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SUPPLEMENTUM 336

INCIDENCE AND COURSE OF  
POSTTRAUMATIC DYSTROPHY  
FOLLOWING OPERATION  
FOR DUPUYTREN'S CONTRACTURE

BY

L. ZACHARIAE

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The investigations carried  
out in the Orthopaedic Department  
enjoyed excellent cooperation  
for Cripples in Denmark  
and great help has been  
received from the Danish  
Government.

In particular, I should like to  
mention the assistance of  
*sen*, M.D., *K. Bang*,  
nurse, and Miss *H. I.*

Moreover, I am indebted  
to Mrs. *K. Lange*,  
follow-up examination  
laboration in the psychiatric  
Department.

Copenhagen, May 1964.

## PREFACE

The investigations to be reported in this volume were carried out in the Orthopaedic Hospital, Copenhagen, where I have enjoyed excellent working conditions. The Society and Home for Cripples in Denmark has afforded me financial support, and great help has been rendered by the various departments.

In particular, I should like to thank Professor *Arne Bertelsen*, M.D., *K. Bang-Rasmussen*, M.D., Mrs. *K. Hjort*, staff nurse, and Miss *H. Bruun*, secretary.

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Copenhagen, May 1964.

*Lis Zachariae*

Translated from the Danish by  
*Anna la Cour, née Claessen.*

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DEFINITION OF DYSTROPHY .	
DEFINITION OF DUPUYTREN'	
POSTOPERATIVE OEDEMA	
(Review of the literature) .	
PRESENT INVESTIGATIONS	
Material and methods .....	
Results .....	
FACTORS CONCERNING THE	
POSTOPERATIVE COURSE	
Surgical technique .....	
Anaesthesia .....	
Bloodlessness .....	
Haematoma .....	
Nerve Damage .....	
Skin .....	
Infection .....	
Dressing .....	
Follow-up and aftercare ...	
FACTORS CONCERNING THE	
Extent and development of	
Duration of disease. Sympto	
Age .....	
Sex .....	
Heredity .....	
Other rheumatic diseases ...	
General condition and inter	
Type of work .....	
Character .....	
CASE REPORTS .....	
CONCLUSIONS AND REFLECT	
THEORY ON THE AETIOLOG'	
DYSTROPHY .....	
PRESENT STUDIES IN PROGR	
Sudomotor function .....	
Capillary flow .....	
ANSWER TO THE POSED QUE	

## CONTENTS

	Page
DEFINITION OF DYSTROPHY .....	7
DEFINITION OF DUPUYTREN'S CONTRACTURE .....	8
POSTOPERATIVE OEDEMA (Review of the literature) .....	11
PRESENT INVESTIGATIONS	
Material and methods .....	15
Results .....	16
FACTORS CONCERNING THE OPERATION ITSELF AND THE PRIMARY POSTOPERATIVE COURSE	
Surgical technique .....	17
Anaesthesia .....	18
Bloodlessness .....	19
Haematoma .....	19
Nerve Damage .....	20
Skin .....	20
Infection .....	21
Dressing .....	21
Follow-up and aftercare .....	22
FACTORS CONCERNING THE PATIENT HIMSELF	
Extent and development of fibrosis .....	23
Duration of disease. Symptoms and signs .....	23
Age .....	24
Sex .....	25
Heredity .....	25
Other rheumatic diseases .....	25
General condition and intercurrent diseases .....	26
Type of work .....	27
Character .....	28
CASE REPORTS .....	32
CONCLUSIONS AND REFLECTIONS .....	41
THEORY ON THE AETIOLOGY OF DUPUYTREN'S CONTRACTURE AND DYSTROPHY .....	43
PRESENT STUDIES IN PROGRESS	
Sudomotor function .....	45
Capillary flow .....	47
ANSWER TO THE POSED QUESTIONS. - COMMENTS .....	48

## Definition of Dystrophy

It has long been known that certain patients may react in a special way to trauma, developing a state generally known as "posttraumatic reflex dystrophy". This is a serious complication, frequently to an originally rather negligible lesion, and at worst it may leave severe, permanent sequelae. This condition has been the subject of numerous investigations and reflections. A clinical picture and course of 3 stages has been described, e.g. GEZA DE TAKATS (1943):

