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Disclosures:

Financial disclosure statements have been obtained, and no conflicts of interest have been reported by the author or by any individuals in control of the content of this article.

0894-9115/15/9406-0444
American Journal of Physical Medicine & Rehabilitation

DOI: 10.1097/PHM.0000000000000186

ORIGINAL RESEARCH ARTICLE

Ultrasonographic Evaluation of the Flexor Pollicis Longus Tendon in Frequent Mobile Phone Texters

ABSTRACT

Akkaya N, Dogu B, Ünlü Z, Çarlı AB, Akkaya S, Tekin L, Özçakar L: Ultrasonographic evaluation of the flexor pollicis longus tendon in frequent mobile phone texters. Am J Phys Med Rehabil 2015;94:444–448.

Objective: The aim of this study was to assess flexor pollicis longus tendon by using ultrasound imaging in frequent mobile phone texters.

Subjects: In total, 149 subjects, aged 18–40 yrs, were recruited as frequent mobile phone texters ($n = 71$) and infrequent texters ($n = 78$).

Methods: Demographic data and estimate frequency of texting were noted. Thumb pain during activity, range of motion for thumb joints, grip and pinch strengths, and Quick Disabilities of arm, shoulder, and hand were evaluated. Standardized bilateral ultrasound evaluations were performed using a linear array probe, and tendon area measurements were done with axial imaging at midthenar region and midproximal phalangeal region with manual trace technique.

Results: The groups were similar except for the mean estimate number of messages/month ($P = 0.001$). Whereas grip and pinch strength values were significantly higher (frequent texter group, $P = 0.001$; infrequent texter group, grip strength $P = 0.018$; pinch strengths, $P = 0.001$) on the texting side in both groups, flexor pollicis longus tendons were larger ($P = 0.001$) and the activity pain was higher ($P = 0.005$) on the texting sides only in the frequent texter group. Flexor pollicis longus thickness significantly correlated with messages/month only in the frequent texter group ($r = 0.592$, $P = 0.001$).

Conclusions: Flexor pollicis longus tendons seem to be thicker at the midthenar level in subjects who frequently use mobile phone texting. Because this increase in thickness parallels the number of messages per day, the authors believe that further studies are needed to elucidate whether such changes become problematic later on in life.

Key Words: Mobile Phone, Message Texting, Flexor Pollicis Longus, Ultrasound

Tendons that are exposed to overloading with repeated joint movements may undergo adaptation and constitutional changes.[1] Likewise, tendon overuse injuries related to recreational and occupational activities are seen frequently and have been widely investigated.[2] The relevant literature comprises studies pertaining to the tendinopathies of the rotator cuff, flexor/extensor tendons around the elbow, and patellar and Achilles tendons.[1,3–11] Although changes in the finger flexor tendons of Olympic archers have been assessed in a recent study,[12] overuse injuries of the small tendons have not been studied frequently. Therefore, in this study, the aim was to explore whether the flexor tendon of the thumb is affected in frequent mobile phone texters. Yet, texting is a very common condition among young people, and, to the authors' best notice, studies concerning the unfavorable effects of mobile phone using has been confined mainly to radiation and brain tumors. Herein, ultrasound (US) was used as the prompt/convenient method for flexor pollicis longus (FPL) tendon imaging.

METHODS

Subjects

This study was performed between January and March 2013 in five physical medicine and rehabilitation departments (four tertiary care university hospitals and one secondary care training hospitals). In total, 149 subjects from the normal population, aged 18–40 yrs, were recruited, and 71 were enrolled as frequent mobile phone texters (sending at least 10 messages per day for at least 3 yrs) and 78 as infrequent texters (sending less than 10 messages per day for at least 3 yrs). The texting style of cases was repeated flexion movements of the interphalangeal joint of the thumb. Presence of any of the following in the hand/upper extremity of the subjects was taken as exclusion criteria: previous fracture, nerve/vessel/tendon injury, and rheumatic disease. The study protocol was approved by the local ethical committee of one of the centers, and written informed consent was obtained from each participant.

Age, gender, and dominant/nondominant/texting hands were recorded. Estimated number of messages per day and duration of mobile phone use (texting) were also noted.

Functional Assessment

Thumb pain during activity was evaluated bilaterally with a 10-cm visual analog scale, where 0 indicates no pain and 10 indicates severe pain. Range of motion (flexion/extension) for the metacarpohalangeal and interphalangeal joints of the dominant and nondominant thumbs was measured with a hand goniometer and total active movement was recorded for each.

