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Treatment of Dupuytren's Contracture

LONG-TERM RESULTS AFTER FASCIOTOMY AND FASCIAL EXCISION*

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ABSTRACT: Of 359 hands treated surgically for Dupuytren's contracture, 135 were available for study after two years or more, often because of recurrence. Of the sixty-five hands treated by excision of the involved fascia (subtotal fasciectomy), 63 per cent had recurrences in the area operated on but only 15 per cent had sufficient deformity to warrant another operation. Of the forty-one hands treated by palmar fasciotomy, 43 per cent had recurrent deformities severe enough to warrant further surgical treatment. After palmar fasciotomy, improvement at the metacarpophalangeal joint persisted; but, as expected, the deformity at the proximal interphalangeal joint progressed just as it did in an untreated control group. The average postoperative period of disability was fifty-nine days after fasciectomy and twenty-one days after fasciotomy. Stiffness and hematoma occurred after fasciectomy but were not observed after fasciotomy. A digital nerve was severed during one fasciotomy and one fasciectomy. Excision of the involved fascia, therefore, gave the best long-term results but was associated with a higher incidence of postoperative complications.

Dupuytren's contracture is a disease of fascia, principally the palmar fascia, and is seen most often in middle-aged white men. It is characterized by progressive contracture of the palmar fascia, with extension of the contracture particularly into the ring and little fingers. The contractures may also arise in areas where the fascia is sparse, such as the thumb web space, but most commonly they are in the ulnar part of the hand. The pathological findings vary with the stage of the disease, progressing from the typical early cellular nodule to a dense fibrous cord [21,25,29]. The cause of the disease is unknown, but there is a definite correlation with the male sex, alcoholism, epilepsy, and heredity [3,27,33]. The diagnosis is made on clinical grounds and is usually not a problem. Treatment is primarily surgical; vitamin E, cortisone, and radiotherapy have all been tried, but the over-all long-term results with these treatments have not been satisfactory [10,11,19,30,34].

The controversy over the use of fasciotomy as op-

posed to fascial excision has existed for a long time. In 1823 Cooper recommended fasciotomy [4], and shortly thereafter Dupuytren also endorsed a special method of fasciotomy: multiple transverse incisions and fasciotomies of the contracted cords [9]. Goyrand [14] criticized Dupuytren's operation of multiple transverse incisions and advocated a longitudinal incision and excision of the cord in an attempt to prevent recurrence of the disease process.

Fasciotomy fell into disrepute over the years because of the frequent complication of inadvertent section of a digital nerve when the operation was performed in a finger. As is well known, the digital nerve often follows a tortuous course through the fibrous cord in the finger, but this does not occur proximal to the distal palmar crease [18]. With the advent of improved surgical facilities and antibiotics, fascial excision became popular [5,12,16,18,24,27,28,31,32]. Some authors recommended excision of the entire palmar fascia, whereas others advocated excision of only the diseased portion. Howard [18] advocated percutaneous fasciotomy in the treatment of older patients who are unable to undergo the more extensive operation of excision of the involved fascia (subtotal fasciectomy). He also recommended this type of fasciotomy as a preliminary to fasciectomy for patients who have extensive contractures of the fingers. More recently, Gonzalez [13] proposed open fasciotomy in the proximal part of the contracted fingers as the sole treatment of Dupuytren's contracture. He advocated a transverse incision with skin-grafting if a skin deficit occurred on straightening of the finger. At the present time enzymatic fasciotomy is being tried in some centers [2,21], but long-term results and comparison with other types of fasciotomy have yet to be published.

The purpose of this study was to review the results of 129 palmar fasciotomies and 230 subtotal fasciectomies, and the progression and outcome of the disease with no treatment in two control groups, the first composed of twenty-four hands with no or mild contractures and the second, of twenty-three hands with moderate to severe contractures, which did not have surgical treatment and which were observed over a number of years.

