Location of Dupuytren’s Disease on the Radial Aspect of the Hand

RAOUL TUBIANA, M.D.,* BARRY P. SIMMONS, M.D.,** AND HERVE A. R. DEFRENNE, M.D.†

Location of Dupuytren’s disease on the radial aspect of the hand, i.e., thumb, first web space, and index finger, is considered rare. In a series of 3,251 hands reviewed in 1952,9 the thumb was involved in 111 cases (3.3%), the index finger in 168 (5%), the middle finger in 731 (22%), the ring finger in 1948 (60%) and the little finger in 1697 cases (52%). Obviously, more than one digit was involved in many of these patients. In a more recent study of 166 hands in 100 patients, the thumb was involved in only 14 cases (8.4%).13 The referral nature of our Institute has allowed us to examine a larger number of patients with radial sided involvement of the hand. Two types of radial involvement are noted: (1) the more common where the fasciitis usually presents later in the course of the disorder as an extension of the ulnar disease, and is slowly or non-progressive without disability; (2) an aggressive malignant disabling involvement occurring in young individuals early in the course of the disease. This latter group is the object of this study which will examine: (1) the normal anatomy of the aponeurosis on the radial aspect of the hand; (2) the pathoanatomy of the Dupuytren’s disease in this area; (3) review and classification of cases; and (4) the principals of surgical management.

The anatomy of the palmar aponeurosis, which was described by Legueu and Juvara,11 has recently been examined more extensively,4,10,12,14–17 reflecting a turn in attention from the palm to the fingers. It is in the fingers that the retractions are most severe, most disabling and most likely to recur. However, the aponeurotic structures of the thumb and first web space have not yet been the object of a similar systematic study. By verifying if the disease localization coincides with the normal aponeurotic structures the techniques of excision could be improved.

MATERIALS AND METHODS

Ten formalin-preserved hands were dissected with the aid of an operating microscope. Four main groups of fibrous formations were distinguished on the radial aspect of the palm (Fig. 1): (1) the fibrous skeleton of the thenar eminence; (2) the radial longitudinally-oriented fibers of the palmar aponeurosis; (3) the distal transverse commissural ligament of the first web (Grapow’s ligament) which branches to both sides of the thumb; and (4) the proximal transverse commissural ligament.

The fibrous skeleton of the thenar eminence has three zones that blend into one another. The ulnar zone has a scanty and poorly developed fibrous cover while the radial zone has a more dense, fi-
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The distal transverse commissural ligament of the first web, described by Grapow in 1887, constitutes the most distal transverse fibrous structure of the first web, and is analogous to the natalatory ligament of the other web spaces. Distally, some fibers join the radial lateral digital sheet of the index finger. In the thumb, the ligament divides into two groups of fibers: an ulnar band joining the ulnar lateral digital sheet, and a radial band which subdivides, inserting on the radial side of the thumb metacarpophalangeal joint and joining the radial lateral digital sheet of the thumb.

The proximal transverse commissural ligament constitutes the proximal transverse structure of the first web analogous to the superficial transverse ligament of the palmar aponeurosis and is a continuation of it. Although certain fibers are in continuity between these two ligamentous structures and cross dorsally to the longitudinal fibers of the pretendinous band to the index finger, most run to one side or the other of the thumb flexor sheath, chiefly on the radial side. The fibrous band thus constitutes passes laterally toward the fibrous “crossroad” at the thumb metacarpophalangeal joint. There, these fibers, like those of Grapow’s ligament, insert on either side of the thumb flexor sheath with some joining the lateral digital sheets of the thumb.

In the thumb, the fibrous architecture is similar to that in the fingers. There is a prevascular layer, Grayson’s ligament, and a retrovascular layer, Cleland’s ligament, which inserts partly on the skin and partly on the long finger sheath. These structures extend as far as the distal phalanx. The aponeurotic fibrous formation of the index is identical to those in the other fingers except that the radial lateral digital sheet, which is joined by Grapow’s ligament, appears to be better developed.

