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Ultrasound Features of Palmar Fibromatosis or Dupuytren Contracture

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Abstract

Objective: To retrospectively characterize the ultrasound appearance of palmar fibromatosis in patients with a surgical or clinical diagnosis of palmar fibromatosis.

Methods: A search of ultrasound reports from 2005 to 2015 and subsequent search of medical records was performed to identify patients with a surgical or clinical diagnosis of palmar fibromatosis. The ultrasound images were retrospectively reviewed to record lesion location, size, echogenicity, compressibility, hyperemia, and calcification.

Results: A total of 36 subjects were identified (average age 60 years; 61% male), yielding a total of 55 palmar fibromatosis lesions, of which 2%, 7%, 29%, 36%, 20%, and 5% were located at the first, second, third, fourth, and fifth digits, and between the fourth and fifth digits, respectively. The lesions were located directly superficial to the flexor tendons in 93% with their epicenters at the distal metacarpal in 89%. Average lesion dimensions were 13.1 mm in length, 6.8 mm in width, and 2.5 mm in depth. On ultrasound, the lesions were characteristically hypoechoic (98%) and non-compressible (95%). Atypical features included calcification (2%), compressibility (5%), hyperemia on color Doppler images (6%), epicenters at the metacarpophalangeal joint (7%) or proximal phalanx (4%), and location superficial but lateral to the flexor tendons (7%).

Conclusion: Palmar fibromatosis most commonly appears hypoechoic located directly superficial to the flexor tendons with an epicenter at the distal metacarpal, most commonly the

fourth digit. However, epicenter location may be at the distal metacarpal and proximal phalanx of other digits, adjacent to the flexor tendons, with possible hyperemia and calcification.

Key Words: ultrasound, hand, palmar, fibromatosis, Dupuytren, contracture

Introduction

Palmar fibromatosis, also known as Dupuytren disease or Dupuytren contracture, is a benign fibroproliferative disorder in which subcutaneous fibrous nodules arise within the palmar fascia of the hand, eventually forming cord-like attachments with the adjacent flexor tendons.[1,2] Progressive shortening of these cord-like attachments ultimately results in debilitating flexion contractures of the fingers. Palmar fibromatosis is common, affecting approximately 20% of people over age 65, and is associated with other fibromatoses, as well as diabetes mellitus, alcoholism, and epilepsy.[3] Imaging may be used to confirm palmar fibromatosis and for imaging-guided treatment.[4]

MRI has been shown to accurately detect palmar fibromatosis, appearing as subcutaneous nodules and cords located superficial and parallel to the flexor tendon.[5] While ultrasound has been used to guide percutaneous collagenase injections of palmar fibromatosis, the ultrasound appearance of palmar fibromatosis has not been fully described in the literature.

In our clinical practice, ultrasound is routinely used to assess hand and wrist pathology, including palmar fibromatosis. We have found variable location, as well as gray-scale and color

Doppler appearances. The purpose of this study was to retrospectively characterize the ultrasound appearance of palmar fibromatosis in patients with surgical or clinical diagnosis of palmar fibromatosis.

Materials and Methods

The Institutional Review Board approved our study, and informed consent was waived. A retrospective search of the radiology database of ultrasound reports from 2005 to 2015 was performed using the key words “Dupuytren” and “contracture” and the key phrases “palmar fibromatosis” and “palmar fibroma.” Medical records were then reviewed to determine if a clinical or surgical diagnosis of palmar fibromatosis was present. Clinical findings of palmar fibromatosis included palpable firm superficial nodules or cords, possible tender, involving the palmar aspect of the hand, with possible flexion of the digits with inability to place palm flat on table top (the Hueston table top test). Other clinical information, including history of diabetes, epilepsy, alcoholism, plantar fibromatosis, Peyronie disease, and adhesive capsulitis, was recorded. Patients were excluded if they had no clinical or surgical diagnosis of palmar fibromatosis, or if they had previously received treatment for palmar fibromatosis prior to the ultrasound.

Ultrasound reports and images including cine clips were retrospectively reviewed in consensus by two authors with 4 and 22 years of experience, and the following information was

recorded: location of abnormality (which digit, epicenter relative to long axis of a digit, if the abnormality was superficial to the tendon), size (length, width, and depth), echogenicity (anechoic, hypoechoic, isoechoic, hyperechoic, or heterogeneous relative to adjacent subcutaneous tissues), hyperemia on conventional color or power Doppler imaging (present or absent), compressibility (present or absent), and calcification (defined as hyperechoic focus with possible shadowing) (present or absent). Subject demographics were also recorded (age, gender, side).

Results

The initial key word search identified 51 subjects, and 15 were excluded because there was no clinical or surgical diagnosis of, or if there was prior treatment for palmar fibromatosis. The final subject group consisted of 36 subjects, comprised of 61% (22/36) male and 39% (14/36) female subjects. The average age of all subjects was 60 years (range 36–79 years). The average age of the male subjects was 58 years (range 36-79 years), and the average age of the female subjects was 63 years (range 51-70 years). In 8% (3/36) of subjects there was bilateral involvement resulting in a total of 39 hand ultrasound exams for review, including 23 of the right hand and 16 of the left hand. The history provided at time of imaging included assessment of a palpable abnormality and/or confirmation of suspected palmar fibromatosis.