Materials and Methods

Data concerning treatment and results were obtained from a study of patients from the private practices of Dr. L. D. Howard, Jr., Dr. J. J. Niebauer, Dr. D. R. Pratt,
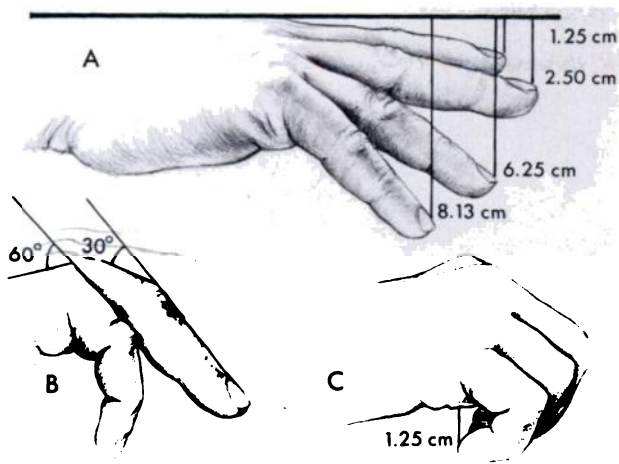
FIG. 1

Method of measuring loss of over-all motion of fingers and of joints. *A*, lack of extension in centimeters, is determined by placing a ruler on the dorsum of the hand and measuring the perpendicular distance from it to the tips of the finger nails. *B*, lack of extension in degrees, is measured at the metacarpophalangeal and proximal interphalangeal joints as shown (modified, with permission, from Howard [18]). *C*, loss of flexion expressed as the distance from the finger tips to the mid-palmar crease, is measured with the fingers flexed as much as possible.

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At the time of the initial examination, the ranges of motion of the metacarpophalangeal and proximal interphalangeal joints were recorded. At specific postoperative intervals and at final examination, the flexion contractures (in degrees) of these two joints were compared with the preoperative contractures (Fig. 1). In addition, with the finger in maximum extension the perpendicular distance from the tip of the finger nail to a straight line projected from the dorsum of the metacarpal was determined as a linear measurement of the over-all loss of finger extension (Fig. 1, *A*). In very advanced cases this linear measurement could not be made because the finger tips were flexed into the palm.

The following grading system was used to give some idea of the over-all hand disability of each patient: *Grade I* — nodules or cords present, but no contractures; *Grade II* — nodules or cords present, flexion contractures not more than 50 degrees in any one joint, no contracture of the thumb web that reduced thumb abduction by more than 30 degrees, and no loss of over-all extension in any finger in excess of 6.4 centimeters (measured as previously described); and *Grade III* — nodules or cords present, contracture of any finger joint exceeding 50 degrees, a thumb-web contracture reducing abduction of the thumb more than 30 degrees, and loss of extension of any finger in excess of 6.4 centimeters. Of the 359 hands operated on, 250 had sufficient preoperative measurements to allow grading by this system. One hundred and forty-nine of these operations were performed on patients with Grade-III lesions and fifty-six, on patients with Grade-II lesions. Thus, about 75 per cent of the hands operated on had Grade-III lesions. Postoperative grades were compared with the preoperative grades, as were the changes

in flexion and extension observed at intervals during follow-up.

In addition to the assessment of the change in function after each operation, the postoperative disability, the occurrence of the inflammatory "flare" reaction, and the development of other postoperative complications were recorded.

Treatment

The following methods were used in the management of the hands in this series: observation, palmar fasciotomy, palmar fasciotomy as a preliminary to subtotal fasciectomy, excision of the involved fascia (subtotal fasciectomy), subtotal fasciectomy and amputation of the little finger, and subtotal fasciectomy combined with skin-grafting. No complete palmar fasciectomy was included in this study; that is, clearance of the entire palmar fascia from both sides of the hand including the deep penetrating septa.

The twenty-three hands with Grade II and Grade-III contractures that were not treated were followed to assess their possible need for operation. The initial condition was less severe in this untreated group than in the surgically treated groups, but a valid comparison of the rate of progression of the disease in the untreated group could be made with the rates in the fasciotomy and fasciectomy groups.

The subcutaneous fasciotomy was usually performed as an office procedure. A tourniquet was used, and local anesthesia (lidocaine) was injected. The fascial cords were divided subcutaneously with a fasciotomy knife. After release of the tourniquet, the slight oozing was controlled by light compression and elevation. Mild compression was maintained by bandaging a soft rubber sponge in the palm, and the patient was seen the following day. At this time an appropriate bandage was all that was necessary for the wound, and a clock-spring splint was provided to obtain correction when tenderness resolved to the point that the splint could be tolerated. The fasciotomy was always limited to the palm at or proximal to the distal palmar crease.

