our sonographic examinations. The pain under strain and localized tenderness can be explained by the findings of this study. In forced movements, the muscle either compresses the underlying inflamed bursa, or, being incapable of further lengthening, muscle or tendon micro-tears are produced. A recent population study reported that LE was more prevalent in the dominant elbow in both sexes (20). Our sonographic findings supported that physical load factors may have effects on the elbow (3).

The second question to be asked is: What other lesions cause pain in patients with LE? First, lateral elbow pain may resource from structures including the supinator muscle, which we did not examine. In addition, we did not examine the elbow joint in detail or poorly described lesions of posterior interosseous nerve entrapment and lateral collateral ligament by US. Second, it is claimed that female gender and concurrent cervical signs influence the accuracy of clinical examination in the diagnosis of LE. The majority of the patients with normal US findings (Group 1) were females (91.7%) and had positive cervical signs (58.3%). It was explored as "illness behavior", and no evidence was found to suggest that individuals with soft tissue injuries are different in their attitudes and beliefs (21). Women are socialized to acknowledge pain and discomfort whereas men are socialized to be stoic and self-reliant; men and women use different coping strategies; and women may recognize and interpret symptoms more readily than men (9). A nearly similar high incidence of cervical signs (57%) was reported in patients with LE (9). It is possible that abnormalities around or within nerves (cervical radiculopathy or radial nerve) could bring about an alteration in joint proprioception and pain perception in patients with LE (21). Specifically, as noted, women were more likely to have work-related onsets, repetitive jobs, and/or positive cervical signs than men. Moreover, work-related onsets were associated with both repetitive jobs and cervical signs and, therefore, these factors were likely to coexist.

Some authors (6, 9, 22, 23) have suggested that cervical spine pathology may contribute to a poor prognosis for women with LE. A retrospective study reported that low pre-treatment pain scores, prolonged duration of symptoms, and female gender were associated with a poor outcome (24). One may think that success in the treatment is related with a correct diagnosis. Future studies are necessary to compare the efficacy of treatments in LE using US.

We concluded that a manual examination alone in cases of LE does not yield a sufficient diagnosis. US allows accurate diagnosis of LE by the detailed depiction of the common extensor origin lesions. Evaluation of disability and probably also of operative necessity in LE also depends on methods other than those included in the traditional clinical examination. Thus, the clinical and sonographic examinations can be completed with pain and grip strength measurements. These measurements provide numerical and quantitative data for evaluation of the severity and disability in patients diagnosed correctly.

Conflict of Interest
No conflict of interest is declared by authors.

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