A total of 55 palmar fibromatosis lesions were identified at ultrasound, of which 2% (1/55) were located within the first digit, 7% (4/55) within the second digit, 29% (16/55) within the third digit, 36% (20/55) within the fourth digit, 20% (11/55) within the fifth digit, and 5% (3/55) between the fourth and fifth digits (Table 1). There was involvement of only one digit in 62% (24/55) of sonograms, two digits in 15% (8/55), and three digits in 7% (4/55).

The lesions demonstrated a hypoechoic appearance in 98% (54/55) (Figs. 1 and 2) and a predominant isoechoic appearance in 2% (1/55) (Fig. 3). Hyperemia was demonstrated in 6% (3/54). Intralesional calcification was observed in 2% (1/55). Non-compressibility of the lesion, as recorded on still images or cine clips, was demonstrated in 95% (52/55) and compressibility in 5% (3/55). The lesion epicenter was located in the region of the distal metacarpal in 89% (49/55), in the region of the metacarpophalangeal joint in 7% (4/55) (Fig. 4), and in the region of the proximal phalanx in 4% (2/55) (Fig. 3D). The lesions were located directly superficial to the flexor tendons in 93% (51/55) and superficial but lateral to the flexor tendons in 7% (4/55). The average length of the lesions measured 13.1 mm (range, 4.1 – 33.5 mm), average width 6.8 mm (range, 3.0 – 19.0 mm), and average depth 2.5 mm (range, 0.7 – 4.6 mm).

Of the 36 subjects, all had a clinical diagnosis of palmar fibromatosis and 19% (7/36) had surgical and histologic correlation as part of the inclusion criteria. One of these subjects with surgical confirmation also had MR imaging (Fig. 5). Surgical findings described a mass or nodule, and pathology described fibrous tissue consistent with diagnosis. A concurrent

diagnosis of diabetes was identified in 14% (5/36), plantar fibromatosis in 6% (2/36), Peyronie disease in 9% (2/22 male subjects), adhesive capsulitis in 11% (4/36), and alcoholism in 3% (1/36). A concurrent diagnosis of epilepsy was not identified in any of the subjects. Of the 15 subjects excluded from this study without a clinical or surgical diagnosis of palmar fibromatosis, one subject had a ruptured epidermoid cyst at surgery (Fig. 6).

Discussion

Ultrasound may be used to confirm palmar fibromatosis and for imaging-guided treatment; however, the sonographic appearance of palmar fibromatosis has yet to be fully described in the literature. The results of our study show that palmar fibromatosis most commonly appears hypoechoic located directly superficial to the flexor tendons with an epicenter at the distal metacarpal, most commonly the fourth digit. Uncommonly, epicenter location may be at the distal metacarpal and proximal phalanx of other digits, adjacent to the flexor tendons, with possible hyperemia and calcification.

Palmar fibromatosis is a benign fibroproliferative disorder in which subcutaneous fibrous nodules arise within the palmar fascia of the hand.[1,2] Debilitating flexion contractures of the fingers result from progressive shortening of cord-like attachments between these nodules and the adjacent flexor tendons. Histologically, the early proliferative phase of the disease

features hypercellular nodules composed of fibroblasts, while older end-stage lesions are, by comparison, less cellular and demonstrate increased collagen content.[3]

While an underlying genetic predisposition and a propensity for palmar fibromatosis to affect Caucasians of Northern European descent is supported by twin and family studies, a multifactorial etiology is suggested by additional studies implicating trauma, microvascular injury, and immunologic processes.[3] Palmar fibromatosis may be seen concurrently in the setting other fibromatoses such as plantar fibromatosis, Peyronie disease, knuckle pads, or adhesive capsulitis.[2,3,6] Associations with diabetes mellitus type I and type II, epilepsy, and alcoholism have also been described.[2,3] In our study, a retrospective review of the subjects' medical records revealed concurrent diagnoses of diabetes (14%), plantar fibromatosis (6%), Peyronie disease (9% of the male subjects), adhesive capsulitis (11%), and alcoholism (3%). However, a concurrent diagnosis of epilepsy was not identified in any of the subjects.

In our study, palmar fibromatosis lesions most commonly were found within the fourth digit, followed by the third, fifth, second, and first digits in decreasing order of frequency. The lesions were typically located directly superficial to the flexor tendons (93%) with their epicenter in the region of the distal metacarpal (89%). The lesions were characteristically hypoechoic (98%) and non-compressible (95%). Atypical features included intralesional calcification (2%), compressibility (5%), and hyperemia on color Doppler images (6%). Lesion epicenters located more distally than what was typical were observed in the region of the

metacarpophalangeal joint (7%) and in the region of the proximal phalanx (4%). In four subjects (7%), the lesions were located superficial but lateral to the flexor tendons, rather than directly superficial to them.