Fascial excision of the involved Dupuytren's contracture was performed by various techniques. The skin incision varied depending on the individual case. The incisions most commonly used were a transverse palmar incision with additional finger incisions as needed [24], Y-V zigzag incisions [7] and z-plasties [8]. The procedure itself was carried out in the operating room with ischemia produced by a pneumatic tourniquet, and either block or general anesthesia was used. The digital nerves were identified proximally in the palm, and as the diseased fascia was removed proximally to distally the nerves were protected. Any involved finger was opened as extensively as necessary to remove the diseased fascia. The tourniquet was released before closure and meticulous attention was paid to obtaining hemostasis. The skin was then closed with interrupted stainless-steel wire or 5-0 nylon sutures. Occasionally there was considerable involvement of the

TABLE I

AVERAGE INITIAL LOSS OF OVER-ALL EXTENSION OF THE RING AND LITTLE FINGERS AND CHANGE AFTER
FASCIECTOMY, FASCIOTOMY, AND OBSERVATION*

Follow-up Interval	Ring Finger						Little Finger					
	After Fasciectomy		After Fasciotomy		After Observation		After Fasciectomy		After Fasciotomy		After Observation	
	No. of Fingers	Average Loss or Change (cm)	No. of Fingers	Average Loss or Change (cm)	No. of Fingers	Average Loss or Change (cm)	No. of Fingers	Average Loss or Change (cm)	No. of Fingers	Average Loss or Change (cm)	No. of Fingers	Average Loss or Change (cm)
Preoperative deficit	53	5.6	32	6.7	21	3.9	55	5.10	36	6.7	20	2.88
2 mos.	53	+2.7 (±0.7)†	32	+4.2 (±0.6)†			47	+2.8 (±0.7)†	32	+4.3 (±0.7)†		
6 mos.	27	+2.9 (±1.1)†	7	+2.9 (±1.1)†			30	+2.8 (±0.8)†	12	+3.2 (±1.4)†		
1 yr.					10	−1.9 (±0.3)†					8	−1.6 (±0.5)†
2 yrs.	10	+2.3 (±0.8)†	11	+0.5 (±0.8)†	10	−2.9 (±1.5)†	10	+1.5 (±1.5)†	11	+2.3 (±1.5)†	8	−1.7 (±0.0)†
3.5 yrs.	12	+4.2 (±1.6)†	9	+0.6 (±1.0)†	4	−2.8 (±1.9)†	12	+2.2 (±1.5)†	5	−1.3 (±1.0)†	3	−2.3 (±1.6)†
5.5 yrs.	13	+3.6 (±1.6)†	2	+2.5 (±8.3)‡	3	−3.8 (±2.1)†	12	+1.8 (±1.7)†	4	+2.5 (±2.9)‡	6	−3.5 (±1.5)†

* See Figure 1 for description of measurement. + signifies a gain; − indicates a loss of extension.
† 90 per cent confidence limits.
‡ Variance too great for reliable comparison.

skin by the disease process; in these cases the skin in question was excised and replaced by a full-thickness or thick split-thickness skin graft. Also, skin deficits occasionally occurred when contracted fingers were extended. If primary closure was impossible, exposed areas were covered with skin grafts. Such grafts were necessary in nineteen of the 230 hands requiring fascial excision. Because of severe, untreatable deformity, the little finger was amputated in seventeen of 230 hands.

Postoperative care was considered to be a very important aspect of the treatment of patients undergoing fascial excision. The first postoperative dressing consisted of fluffs soaked with Bunnell's solution (to which glycerin had been added) to act as a wick for evacuation of postoperative bleeding. An outer layer of plaster of Paris was added for immobilization. The dressings were changed twenty-four hours postoperatively to permit inspection of the wound for hematoma; if this complication occurred, the patient was returned to the operating room and the hematoma was evacuated. On the third or fourth postoperative day a dry dressing was usually applied. Immobilization was routinely discontinued after the skin had healed. Then the patient was started on active exercise with a sponge and exercise block. Assistive extension clock-spring splints or the like were sometimes used after the wounds had healed. The patients were then seen at frequent intervals to measure their postoperative progress.