CASE MATERIAL

A review of 94 patients (173 hands) afflicted with Dupuytren’s disease during a three-year period at “l’Institut de la Main” revealed a radial location in 65 patients (103 hands; 63%). This large proportion, which is strikingly unusual, is

**Fig. 1.** The main fibrous structures on the radial side of the hand: (1) the fibrous skeleton of the thenar eminence; (2) the radial longitudinal oriented fibers of the palmar aponeurosis; (3) the distal transverse commissural ligament of the first web; and (4) the proximal transverse commissural ligament.
due in part to the systematic examination and recording, ray by ray, by the accepted method of codation. However, it is mainly due to the referral nature of l’Institut de la Main, to which are referred the patients with the most severe contractures, operative failures, and recurrences. Fifty-five per cent of the hands recommended for surgery have already had one or more operations.

LOCATION OF THE LESIONS

In all the cases with radial disease, the pathologic fibrous formations were situated at the level of the anatomical structures described above. Four locales were observed (Figs. 2 and 3A–3D) corresponding to the fibrous elements of Figure 1: Locale 1 (Fig. 3A), a longitudinal fibrous cord on the radial side of the thenar eminence, extending into the thumb and having the tendency to pull the metacarpophalangeal joint of the thumb into radial deviation and flexion; Locale 2 (Fig. 3B), a longitudinal cord to the first web and flexor sheath of the thumb corresponding to the longitudinal fibers of the palmar aponeurosis, causing a flexion contracture of the thumb; Locale 3 (Figs. 3B and 3D), a distal transverse interdigital cord, corresponding to Grapow’s ligament, producing an adduction and retroposition contracture; and Locale 4 (Fig. 3C), a transverse proximal cord in the first web, corresponding to the proximal transverse commissural ligament, resulting in a web space contracture.

CLINICAL CASES

Patients who have exclusive radial involvement are rare. There were only seven hands with radial involvement alone, whereas associated ulnar and radial involvement occurred in 96 hands. We have been able to distinguish three types of radial involvement: (1) a mild form, developing late in the more usual ulnar disease, and seen in the elderly,

FIG. 2. Sites of involvement in Dupuytren’s disease, i.e., Locales 1–4.

FIGS. 3A–3D. (A) involvement of the fibrous skeleton of the thenar eminence (Locale 1); (B) involvement of the radial longitudinally oriented fibers of the palmar aponeurosis (Locale 2) and the distal transverse commissural ligament (Locale 3); (C) involvement of the proximal transverse commissural ligament only (Locale 4); (D) isolated involvement of the distal transverse commissural ligament (Locale 3).
our patients had more than ten operations, one having had 18. Because of the biased selection of patients in our institute we cannot establish the relative incidence of these three types of radial involvement.

The presence of Dupuytren’s disease on the functionally important radial aspect of the hand, although a cause for concern, is not in itself a reason for classifying the disease as severe. We restrict the classification of severe forms to either contractures scoring over 10 points on our system of evaluation of deformity\textsuperscript{18} or recurrence or extension of the disease with contractures within three years of surgery. Applying this criteria half of the patients in this series would be classified as severe.

**Principles of Surgical Management**

The treatment of all patients with Dupuytren’s disease has two goals: to correct the deformity and to prevent extension and recurrences.

In the treatment of the usual forms of the disease, correction of the contractures and rapid functional recuperation constitute the principal goals; prevention of possible recurrences carries the need for a larger operation which often cannot be justified. However, the goals are not the same in those patients having a high potential for recurrence; prevention in those patients is part of the initial plan. There are two ways to decrease recurrences: extensive excision of the aponeurotic formations and replacement of the involved skin by skin graft. It is logical to use grafts to treat patients with severe radial involvement, especially young patients. The younger they are, the more aggressive should be the surgical approach. The “open palm” method of McCash has not been used in this series.