Grip strength was assessed using a Jamar dynamometer (kilograms), and pinch strengths (lateral, tip-to-tip, and chuck pinch) were assessed using a Jamar pinch meter (pounds). The measurements were performed in a standard manner and the mean of three measurements was taken.[13]

Functional assessment of the upper extremity was evaluated with the Quick Disabilities of arm, shoulder, and hand, consisting of 11 questions, where higher scores indicated worse function.[14]

Ultrasonographic Evaluation

Standardized bilateral ultrasound evaluations were performed using a linear array probe while subjects were in a sitting position and hands placed on the examination table in supination. Because repeated flexion motion of the thumb was one of the major components of the texting style, ultrasonographic evaluation of the FPL tendon was performed. In longitudinal view, the FPL tendon was followed from the wrist to its distal insertion (the base of the distal phalanx) for any tendon pathology both with static and dynamic imaging (passive flexion/extension).[15] In the presence/suspicion of tenosynovitis, Doppler imaging was also performed according to European League Against Rheumatism recommendations.[16] Thereafter, tendon measurements were done with axial imaging at midpoint between the first carpometacarpal and metacarpophalangeal joints and at midpoint between the first metacarpophalangeal and interpahalangeal joints with manual trace technique (Fig. 1). All acquired images were also evaluated eventually by a senior physiatrist sonographer (LÖ, with a background of >10 yrs in musculoskeletal ultrasound).

Statistical Analyses

Statistical analyses were performed using SPSS 17.0 software. Descriptive statistics were used for numeric demographical data, and frequency analysis, for categorical data. Group comparisons were done with Student's t and χ^2 tests, where appropriate. Paired t test was used for comparison of the two thumbs of the subjects. FPL area ratio was calculated as follows: (texting side − contralateral side) / contralateral side × 100). Correlations between FPL ratio and number of message/month for each group were analyzed by using Pearson correlation

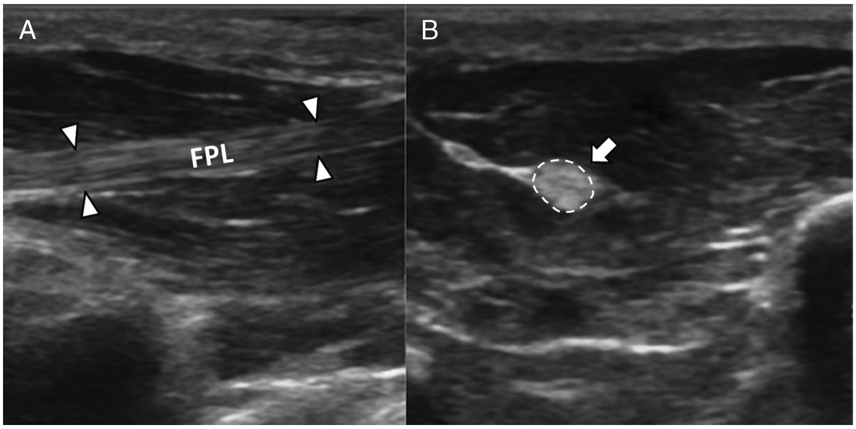

FIGURE 1 *Ultrasonography demonstrates the longitudinal view (white arrowheads) (A) and the axial view (white arrow) (B) of the FPL tendon at midpoint between the first carpometacarpal and metacarpophalangeal joints.*

coefficients. *P* values less than 0.05 were considered significant.

RESULTS

Demographic data of the subjects (63 men, 86 women) are summarized in Table 1. The groups were similar except for the mean estimate number of messages per month (1208.5 ± 693.4 *vs.* 50.2 ± 46.4, $P = 0.001$). Dominant hand, texting hand side, and occupations were similar between groups ($P = 0.880$). There were no limitations with regard to the thumb range of motions in either group.

While grip and pinch strength values were significantly higher on the texting side in both groups; FPL tendons were larger and the activity visual analog scale was higher on the texting sides only in the frequent texter group (Tables 2 and 3). Similarly, FPL ratio significantly correlated with messages per month only in the frequent texter group ($r = 0.592$, $P = 0.001$). Tendon pathology during B-mode and Doppler imaging was not detected.

DISCUSSION

This study's results suggest that repetitive thumb movements may cause FPL tendon thickening in frequent mobile phone texters and that this thickening is positively correlated with the number of messages per month.