Results

Over-all Finger Extension

The changes in over-all extension of the ring and little fingers, measured by the method already described (Fig. 1, A) at intervals ranging from two months to six years

after the initial evaluation, are given in Table I for the three groups (fasciectomy, fasciotomy, and observation) and are shown graphically in Figures 2 and 3. Not all hands were followed using the linear measurement (lack of finger-tip extension to a straight line), nor were all hands measured at each of the postoperative times shown in Table I. In addition, some hands were not included in this part of the study because contractures were so severe that the preoperative measurement could not be made. Thus, data with respect to over-all finger extension were not available for all of the 230 hands treated by fasciectomy, the 129 treated by fasciotomy, and the twenty-three untreated control hands. The number of ring and little fingers measured at each time interval, their average measurements, and the 90 per cent confidence limits are given in Table I. At some time intervals the number of fingers was too small and the variance was too great to allow a statistically reliable average measurement.

In the ring finger (Fig. 2), both fasciotomy and fascial excision produced a marked gain of extension at two and six months after operation. At two months the gain was significantly more after fasciotomy than after fasciectomy, but at six months the gains after the two procedures were essentially the same. At two years or more after fasciotomy the original contracture had recurred, whereas the gain after fasciectomy had been maintained. Also worthy of note was the fact that the deformity of the ring finger in the non-operative control group continued to increase over the six-year period, showing that both fasciotomy and fascial excision increased extension compared with no treatment.

In the little finger the same over-all pattern was evident (Fig. 3). However, after fasciotomy the deformities
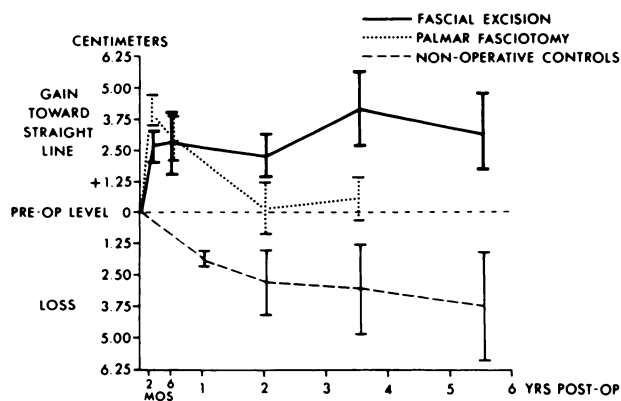
FIG. 2

FIG. 3

Average gain or loss of extension of the ring finger during six years after fasciotomy, fasciectomy, and observation (non-operative control group). After palmar fasciotomy there was a good initial gain, but this was all lost after three years. After fasciectomy the initial gain was maintained, and it increased slightly during the entire period. The non-operative control group showed a steady loss of extension throughout the period. The numbers in brackets indicate the ± 90 per cent confidence limits for each time interval.

Average gain or loss of extension of little finger during six years after fasciotomy, fasciectomy, and observation (non-operative control group). After palmar fasciotomy there was a good initial gain, but most of this was lost within the first two years and thereafter there was an insignificant gain. After fasciectomy there was an initial gain which was maintained and increased up to 3.5 years, after which there was some slight loss. The non-operative control group showed a steady loss of extension through the period. The numbers in brackets indicate the ± 90 per cent confidence limits for each time interval.

increased sharply after two years and at 3.5 years the deformities in the fingers treated by fasciotomy were significantly worse than those in the fingers treated by fascial excision, and in fact were not significantly different from those in the untreated controls. Thus, in this finger as in the ring finger, the group treated by fascial excision showed persistent and long-standing gains in extension over the years covered by the study.

Finger-Joint Extension

The changes in the deformities of the metacarpophalangeal and proximal interphalangeal joints in all four fingers (averaging index, long, ring, and little-finger deformities) after fasciotomy, fasciectomy, and no treat-
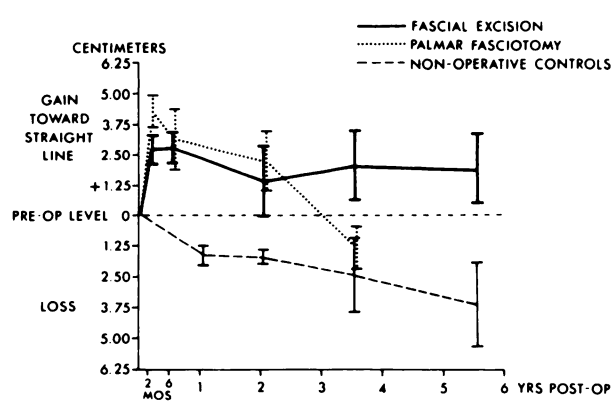
ment were also compared, as shown in Table II and Figures 4 and 5. Here, too, not all hands were followed using the same method of measuring individual joints in degrees, nor were all joints measured at each postoperative time shown in Table II. The number of joints measured at each time interval, their average measurements, and the 90 per cent confidence limits are given in Table II. As in Table I, the number of joints was too small and the variance was too great at some time intervals to make a statistically reliable average measurement.

