DUPUYTREN'S CONTRACTURE

A CLINICAL REVIEW∗

JAMES A. ROSS, M.B.E., M.D., F.R.C.S.E.†, AND
J. HUNTER ANNAN, M.B., F.R.C.S.E.‡

EDINBURGH, SCOTLAND

During the past two years 50 cases of Dupuytren's contracture (44 males, 6 females) have presented themselves for treatment at the Surgical Out-Patient Department, Edinburgh Royal Infirmary. Of these, 36 have submitted themselves to a questionnaire and review of their condition. Certain of their features are of interest, and appear worthy of consideration. They form the subject of the present study.

ANATOMY

The detailed anatomy of the fascia of the palm is of some importance in deciding a rational approach to treatment of Dupuytren's contracture. Excellent accounts have been given by Hutchinson,7 Horwitz6 and Skoog.10 The palmer fascia is proximally continuous with the palmaris longus tendon. When this is absent it is continuous with the fascia of the forearm. It is composed chiefly of longitudinal fibers in four bundles; a transverse sheet of interweaving fibers bridges the intervals, and this is more developed across the transverse creases of the hand, where it is attached to the skin. Proceeding into the fingers, fibers blend in succession with the transverse creases of the digits (Fig. 1); at the webs between the fingers transverse fibers are also evident.

The edges of the aponeurosis blend with the thin fascia over the hypothenar and thenar eminences, sending fibers to the skin. Better developed bands of fibers are present in the web of the thumb, and others pass longitudinally to the phalanges of the thumb. Proximally many of the deeper fibers are firmly fixed to the flexor retinaculum. Well formed septa pass dorsally from the aponeurosis; the proximal edges of the septa are strong and pass just distal to the vascular arches of the hand. There are eight such septa running from the deep surface of the aponeurosis. They pass on either side of the flexor tendons and gain insertion into the sides of the volar surface of the metacarpal shafts. Each septum on the radial side of the tendon splits to enclose the lumbrical muscle; this constitutes a well formed lumbrical canal distally. Prior to their attachment to the metacarpals these septa have connections across the interosseous spaces forming slings to support the digital nerves and branches of the superficial palmar arch. Beneath those slings each metacarpal branch of the deep palmar arch runs. Where the adductor pollicis muscle passes toward the third metacarpal, the septa arch over the distal border of the muscle (Figs. 2 and 3).

On reaching the webs of the fingers, the longitudinal bundles of the aponeurosis criss-crossing with the superficial transverse palmar ligaments send fibers backwards on either side of the fingers, which continue the septal sheets of the palm into the digits.

∗ Submitted for publication December, 1950.
† Assistant Surgeon, Edinburgh Royal Infirmary. Surgeon, Leith Hospital.
‡ Clinical Tutor in Surgery, Edinburgh Royal Infirmary and Demonstrator in Anatomy, Edinburgh University.
These sheets pass obliquely backwards to be attached to the ridged lips of the volar aspect of the proximal and middle phalanges and the intervening joint capsules (Fig. 1). The fibers run obliquely, splitting throughout their length to enclose digital vessels and nerves. Some fibers reach the dorsum of the phalanges and blend with the extensor expansion.

It will be seen therefore that the attachments of the palmar fascia are extensive and complicated, and if affected by a pathologic condition such as is present in Dupuytren's contracture can give rise to far reaching deformities.

**ETIOLOGY**

Of 36 patients interrogated, 31 were males, five were females, the usual preponderance of the male sex in this condition being present; Black, Davis and Kanavel, Koch & Mason record similar findings.

The average age of onset was 42, the youngest patient seen was 19, the oldest 71. Eight patients admitted a history of a familial incidence. The father alone was affected in four cases; the father, paternal uncle and two brothers in one case; father and two brothers in one case; uncle and brother in one case; the brother only in one case. Skoog found that the disease had occurred in the family of 22 of 50 patients. Wainwright stated "It is safe to say that in at least one-quarter and probably more... there is an hereditary element." There is no doubt therefore that heredity is of definite significance.

The patients followed a variety of occupations and it cannot be said that this in-
vestigation throws any fresh light on occupation as a possible etiologic factor. Five of the patients were housewives, three were non-manual workers, 28 were manual workers of different kinds.