1. After a major or minor trauma, the patient develops, usually after a certain latent period, pain in the extremity of a constant, burning nature and with paroxysmal exacerbations. In this stage the pain is confined to the affected part of the extremity, e.g. to the hand. This part is hot and swollen. The skin temperature is elevated, the blood flow increased, the oscillometric index is elevated, and there is oedema fluid in the tissues, especially subcutaneously and in the periarticular spaces. Sweating is often reduced, and the muscles are tense to prevent movement of the painful extremity.
2. The oedema now spreads to adjacent areas, the hand becomes indurated, cyanosed, cold, and sweating. The joints become stiff, leading to a possibly lasting deformity. The pain spreads and acquires the nature of neuralgia. Pain develops in the shoulder, and we have the typical shoulder-hand syndrome.
3. The skin becomes atrophic, fingers and joints stiff, the muscles grow atrophic, and the nails become reedy, curved,

and brittle. This is what is called the "frozen hand". At this stage the pain has usually disappeared.

At a fairly early stage, in the 3rd or 4th week, the increased blood flow gives rise to pronounced radiological signs of halisteresis.

This is a schematic presentation, but quite a good description of the condition. The duration of the various stages differs within wide limits, and of course there are variations and transitions. A large proportion of the patients recover spontaneously or during treatment after Stage 1. A shoulder-hand syndrome may just as often, or perhaps more often, start as pain in the shoulder, the changes in the hand being secondary.

The aetiology and pathogenesis are far from being fully understood. Numerous theories have been advanced, and the syndrome has always been "surrounded by a haze of mystery or the supernatural". Among the authors who have taken a particular interest in this subject there are e.g.: SUDECK (1900) who studied mainly the osseous atrophy, also in inflammatory conditions, DE TAKATS and associates (1937, 1943), LERICHE (1930), STEIN-BROCKER and associates (1948), FAULONC (1952), and from Scandinavia HALDBO (1942) and MOBERG (1955) – and the list is of course far from complete.

Among the advanced theories two are opposed and each has its adherents. One holds that the signs and symptoms of dystrophy are caused by a reflex arc *via* the autonomic nervous system (HALDBO 1942, BERTELSEN 1958): Stimuli from a chronic

focus of irritation in a peripheral site are believed to travel through ordinary sensory nerves to the spinal cord where the reflex is transmitted, *via* a number of different small cells of Lorento de No (1938) called internuncial pool, and hence sympathetic impulses are emitted to the affected extremity. A suggested explanation of the frequently motley symptomatology of the dystrophy is that owing to the constant bombardment by stimuli from the peripheral focus the impulses in the spinal cord may spread both upwards and downwards and thus affect several segments. The other theory, which in our times has been propounded especially by MOBERG (1955), flatly denies the existence of such a reflex arc, explaining the symptoms on the basis of primary immobilization of the extremity: Owing to the pain, the patient fixes the affected extremity; this gives rise to oedema which is not removed, as the muscle pump is also ineffective because of the immobilization, and the

oedema is further increased. This oedema gives rise to a foreign-body reaction in the tissues, followed by fibrosis. MOBERG (1955) identifies the so-called dystrophy, a term which he does not use, with the shoulder-hand syndrome and describes a circle consisting of pain - fixation - oedema, which may arise following a primary injury to the shoulder or to the hand.

In the author's opinion, both mechanisms occur, also combined and intertwined. It is not yet understood why some patients react so violently to a trauma, but most investigators assume that the explanation is some factor or other in the patient himself - an imbalance of the vegetative nervous system or a neurotic constitution. In DE 'TAKATS' (1937) opinion the named reflex is normally inhibited by superior cortical centres and the syndrome, therefore, usually occurs in mentally unstable individuals. However, this claim does not seem to have been proved (BERTELSEN 1958).