In the metacarpophalangeal joint both operations produced gains in extension at two and six months. In the long-term follow-up, the average gains after fascial excision appeared to be better than those after fasciotomy;

TABLE II

AVERAGE LOSS OF EXTENSION OF THE FINGER METACARPOPHALANGEAL AND PROXIMAL INTERPHALANGEAL JOINTS*

	Metacarpophalangeal Joint						Proximal Interphalangeal Joint					
	After Fasciectomy		After Fasciotomy		After Observation		After Fasciectomy		After Fasciotomy		After Observation	
Follow-up Interval	No. of Joints	Average Loss or Change (*Degrees*)	No. of Joints	Average Loss or Change (*Degrees*)	No. of Joints	Average Loss or Change (*Degrees*)	No. of Joints	Average Loss or Change (*Degrees*)	No. of Joints	Average Loss or Change (*Degrees*)	No. of Joints	Average Loss or Change (*Degrees*)
Preoperative deficit	90	27	54	43	34	19	81	46	41	44	31	31
2 mos.	22	+26.1 (±8.0)†	21	+35.3 (±6.3)†			52	+19.1 (±5.3)†	18	+1.2 (±5.1)†		
6 mos.	27	+32.2 (±7.6)†	15	+20.0 (±6.4)†			38	+12.1 (±7.4)†	14	−7.4 (±8.0)†		
1 yr.					3	−8.0 (±7.2)†					5	−24.5 (±12.8)†
2 yrs.	13	+21.8 (±10.0)†	6	+5.5 (±15.5)†	10	−22.2 (±10.5)†	19	+2.6 (±3.8)†	6	−3.5 (±20.0)‡	11	−28.4 (±9.5)†
3.5 yrs.	11	+19.5 (±12.5)†	10	+12.8 (±17.0)†	7	+19.6 (±12.5)†	17	+15.3 (±10.0)†	9	−10.3 (±12.5)†	7	−28.0 (±14.4)†
5.5 yrs.	24	+30.2 (±8.0)†	12	+13.1 (±9.0)†	8	−14.9 (±9.4)†	21	+14.7 (±13.0)†	10	−26.6 (±17.0)†	10	−32.0 (±14.5)†

* See Figure 1 for description of measurement of angles. + signifies a decrease in flexion contracture; − indicates an increase in the contracture.
† 90 per cent confidence limits.
‡ Variance too great for reliable comparison.

however, it is of interest that there was no significant difference at any time during the entire six-year period except at the end (Fig. 4). Again, in the non-operative control group extension had decreased and remained below that in the two groups treated operatively.

The proximal interphalangeal joints after fasciotomy continued to lose extension throughout the period covered by the study, as would be expected, and there was no significant difference between the changes in this group and those in the control group. Conversely, after fascial excision there was a gain in extension that decreased slightly after six months but persisted over the long term (Fig. 5).

Recurrence of Disease after Fasciotomy and Fascial Excision

In studying the incidence and severity of recurrence of the disease after operation, only data from those patients who had been followed for two years or more were included. There were sufficient data after sixty-five fasciectomies and forty-seven fasciotomies for such study.

Of the sixty-five hands that had fascial excision and were followed for from two to twenty years, forty-one (63 per cent) had recurrence of the disease in the areas of the hand from which the fascia had been removed previously. However, only twenty-two of these forty-one had recurrence to a Grade-III level, and only ten of them had required further surgical procedures. This relatively high rate of repeat operations probably reflects the fact that the patients who returned for follow-up often came because of recurrences. Had all 230 patients with fasciectomies been followed for two years or more, the reoperation rate would probably have been lower.

Of the forty-seven hands that had fasciotomy, all showed some recurrence and thirty-four (72 per cent) had recurrence to a Grade-III level. Twenty hands (43 per cent) underwent repeat surgical procedures. Again, the reoperation rate was probably falsely high because of a skewed follow-up.