**Surgical Approaches**

A zigzag incision on the radial side of the thenar eminence, reaching as far as necessary on the radial side of the thumb, permits access to the longitudinal fibrous cord on the radial side of the thenar eminence and thumb (Fig. 4). An isolated contracted proximal transverse commissural ligament is approached by a zigzag incision over its whole length (Fig. 5). The involvement of both transverse commissural ligaments requires a Z-plasty, in which the middle portion is over the interdigital crest, the palmar limb following the proximal transverse commissural ligament and the dorsal limb starting at the distal end of the first web space (Fig. 6). At each end of the web space, the incision can be prolonged on the ulnar border of the thumb or radial border of the index finger. On the index finger the course of the in-
cision follows the same rules as on the other fingers.

APONEURECTOMY

Excision of the diseased tissue is facilitated by a sound knowledge of the anatomy of the aponeurotic structures. It is always necessary to first isolate the neurovascular bundles of the thumb and index in order to protect them. The ulnar neurovascular bundle of the thumb, the most important in the hand, is easily located at the base of the thumb at the point of the division of Grapow's ligament as its two terminal expansions go to each side of the thumb (Fig. 1). The radial neurovascular bundle of the thumb is more difficult to find at the base of the thumb because it is covered by a dense fibrous sheet, the "crossroad", at the side of the metacarpophalangeal joint (Fig. 1). It is wiser to look for it more proximally in the palm, just within the thenar eminence. It only reaches the radial side of the thumb distal to the middle of the proximal phalanx.

The radial digital nerve of the index is found in the obtuse angle formed by the radial edge of the proximal transverse commissural ligament and the pretendinous band of the index. It should be remembered that the artery, also at this level, is at a variable distance from the nerve and up to 8 mm lateral to it. The two elements of the neurovascular bundle reunite at the base of the digit. Once the neurovascular bundles are exposed and isolated, they can be dissected free from the pathologic fibrous tissue surrounding them as is routinely done in other

Fig. 5. Surgical approach of an isolated involvement of the proximal commissural ligament.

Fig. 6. One Z-plasty in the web space extended by a zigzag incision towards the index permits complete dissection of all the structures in the first web space. This incision allows approach to both transverse ligaments of the first web and is easily extended towards the index.
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OTHER RETRACTED TISSUES

The essential functional goal on the radial side of the hand is to restore a wide first web space and to permit a wide range of motion of the first metacarpal. These aims are usually accomplished by ablation of the contracted fibrous tissue. However, if the contracture is long-standing, the other structures may be secondarily contracted without being invaded by the disease. The dorsal aponeurosis is thick and should be cut at the same time as the dorsal skin. Sometimes the fibrous compartments of the adductor pollicis and first dorsal interosseous are contracted; these should be incised if necessary. Flexion contractures of the thumb and index finger may persist despite removal of all the diseased tissue. The flexor tendon sheath of the thumb or index can be opened or a volar plate release performed. In the thumb, however, the stability of the metacarpophalangeal joints is more important than mobility and volar capsulotomies should not be too vigorous.

THE SKIN

When there is only minimal skin infiltration and the threat of recurrence is low, the skin is simply sutured. Moderate retractions can be corrected by a Z-plasty or a VY-plasty. But, if the contractures are extensive and the risk of recurrence high, skin grafts are advisable (Figs. 7A, 7B, and 8). Recurrences into grafted areas are rare. A number of reasons have been raised to explain this. The most reasonable appears to be that ablation of the skin permits a more complete removal of diseased tissue by eradication of the dermal insertions of the aponeurosis, i.e., a more complete aponeurectomy. Other possibilities include the limiting effect the skin graft may have on the turnover of collagen and also that it “breaks up” the usual tension stress on the fascial structures.