Repeated minor traumata was the most common factor given by the patients as the explanation, in their opinion, of their condition. A golf club-master considered golf club swinging the cause in his case; one housewife blamed using a broom when sweeping, another blamed using the lawn-mower. Pick and shovel work (a miner, laborer and a stoker) straining on cables (cablejoiner) gripping farm tools (farm worker) gripping spanners or sharpening saws (sprayer and platelayer) screwing actions bending pipes (electrician) were various causes given. A lithographic printer considered the acid used at his work getting into little cuts and abrasions was the factor—"slow poisoning." A crematorium officer attributed his condition to lifting the sharp edge of coffins, and a bank clerk blamed his fondness for badminton and rowing. Several patients thought that one particular injury was the cause—a sore following heavy shoveling, a scratch on the palm, a hutch falling on the hand, an inflamed blister after lifting a heavy rock. Eleven patients gave no explanation at all.

Epilepsy has been found to be present in cases of Dupuytren's contracture in a sufficiently high percentage of cases to suggest a connection between the two conditions (Skoog). None of the patients in the present series, however, gave any history of fits. The general health was inquired into in every instance; one female patient was a diabetic, but otherwise no endocrine disturbances were noted. In particular, no obvious signs of thyroid hypofunction were noted, a possible underlying cause according to some authorities (Leopold-Levi, quoted by Black). No obvious connection between the degree of the patient's intelligence quotient and Dupuytren's contracture was noted; the I. Q. however had a marked effect on the prognosis, the co-operation of intelligent patients making all the difference in postoperative care.

Contracture of the palmaris longus was considered the underlying factor in Dupuytren's contracture at one time. This, of course, has long since been disproved. In the present series, for instance, the palmaris longus was absent on both sides in eight cases, and absent on one side in two cases, all well marked examples of Dupuytren's contracture.

Black in 1915 ventured to surmise that "the true cause or at least the principal cause of Dupuytren's contracture will eventually be recognized to be a certain internal condition (possibly akin to a gouty or rheumatic condition)." Steinberg considers it a form of primary fibrositis. As a result of his studies he concludes that in this condition, although the vitamin E intake is sufficient and the absorption from the gastro-intestinal tract adequate and the blood vitamin E level usually normal, there is a disturbance in the ability to utilize vitamin E. The response to increasing this vitamin in the diet, to make up for this disturbance, appears to confirm Steinberg's view. Skoog considers Dupuytren's contracture the result of a general patho-physiologic reaction in the connective tissues.

In common with Skoog, our impression is that Dupuytren's contracture is a "lesion in the aponeurosis in certain predisposed individuals, who in addition develop more or less excessive scar tissue when this lesion heals." The most likely cause of this lesion is repeated minor traumata, perhaps accented by disturbance in Vitamin E metabolism.

**Pathology**

The present series illustrates the typical features of Dupuytren's contracture; these are demonstrated in the histologic sections shown in Figures 4 and 5. These show that the disease tends to pass from an active
Fig. 4.—Histologic section (x 120) shows “dense fibrous aponeurosis containing numerous foci of active fibroblastic proliferation. A few cells (?fibroblasts ?elongated histiocytes) contain a few brown granules which suggest previous hemorrhage on a small scale. The picture is typical of Dupuytren’s contracture.” (Dr. A. C. P. Campbell.)

Fig. 5.—Histologic section (x 450). Dense fibrous tissue with the appearance of normal aponeurosis. No cellular fibroblastic areas such as are characteristic of Dupuytren’s contracture can be seen. Possibly the lesion is in a “healed stage.” (Dr. A. C. P. Campbell.)
initial cellular stage—fibroblasts—to a later acellular stage when collagen fibers predominate. Both can be seen in some histologic sections; in the earlier stages the cellular foci predominate, in the later, fibrous tissue plasia. The hypertrophy is found to take place within the anatomical distribution of the palmar fascia and its prolongations. The firm attachments to the phalanges raise exostoses on the volar surfaces of the bones, especially the middle phalanx (Fig. 6). The fibrous tissue is attached to the joint capsules, but joint involvement is a secondary process, and recoverable from if efficient treatment is instituted in time.

An interesting feature of Dupuytren's contracture, which is probably part and parcel of the underlying reaction of the connective tissue, is the occurrence of dorsal knuckle pads or nodules. This feature was noted by Garrod who found in 12 patients with dorsal knuckle pads no less than six who exhibited Dupuytren's contracture; and 22 of Skoog's 50 cases had nodules over the proximal interphalangeal joints of one or more fingers. Eight out of 36 of our cases presented them (Fig. 7). Histologic section of a dorsal nodule (Fig. 8) shows appearances similar to an early active cellular phase of palmar contracture, thus adding confirmation to the previous observations.