Several benign and malignant lesions in the hand may simulate palmar fibromatosis including epithelioid sarcomas, giant-cell tumors of the tendon sheath, ganglion cysts, inclusion cysts, stenosing tenosynovitis without triggering, edematous changes of the hand, and thickening and callus formation related to occupational activity.[2] Familiarity with the imaging features of palmar fibromatosis can aid in distinguishing this disease from these various other entities. For example, hypoechoic mass superficial to a flexor tendon of the third, fourth, or fifth digits at the level of the distal metacarpal, where the length of the lesion is greater than its width, is typical for palmar fibromatosis and helps to exclude other diagnoses. Knowledge of the ultrasound appearance of palmar fibromatosis is also needed if ultrasound-guidance is used for collagenase injection therapy to also avoid complications associated with injections into tendons, neurovascular structures, and collagen containing structures within the hand.[7]

One limitation of our study was its retrospective design, which restricted our sonographic imaging review to the existing imaging; however, the presence of cine clips complementing the static images added valuable real-time information. Another limitation was lack of surgical confirmation in all cases. When surgical and histologic data were not present, only patients where unequivocal clinical evidence for palmar fibromatosis were included.

Another limitation was our small sample size, likely secondary to patients with palmar fibromatosis who may not have been managed with imaging. The clinical significance of the atypical ultrasound findings of palmar fibromatosis is outside the scope of the current study but warrants further investigation.

In conclusion, palmar fibromatosis most commonly appears hypoechoic located directly superficial to the flexor tendons with an epicenter at the distal metacarpal, most commonly involving the fourth digit. However, epicenter location may be at the distal metacarpal and proximal phalanx of other digits, adjacent to the flexor tendons, with possible hyperemia and calcification. Knowledge of both the common and atypical sonographic appearance of palmar fibromatosis can improve diagnostic accuracy and avoid potential complications associated with percutaneous therapies.

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TABLE 1

Ultrasound Characteristics of Palmar Fibromatosis

LOCATION	Digit 1	2 % (1/55)
	Digit 2	7% (4/55)
	Digit 3	29% (16/55)
	Digit 4	36% (20/55)
	Between Digits 4 and 5	5% (3/55)
	Digit 5	20% (11/55)
ECHOGENICITY	Anechoic	0% (0/55)
	Hypoechoic	98% (54/55)
	Isoechoic	2% (1/55)
	Hyperechoic	0% (0/55)
HYPEREMIA	Present	6% (3/54)
	Absent	94% (51/54)
COMPRESSIBILITY	Present	5% (3/55)
	Absent	95% (52/55)
EPICENTER	Distal Metacarpal	89% (49/55)
	Metacarpophalangeal Joint	7% (4/55)
	Proximal Phalanx	4% (2/55)
LOCATION RELATIVE TO TENDON	Superficial	93% (51/55)
	Superficial and lateral	7% (4/55)
SIZE	Length (mm)	13.1 (range 4.1 – 33.5)
	Width (mm)	6.8 (range 3.0 – 19.0)
	Depth (mm)	2.5 (range 0.7 – 4.6)

FIGURE LEGENDS

Fig. 1 – 68-year-old woman with palmar fibromatosis. Ultrasound images **(A)** long axis and **(B)** short axis to the flexor tendons (T) of the fourth digit shows hypoechoic palmar fibromatosis (arrows) at the level of the distal metacarpal (MC).

Fig. 2 – 67-year-old woman with palmar fibromatosis. Ultrasound images **(A)** long axis and **(B)** short axis to the flexor tendons (T) of the third digit shows hypoechoic palmar fibromatosis (arrows) at the level of the distal metacarpal (MC). Note lack of flow on color Doppler image in **(B).**

Fig. 3 – 50-year-old man with palmar fibromatosis. Ultrasound images **(A)** long axis to third digit, **(B)** long axis to fourth digit, **(C)** short axis to third and fourth digits show predominantly isoechoic and hypoechoic palmar fibromatosis (cursors and arrows). Ultrasound image **(D)** long axis to fifth digit shows additional nodule (cursors) just distal to proximal interphalangeal joint (PIP). T, flexor tendons; MC, metacarpal; L, lumbrical muscles, MP, middle phalanx; DIP, distal interphalangeal joint.

Fig. 4 – 61-year-old man with palmar fibromatosis. Ultrasound images **(A)** long axis and **(B)** short axis to the flexor tendons (T) of the fourth digit shows hypoechoic palmar fibromatosis (arrows) extending beyond the distal metacarpal (MC) over the metacarpophalangeal joint.

Fig. 5 – 48-year-old man with palmar fibromatosis. Ultrasound images **(A)** long axis and **(B)** short axis to the flexor tendons (T) of the third digit shows hypoechoic palmar fibromatosis (arrows). MC, metacarpal head. T2-weighted fat-saturation **(C)** and T1-weighted fat-saturation post-intravenous gadolinium **(D)** MR images show enhancing mixed but predominately low signal palmar fibromatosis (arrows) superficial to the third digit flexor tendons (T).

Fig. 6 – 45-year-old man with ruptured epidermoid cyst. Extended field-of-view ultrasound image **(A)** long axis and **(B)** short axis to the flexor tendons (T) mixed echogenicity but predominantly hypoechoic ruptured epidermoid cyst (arrows).