New Disease after Operation

In studying the occurrence of new disease (nodules or cords) in areas of the hand that were not touched during the original procedure, seventy-three hands were available for long-term follow-up of more than two years. New nodules and cords developed in forty-eight (66 per cent), mainly on the radial side of the hand. However, the severity of this new involvement was usually not significant; in only four hands (6 per cent) was it rated Grade III. All four of these hands had further operations.

Postoperative Disability

Postoperative disability was defined as the time from operation to return to work or previous avocation without further therapy or splints. The average duration of disability of the patients who had fasciotomy was 20.6 days (range, two to 120 days), whereas the average duration
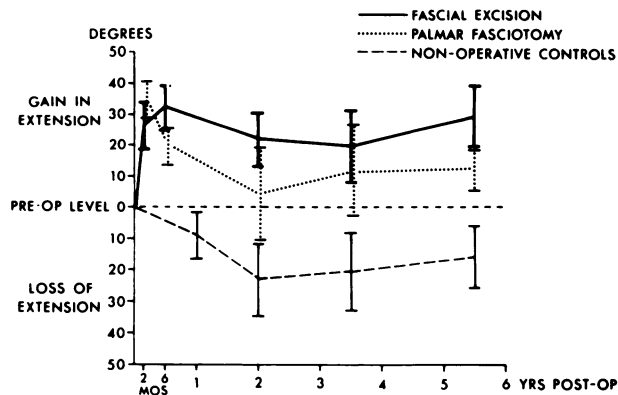

FIG. 4

Average gain or loss of extension of involved metacarpophalangeal joints of all fingers during six years after fasciotomy, fasciectomy, and observation (non-operative control group). After palmar fasciotomy there was a steep gain, and then a fall to levels which remained above the preoperative level throughout the six years. After fasciectomy there was an immediate and persistent gain. The non-operative control group showed progressive loss of extension up to two years, after which there was a leveling-off. The numbers in brackets indicate the ± 90 per cent confidence limits for each time interval.

after fascial excision was 58.7 days (range, twenty-one to 180 days). Patients who had complications were not included in these average figures.

Complications

Postoperative stiffness of the hand, the so-called inflammatory flare reaction, did not occur after fasciotomy but it was the most frequent complication after fasciectomy, occurring in twenty-four (approximately 10 per cent) of the 230 hands so treated. It usually appeared during the second week after operation and was characterized by stiffness, edema, and swelling, which varied from a moderate degree of stiffness to a full-blown shoulder-hand syndrome. There was no evidence of wound drainage or infection in any of these hands. Most hands with this com-
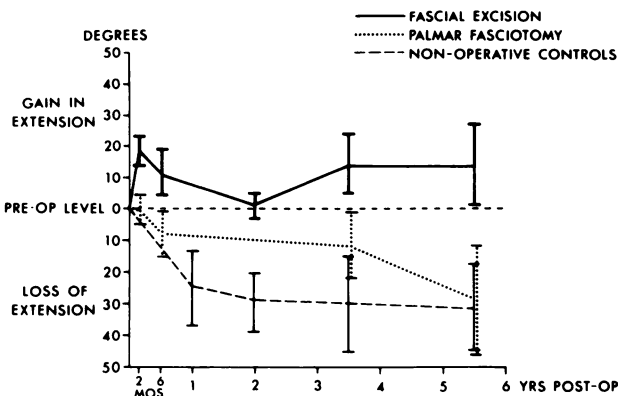

FIG. 5

Average gain or loss of extension of involved proximal interphalangeal joints of all fingers during six years after fasciotomy, fasciectomy, and observation (non-operative control group). After palmar fasciotomy there was no apparent effect on the progressive contracture of this joint, as compared with contracture in the non-operative control group. Fasciectomy resulted in an immediate gain followed by some loss, but there was long-term improvement over the preoperative condition. The numbers in brackets indicate the ± 90 per cent confidence limits for each time interval.

plication were treated with elevation and active exercise to tolerance; four patients were treated with systemic cortisone, but whether this was effective was questionable. Passive exercise, heat of any kind, and soaking were avoided. In general, all hands had some postoperative stiffness for several weeks, but only twenty-four with the severe flare reaction had prolonged stiffness persisting for up to one year after operation. Ten of the twenty-four hands (5 per cent of the 230) showed persisting long-term stiffness for more than one year, as indicated by a lack of flexion of the finger tip to the mid-palmar crease of more than 2.5 centimeters (Fig. 1, C). The stiffness was probably permanent in these hands.