Use of grafts on the radial side of the hand presents some particular problems because of the functional importance of this side of the hand. It is necessary to preserve normal sensation in the area of pinch, i.e., the pulps, the radial side of the index finger and the ulnar side of the thenar eminence. Also, the skin excisions should be done in the areas
where the risk of recurrence is highest, i.e., the zones described above where the usual diseased fascia is found: the lateral edge of the thenar eminence, over the radial side of the metacarpophalangeal joint of the thumb, over the crest of the first web space and about the proximal phalanx of the index finger (Figs. 7A and 7B). One must also be cautious, however: when the severity of the contracture forces one to open the tendon sheath, the open tendon must be covered by a flap and not a graft (Fig. 8).

Finally, it is essential that the contour of the graft be designed so as to avoid subsequent retraction along the suture line. The graft must, as much as possible, respect the rules of skin unity, and the traction lines should be broken by a series of angulations. Otherwise, they may recur due to skin scar contractures if the suture lines coincide with the lines of traction. All these considerations show the care that must be used in planning the lines of incision, the extent and the area of skin removal, and coverage with a local flap or graft.

The graft is usually full thickness taken from the medial aspect of the arm. For larger areas, thick split thickness skin may be used, although it contracts more than full thickness grafts. Good hemostasis must be achieved before the application of the grafts, and in all cases, the tourniquet is released after excision of the diseased tissue. Because of the duration of the operative procedure and the difficulty of the dissection when the contractures are severe and extensive, one should stage the surgery doing the radial and ulnar aspects of the hand at separate sittings. Multiple procedures are not necessary when the contractures are moderate.

Despite the magnitude of these operative procedures, the complications were rare and minor on the radial side of the hand. The danger of hematoma is less than after extensive palmar dissections and the grafts take well on the thenar eminence. Good recovery of thumb mobility was always achieved. In one case a painful neuroma of the dorsal branch of the radial digital nerve of the index finger developed but cleared spontaneously in about six months. Sensation was always preserved in the areas of pinch and grasp.

The important problem of recurrence remains. Regular follow-up on our patients showed some signs of extension in the areas in which surgery was not performed. Some needed reoperation. However, in the series followed for three years at l’Institut de la Main, no recurrence was found in the areas grafted. Some recurrent contractures did occur due to scar contractures where the edges of the grafts were not sufficiently extended or angulated. Recurrences are always likely, especially in people with Dupuytren’s
diathesis, as a surgical procedure on a local area will not cure a systemic disease. Functional recovery seems to be easier and quicker for radial forms of Dupuytren’s disease compared to ulnar forms, probably due to the fact that complete range of thumb movement is not necessary for good function.

SUMMARY

The fibrous elements of the radial side of the hand, i.e., index, first web space, and thumb, have not previously been fully described. However, involvement of this area may be significant, as seen in patients with a malignant form of Dupuytren’s disease known as Dupuytren’s diathesis, and adequate surgical removal depends on knowledge of the anatomy. Using cadavers, four major fibrous elements are defined: (1) the fibrous skeleton of the thenar eminence; (2) the radial longitudinally-oriented fibers of the palmar aponeurosis; (3) the distal transverse commissural ligament of the first web; and (4) the proximal transverse commissural ligament. These fibrous elements correspond with the four major locales of contracture seen in patients with radial side involvement and can produce a variety of contractures: metacarpophalangeal and interphalangeal flexion, abduction/opposition and/or adduction of the thumb. Surgical management, designed to correct deformity and prevent extension and recurrences, can be achieved by extensive excision of involved tissue and skin grafts. This can be accomplished by zig-zag incisions over isolated contractures of the fibrous elements or in combination with Z-plasty if the involvement is more extensive. Besides extensive aponeurectomy, tendon sheath releases and capsulotomies may be necessary. Use of skin grafts helps prevent recurrences. Full or thick split-thickness grafts should be used with discretion avoiding major sensory areas or open tendon sheaths.

REFERENCES