## Definition of Dupuytren's Contracture

Dupuytren's contracture is taken to mean thickening and subsequent shrinkage of the palmar fascia, including all its extensions, which entails increasing contracture of the fingers. The disease derives its name from the French surgeon DUPUYTREN by whom it was studied in the 1830's, first on corpses and later (1834) at operations. He demonstrated that the disease affected the palmar fascia and not, as previously believed, the flexor tendons.

During the past century innumerable investigations have been performed to

throw further light on this problem, but in actual fact the aetiology and pathogenesis of Dupuytren's contracture remain unelucidated to this day.

In 1902 JANSSEN published the first thorough microscopic description, but in this field too we have not got much closer to the problem.

Let me now briefly sum up the available information on Dupuytren's contracture. The reported incidence varies within wide limits. According to LARSEN & POSCH (1958), it occurs in 1-2 % of the general

population, most often in the elderly. HUESTON (1960), in a mixed 3700 patients, found the incidence approx. 13 % in the age 30-40, and to approx. 40 % in the age group 60-70 years. HUESTON found the condition equally common in males and females, a finding at variance with other studies which have usually found the incidence to be 5 times as common in males as in females (JAMES & TUBIANA 1952). A possible explanation of this divergence in most analyses are based on surgical material while HUESTON's was based on the general population. It is generally agreed that the disease increases in frequency with advancing age. Those who present themselves for treatment are usually about 50 years of age, i.e. of the working age in whom the disease has reached a stage interfering with their working ability.

The aetiology is also not elucidated. It may be considered an established fact that the disease is hereditary, but to what extent in the different material. SKOOG (1948) found a family history in 44 %.

Whether trauma is an aetiological factor is a burning question, and the answer may have changed. SKOOG (1948) is inclined to think that it is, as he found blood clots, i.e. remnants of bleeding, in the affected tissue, and LARSEN *et al.* (1960), in a microscopic study, found the capillaries to be ruptured. By experiments on the palmar and plantar fascia, LARSEN also succeeded in inducing Dupuytren-like changes. HUESTON (1960) found the incidence to be the same in brewery workers. Incidentally, the incidence is also high among coachmen and brewery workers.

population, most often in the elderly, while HUESTON (1960), in a mixed group of 3700 patients, found the incidence to be approx. 13 % in the age 30-40, increasing to approx. 40 % in the age group 70-80 years. HUESTON found the condition to be equally common in males and females, a finding at variance with other analyses which have usually found the disease to be 5 times as common in males as in females (JAMES & TUBIANA 1952). A possible explanation of this divergence is that most analyses are based on surgical series, while HUESTON'S was based on groups of the general population. It is generally agreed that the disease increases in frequency with advancing age. The patients who present themselves for treatment are usually about 50 years of age, i.e. persons of the working age in whom the contracture has reached a stage interfering with their working ability.

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gory said to have a high incidence of Dupuytren's contracture, a finding which according to WOLFE and associates (1956) should not be interpreted in favour of the traumatic aetiology. In their opinion, the explanation is that these persons drink the contents of the crates rather than that they carry them, as there is a striking preponderance of Dupuytren's contracture in alcoholics, especially those who have developed hepatic cirrhosis. The incidence is as high as 66 %, possibly because of vitamin E deficiency.

However, hepatic cirrhosis is not the only disorder claimed to be connected with Dupuytren's contracture which is stated to be common also in association with coronary occlusion (JOHNSON 1943, ASK-UPMARK 1944), with epilepsy (SKOOG 1948, M. LUND 1941), possibly because of the medication, and other neurological disorders, e.g. syringomyelia, or following brain operations (VÆRNET 1952). Several authors have reported a certain connection with the ulnar nerve, possibly because it carries sympathetic fibres (POWERS 1932). Endocrine disease have been said to be contributory, e.g. diabetes (PAELSLACK 1962) or disturbances of thyroid, parathyroid, or pituitary function (SKOOG 1948). Many workers have inclined to a mental factor (KINGSBURY 1891, NIPPERT 1929, JELLIFFE 1931), while HUESTON (1960) maintains that patients suffering from mental diseases do not have an increased incidence of Dupuytren's contracture.