CLINICAL FEATURES

The great majority of cases of Dupuytren's contracture present themselves for treatment because of an increasing stiffness and difficulty in extension of the fingers of one or both hands. It is very probable, as Davis points out, that persons with Dupuytren's contracture come but seldom for treatment because only a few find the disease sufficiently inconvenient to necessitate relief. The average duration of the condition before treatment was sought in the present series was 18 months to two years; many however had been going far longer. In this respect it was noted that Dupuytren's contracture may develop at a varying speed. Some of the cases of long duration had the condition in a slight degree only; in one patient, aged 69, the condition had been present over 30 years, and others had been going 26, 22, 20 and 17 years. In other

Fig. 6.—Antero-posterior and lateral views of phalanges from amputated fifth finger (operation specimen) showing prominent ridges in middle and proximal phalanges.

("healed stage"). The cuff of small round cells around the vessels suggest an underlying low grade inflammatory element. The scattered phagocytes containing hemosiderin are also a characteristic feature; they suggest repeated mild traumata.

On examining the macroscopic appearances, the fat of the palm is found to be lost and replaced by dense scar tissue blending skin to aponeurosis. The skin itself assumes a sclerodermatous change. Muscles, nerves, vessels and fibrous tendon sheaths are not involved directly, though they may be in close contact with the fibrous hyper-
patients, the same degree of contracture had been reached in three or four years, and in one patient the left little finger became acutely flexed into the palm in a year and a half. The age of the patient at onset did not appear to affect this; that is, the cases which started earlier in life did not necessarily progress more rapidly than those starting later. Contracture may develop at a variable speed in the same patient. One patient had had a gradual development of the condition for 25 years; then, in the space of a year his left ring finger became acutely flexed against the palm. In another case after 20 years, the left fourth finger became drawn up within six months.

The first sign noted in most cases is a thickening, nodule or lump in the skin of the palm just above the root of the ring finger associated with a puckering of the palmar skin in relation to it (Tubby). This was the sign noted first in 30 of our patients; in six the first sign noted was the drawing up or contracture of the fourth finger toward the palm with a ridge running to the finger.

The onset and development of the condition was accompanied by very little in the way of symptoms. Twenty-three had no symptoms worth recording in their opinion, apart from stiffness and increasing flexion of the fingers. This was frequently brought to notice by difficulty in washing the face. Six complained of slight pain, particularly on stretching the affected palm. Tingling, numbness or "going to sleep," itchiness and heat, and slight cramps if not used were noted by a further six. These findings correspond to those of Kanavel, Koch & Mason, five of whose 29 patients complained of pain in the affected hand. Only one of our patients presented acute pain; this was due to a rupture of a contracted band while at work.

In the present series, 29 were bilateral and seven were unilateral (four left, three right). In the bilateral cases, not all the patients were aware that the condition affected both their hands, the contracture having progressed sufficiently in one hand to require relief, but not enough in the other side to attract attention. This being so, figures showing the length of time between the development in one hand and in the other cannot be accurate. No patient noted the onset simultaneously in both hands; the shortest time noted between the two was six months, the longest nine years. One unilateral case had been present for 26 years without any evidence of Dupuytren's contracture developing on the other side; however, on the whole the unilateral cases were of short duration. As noted before, the condition was found to start and develop very constantly in one position—on the ulnar side of the hand at the base of the fourth and fifth finger. The following table shows clearly the very marked preponderance of this side of the hand:

<table>
<thead>
<tr>
<th>Fingers Affected</th>
<th>Thumb</th>
<th>Index</th>
<th>Middle</th>
<th>Ring</th>
<th>Little</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>0</td>
<td>12</td>
<td>45</td>
<td>40</td>
<td></td>
</tr>
</tbody>
</table>

These findings correspond to those of previous authors.

**TREATMENT**

In this series treatment has been assessed in the 36 patients who reported for review, and in a further seven, the notes of whom are complete, making 43 patients in all.

One hand only was operated on in 34, both hands in seven. Two patients, a female diabetic and an elderly man, had no operation, being given a course of vitamin E ("Ephynal") alone.

A transverse palmar incision was used 43 times, a longitudinal incision five times, the operation consisting of a dissection of the fascia. In seven cases more than one transverse incision was made in the palm; three incisions in four cases, two incisions in three cases. Z-shaped incisions were used on the affected fingers in 16 patients and in three patients amputation of the fifth finger was
required; in one the fourth finger was removed.

Operative treatment in most cases has been on the lines advocated by McIndoe (Skoog)—a radical removal of the affected fascia based on a thorough knowledge of the anatomy of the fascia. Multiple subcutaneous divisions of the fascial bands, described by Adams and favorably considered by Davis do not reach the deeper prolongations of the fascia which play so im-

portant a part in affecting the fingers. Such a line of treatment is therefore not complete in itself, although useful as a preliminary to more radical procedures. It was not employed in our series, but occasionally a local removal of the affected fascia was carried out.