Significant postoperative hematoma was the second most common complication. It occurred in nine of the 230 hands (4 per cent) in which a fasciectomy was done. As a result of this complication an extensive skin slough occurred in one hand. No patient who underwent fasciotomy had a significant hematoma.

Infection and inclusion cyst (three cases each) and severance of a digital nerve and neuroma in an amputation stump (one case each) also occurred after fascial excision. One severed digital nerve was seen after fasciotomy.

Progression with No Treatment

Twenty-four hands that initially had no or mild contracture (Grade I or Grade-II hands) and were followed for up to eleven years were available for study of the natural progression of the disease. In some of those hands the disease progressed. The average time required for these hands to reach a Grade-III level was 4.7 years (range, one to eleven years), but three hands with Grade-I disease initially showed no progression and no contractures over a five-year follow-up period.

The other twenty-three hands which had Grade II or Grade-III disease (moderate to severe contractures) but did not have surgical treatment were followed for up to seven years. They served as the non-operative control group for comparison with the hands that had surgical treatment. These twenty-three hands were considered appropriate controls since they had some degree of contracture initially, as did all of those that were operated on. Although their average initial contracture was less than that in the operative groups (Tables I and II), the rate of progression of their disease was comparable to the postoperative rates of progression of disease in the hands that had fasciectomy or fasciotomy. Most of the twenty-three hands in this control group were eventually operated on.

Discussion

The findings in this study suggest that fascial excision provides a long-term and reliable gain in finger extension while palmar fasciotomy, as done in this series, provided a good immediate gain in extension which lasted for two to three years, after which the flexion deformity recurred, returning to the preoperative level or worse. The main reason for this loss of extension after fasciotomy in the

palm appeared to be progressive contracture of the proximal interphalangeal joint (Fig. 5). Fasciotomy, as expected, appeared to have no effect on the progression of the disease as it affected the proximal interphalangeal joint. At the metacarpophalangeal joint the average contracture recurred about one year after fasciotomy but remained improved over preoperative levels during the period of this study.

Howard proposed what may be the most sensible set of indications for fasciotomy [18], as follows: (1) as a preliminary to fasciectomy in severe cases, since it allows the palmar skin to stretch out before the fascia is excised; (2) for older, retired, or non-working patients with limited palmar involvement and cords localized to one or two fingers; (3) for skilled workers with palmar cords who cannot afford the loss of working time associated with fasciectomy, provided they understand that later fasciectomy or repeat fasciotomy will be necessary; (4) for patients who have arthritis or who for other reasons are prone to joint stiffness; and (5) for patients who, because of other physical impairment, can only tolerate minor procedures. These indications were followed for the patients who underwent fasciotomy in this group.

Fascial excision should be performed in patients who do not fall into any of these categories and who have more widespread disease with severe progressive contractures. Many patients with more severe involvement have cords running in many different directions. Fibers such as these, and any that involve the ligamentum natatorium, can only be released by excision. Fascial excision is also indicated for the young person with widespread disease.

Although the rate of recurrence of the disease process was 63 per cent in areas of the hand from which fascia had been previously excised, only about half of these recurrences reached the Grade-III level. Half of the patients who reached this level had repeat operations. All of the hands that had no recurrence of the disease process in areas previously operated on ended up with a good result (Grade I or II).

Seventy-two per cent of the hands treated by palmar fasciotomy progressed to Grade III after surgery, whereas only 32 per cent of those treated by fascial excision progressed to this level. Therefore, fascial excision would appear to provide the best chance of a good long-term result.

It is of interest that our recurrence rate of 63 per cent after fasciectomy is higher than that in most reported series. In Weckesser's series [32], in which rather radical excision of the palmar fascia was done, a 5 per cent recurrence rate in forty-three hands was reported. In Luck's series [23], recurrence after simple nodulectomy was found in three of twelve patients followed over ten years, a 25 per cent rate of recurrence. In Hueston's series [20] of twenty-two patients followed for twenty years, a 25 per cent recurrence rate in the area of fasciectomy was reported, and only two of the recurrences required further operations. Davis and Finesilver [6], however, reported that

the recurrence rate after subtotal fasciectomy in thirty-one hands followed for longer than three years was 52 per cent, a rate comparable to that reported in this paper. More recently, Honner and associates [17] reported a 54 per cent recurrence rate in 138 hands, and 13 per cent required further operations. This rate is also similar to the one in our series. Our recurrence rate is also probably somewhat high because many of those who had a long-term follow-up had recurrences. After partial fasciectomy the recurrence of this disease process (nodules and cords) is probably high, as suggested by this series and the one reported by Honner and associates [17], but recurrence of severe contracture is probably infrequent. To obtain valid data on the rate of recurrence, one must differentiate between mild and severe recurrences and also have a long-term follow-up. The average follow-up in this series was 4.2 years (range, two to twenty years).