Most of the studies exploring the unfavorable effects of mobile phone use have focused on the effects of radiation on head and neck regions, and the pertinent consequences are well known.[17–20] On the other hand, despite the fact that texting via mobile phones has become widespread especially

TABLE 1 Demographics of the subjects

	Frequent Texters (n = 71)	Infrequent Texters (n = 78)	*P*
Age, yrs	26.8 ± 4.7	28.4 ± 5.7	0.070
Body mass index, kg/m^2	22.8 ± 2.9	23.0 ± 2.6	0.658
Smoking, pocket/yr	1.5 ± 3.9	1.8 ± 4.9	0.674
Estimate message/month	1208.5 ± 693.4	50.2 ± 46.4	0.001[a]
Male	31 (43.7)	32 (41.0)	0.745
Female	40 (56.3)	46 (59.0)	
Right-hand dominant	68 (95.8)	72 (92.3)	0.375
Left-hand dominant	3 (4.2)	6 (7.7)	
Right-hand texting	66 (93.0)	72 (92.3)	0.880
Left-hand texting	5 (7.0)	6 (7.7)	
Occupation			
Unemployed	2 (2.8)	2 (2.6)	0.415
Housewife	2 (2.8)	8 (10.3)	
Employee	7 (9.9)	5 (6.4)	
Official	24 (33.8)	28 (35.9)	
Student	36 (50.7)	35 (44.8)	

Data are presented as mean ± SD or n (%).

TABLE 2 Comparison of the data in the frequent texter group

	Texting Side	Contralateral Side	*P*
Activity VAS	0.3 ± 0.9	0.01 ± 0.1	0.005[a]
Total active thumb motion	157.3 ± 4.9	157.8 ± 4.4	0.089
Lateral pinch, lb	12.9 ± 5.0	12.0 ± 4.9	0.001[a]
Chuck pinch, lb	11.8 ± 4.4	11.1 ± 4.3	0.001[a]
Tip-to-tip pinch, lb	9.6 ± 4.1	8.9 ± 3.9	0.001[a]
Grip strength, kg	30.9 ± 10.7	29.4 ± 10.7	0.001[a]
Thenar FPL area, cm^2	0.087 ± 0.02	0.082 ± 0.02	0.001[a]
Phalangeal FPL area, cm^2	0.085 ± 0.02	0.082 ± 0.03	0.242

Data are presented as mean ± SD.
[a]Statistically significant.
VAS indicates visual analog scale.

among young people, its possible impact on hand structure/functions has not attracted much attention. However, it may well be considered a potential overuse syndrome. Tendons, when exposed to repetitive overload, are capable of undergoing structural changes. In general, whereas enlargement may ensue because of edema/inflammation in the acute phases of tendon injuries, thickening of the tendons can also be seen in the long-term.[21] In animal studies, exercise-induced hypertrophy of the flexor digitorum superficialis and extensor digitorum communis tendons has been reported.[22] Similarly, in a recent study, hypertrophy of the fourth finger flexor digitorum profundus tendons has been shown on the string hands of asymptomatic Olympic archers.[12] In line with these studies, this study's results indicate a hypertrophy in the FPL tendons of frequent mobile phone texters, to the authors' best notice, for the first time in the literature. Furthermore, the positive correlation between tendon thickening and the estimate overload is also in accordance with the hitherto literature.[21] In the frequent texter group, activity pain was higher on the texting side; however, because of the absence of any tendon pathology and because the upper extremity functions were indifferent, its clinical relevance remains unclear.

One major limitation of this study is the lack of precise comparison between the texting styles of the subjects. The estimate number of messages per month was taken into account; however, the length of the messages was not considered, which can actually impact the amount of overload on the FPL. This could have been overcome, perhaps, with the inclusion of time spent for daily texting as well.

To summarize, in light of this study's first and preliminary findings, it is implied that FPL tendons seem to be thicker at midthenar level in subjects who frequently use mobile phone texting. Drawing attention to the fact that this increase in thickness parallels the number of messages/day, the authors believe that further studies are needed to elucidate the functional relevance of this thickening and its probable reflection on future structural injury. However, the use of mobile phone texting still remains to be noteworthy issue among young people.

TABLE 3 Comparison of the data in the infrequent texter group

	Texting Side	Contralateral Side	*P*
Activity VAS	0.08 ± 0.4	0.01 ± 0.01	0.109
Total active thumb motion	158.1 ± 4.9	157.9 ± 5.1	0.159
Lateral pinch, lb	12.8 ± 5.5	11.9 ± 5.3	0.001[a]
Chuck pich, lb	12.04 ± 4.8	11.4 ± 4.7	0.001[a]
Tip-to-tip pinch, lb	9.9 ± 4.7	9.0 ± 4.4	0.001[a]
Grip strength, kg	30.9 ± 11.3	29.7 ± 11.8	0.018[a]
Thenar FPL area, cm^2	0.092 ± 0.02	0.089 ± 0.02	0.084
Phalangeal FPL area, cm^2	0.084 ± 0.02	0.084 ± 0.02	0.881

Data are presented as mean ± SD.
[a]Statistically significant.
VAS indicates visual analog scale.

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