Amputation was considered advisable in cases with a severely contracted finger; and Chitty’s maneuver—filleting the finger and using the skin as a whole thickness graft in the palm can be employed with benefit in such cases. No excision of skin and free grafting was employed in our series. Hutchinson’s operation—excising the head of the proximal phalanx and shortening the exten-

sor tendon through a small dorsal incision, was not employed in any case in the present series.

Postoperatively, 16 patients had plaster of paris splints applied for ten to 21 days; the remainder had no splint applied. Active exercises under trained supervision were instituted following removal of the stitches. The response, in the extent of benefit, at this stage depended largely on the patient’s intelligence quotient.

Fig. 7.—Photograph illustrating dorsal knuckle pads typical in Dupuytren’s contracture.

Certain complications occurred. Hemato-
toma formation developed seven times; this was probably due to insufficiently firm pressure when bandaging after removal of the tourniquet. This complication did not interfere with subsequent satisfactory recovery. A degree of sepsis was noted in a further eight cases, perhaps due to the difficulty in sterilizing the hands of manual workers operated on as out-patients. Slight skin necrosis at the edges of the wound occurred in a few cases, and in one patient in whom the stitches were removed at the end of a week, instead of the usual period of ten days to a fortnight, the palm wound gaped open and had to have fresh suturing.
The functional result was classed as very good in 15, satisfactory in 21, and poor in five. In every case, however, with only two exceptions, i.e., in 39 cases, some skin thickening or subcutaneous nodules or fibrous bands persist. Some of the patients questioned said the nodule or thickening had definitely appeared postoperatively. In others, though clinically now satisfactory, the thickening was almost certainly due to insufficient removal of the fascia at operation. In only one case no trace of the previous disease was noted. In another the postoperative, or residual thickening had disappeared after a course of vitamin E.

In 1946 Steinberg reported that the administration of mixed natural toxopherols, Vitamin E, produced marked improvement in cases of Dupuytren's contracture. He noted however the tendency for Dupuytren's contracture to recur both after surgery and after the cessation of toxopherol therapy, and suggested later (1947) a combination of surgery plus toxopherol therapy. Thomson\textsuperscript{13, 14} has also described excellent results. King\textsuperscript{9} however, found no evidence of any alteration in 12 out of 13 patients, and four cases, moreover, complained of headache, giddiness, drowsiness and blurred vision during treatment.

We have begun to use vitamin E only recently, and so far have employed it in 12 patients postoperatively and as the sole treatment in two. A course of four 50 mg. tablets daily is given for eight to 12 weeks. Our impression is that vitamin E is of some benefit because it appears to facilitate earlier free movement of the fingers, and to soften the operation scar and also resolve the sclerogenous condition of the skin. In one case small residual postoperative nodules completely disappeared. Of the two cases treated with vitamin E alone, the diabetic woman has shown no improvement. The elderly man (aged 72) has shown an excellent response to the treatment. His fourth right finger, which was well flexed toward the palm, is now almost straight, after 16 weeks of treatment.

**SUMMARY**

1. A series of cases of Dupuytren's contracture have been reviewed.
2. The anatomy of the fascia of the hand is briefly described.
3. The etiology of Dupuytren's contracture is discussed.
4. Pathologic and clinical features are described. The tendency of Dupuytren's contracture to develop on the ulnar side of the hand involving especially the fourth and fifth fingers; the bilateral nature of the condition; the tendency to progress at a varying rate; and the frequency of dorsal knuckle pads, are noted.
5. Treatment is described. A combination of operation and vitamin E has recently been adopted. The operation consists of meticulous dissection of the palmar...
fascia plus its prolongations. Postoperative complications are mentioned.

Acknowledgments. We are grateful to Mr. H. W. Porter and Mr. A. McEwen Smith for permission to include their cases in this review. We are indebted to Professor J. C. Brash for the facilities of the Anatomy Department, Edinburgh University, to enable us to ascertain anatomical details, and we thank Dr. Nora Campbell, Department of Medical Illustrations, Edinburgh University, for the drawings illustrated in Figures 1, 2, 3 and 6. We also thank Sister Dewar for her care of the patients, and Miss McNeil and the Clerical Staff of the Surgical Out-Patient Department, Edinburgh Royal Infirmary, for their help in recording the details of this paper.

BIBLIOGRAPHY