New disease in areas not previously operated on was seen in 66 per cent of our patients after fascial excision. In Hueston's series [20] of twenty-two patients, new disease developed in such areas in 50 per cent. In our series, only 6 per cent of the hands with new disease had contractures of Grade-III severity, and all of these had further surgical treatment.

No patient in this series had a total fasciectomy. Originally, the concept of total removal of the fascia was most attractive, but in light of the foregoing statistics it appears faulty. It is not possible to excise all the fascia that may become involved, for the disease process can develop elsewhere in the deep fascia [20] of the hand and not just in the palmar fascia. Also, there is often a recurrence despite a radical fasciectomy. Even in cases of complete fasciectomy followed by skin-grafting, the fascia grows back and Dupuytren's disease may recur in the grafted area. Furthermore, it appears from our experience that the more diffuse and severe the disease the more common are recurrences, and the more extensive the procedure the higher the incidence of complications.

Amputation of the little finger at the time of fascial excision was occasionally required in the surgical treatment of this disease. Amputation was considered indicated when the involvement at the level of the proximal interphalangeal joint was severe and irreparable and when the little finger was fixed tightly in the palm. Skin from the little finger may be filleted and used as a local flap in these cases. However, arthrodesis or osteotomy of the proximal interphalangeal joint in a position of function should also be considered.

Skin deficits occasionally accompany severe contractures; they can be readily treated with split-thickness or full-thickness skin grafts. If incisions are used in which flaps are created, the flaps should be inspected with the tourniquet deflated. If the flaps remain white and show evidence of impaired circulation, the skin should be excised and the defect covered with a skin graft. It is important to have permission from the patient before operation if a graft may be needed.

The natural course of the disease, once the contrac-

ture has begun, is progressive contracture of the involved joints. In our control group of twenty-three hands in which mild to moderate contractures were already present, the contractures of the involved digits progressed over the years.

The period of disability is, of course, much shorter after fasciotomy than after fascial excision, due in part to the more limited nature of the procedure. The length of postoperative disability is an important factor in evaluating patients and in planning over-all management. It is also essential to keep in mind that palmar fasciotomy produces only temporary correction of the deformity.

Postoperative stiffening should be treated by elevation and active exercise, and perhaps systemic steroid therapy [1], but the cause and the effective treatment of this complication have yet to be established. Barclay [1] showed that there appears to be a "body type" predisposition toward this complication. It has also been suggested that diuretics may significantly decrease the incidence of postoperative flare reactions [35], but we did not use them. A postoperative hematoma compromises the circulation of flaps and should be treated by immediate evacuation in the operating room when it is discovered, usually at the dressing change on the first postoperative day.

Conclusions

1. The natural course of Dupuytren's contracture is progressive. The average time required for a mild contracture to progress to a severe one is 4.7 years (range, one to eleven years).

2. Fasciotomy in the palm only results in good immediate improvement of the contracture of the metacarpophalangeal joint. Progressive contracture of the proximal interphalangeal joint will eventually cause severe contracture in 72 per cent of patients so treated.

3. Subtotal fasciectomy, or excision of the involved fascia, can be relied on to give long-term improvement, even though some recurrence of the disease in the region of the excision can be anticipated in approximately 63 per cent of patients and spread of the disease to previously uninvolved fascia, in 66 per cent.

4. These results suggest that palmar fasciotomy is best used as a temporary procedure. Therefore, it is usually indicated as a preliminary to fasciectomy or in cases in which fasciectomy is contraindicated. Subtotal fasciectomy is commonly indicated in younger patients with widespread disease because of the good long-term results, although it involves a higher incidence of postoperative complications. It is essential that the patient understand before operation that no one can predict the degree and duration of stiffness that may occur after operation, and that no one can determine which patient will have a recurrence; it is equally important that the patient understand that with progressive disease, surgical treatment offers the only hope of improvement.

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