Lastly, it is worth mentioning the so-called "fibroplastic diathesis", a tendency to "collagen disease", which some authors call "arthritic diathesis", i.e. a predisposition in certain people for diseases of the



connective tissue. This theory is based on the common occurrence of diseases such as plantar fibrosis, Peyronie's disease, knuckle pads, humeral peri-arthritis, cervical osteoarthritis (PADOVANI & LORD 1951), and arthritis of the finger joints in association with Dupuytren's contracture. The current opinion is that such a connective-tissue constitution does exist, but this is far from having been proved (LUND 1941, TUBIANA 1955, SKOOG 1957).

As already mentioned, the microscopic appearances were described admirably for the first time by JANSSEN in 1902, and little has been added to this description in the course of the last 60 years.

In the first stages there are active, proliferating fibroblasts in islets of a typical whorl structure. The appearances may at times be reminiscent of fibrosarcoma, but mitotic figures are not common. This proliferative tissue forms nodules of varying size situated in a dense connective tissue consisting of collagen fibrils, and in advanced cases there are practically only collagen fibrils. In relation to the active cellular islets there will be increased capillary vascularity, and the vessel walls proper exhibit hyperplasia of the connective-tissue elements, especially in the adventitia. The adipose tissue and the interstitial tissue surrounding the aponeurosis show perivascular lymphocytic infiltration. MEYERDING and his associates (1941) took this latter finding to indicate an inflammatory aetiology, while STEIN et al. (1960) found, in 78 % of their Dupuytren biopsies, cells showing staining properties characteristic of muscle tissue. They deduced that the disease was due to embryonic remnants of the m. flexor brevis superficialis which persists in some people and which may

undergo hyaline degeneration with subsequent fibrosis because of injury or some other action. In addition, iron pigment has been found in the active nodules (SKOOG 1948) and rupture of collagen fibrils (LARSEN 1960) as already mentioned above.

The treatment of Dupuytren's contracture has been a matter of equally heated discussion. I shall not deal with the various topical and systemic drugs used in the course of time, but shall concentrate on the surgical treatment which has always been and still is preferred, although it is realized that by removing the thickened palmar fascia we attack only the symptoms and not the disease itself. The operation may be carried out in a number of different ways, using various incisions and removing major or minor parts of the fascia, ranging from almost total fasciectomy with careful dissection of all bands, as recommended by int. al. CHEVALIER (1951), LANGSTON & COVAN (1955), LAMPIER et al. (1956), SKOOG (1957), McINDOE (1958) and others, *via* partial fasciectomy removing only the affected areas (HAMLIN 1952, GORDON 1956, BARCLAY 1959, WAKEFIELD 1960, SÖDERBERG 1951, and HUESTON 1961), to fasciotomy (HOWARD 1959), possibly combined with removal of the primary nodule as suggested by LUCK (1959). In LUCK's opinion, this nodule is the primary pathogenetic factor, while the bands represent reactive functional hypertrophy of the fascia.

The discussion has also concerned how much skin is to be excised and how covering of the wound is to be obtained, but no further mention will be made of these items here.

## Post

### *Review of the Literature*

It is generally known among and for that matter also among patients, that the postoperative course of surgery for Dupuytren's contracture is extremely protracted and complicated by oedema and stiffness of the hand. However, it is far more difficult to get absolute values from the literature. Analyses of the operative results are divided into good, fair, and poor, the latter as poor group comprising both recurrences, operations, recurrences and postoperative stiffness. For instance, TUBIANA and SKOOG (1957) who have exclusively good results, do not mention any complication, while CARSTAM, in a paper read in 1958, reported 22 cases of postoperative oedema and stiffness of the hand, treated by 3 different techniques.

Nevertheless, a more detailed analysis of the published results discloses a quite a number of "dystrophic" results after operations by the McIndoe technique. ISELIN & DIECKMANN (1951) found no flexion at follow-up in 7 patients assigned only 2 to the poor group and 5 to the fair group. They do state that the main complication of the operation is postoperative stiffness.

CHEVALIER (1951), in his analysis of fasciectomies, reported that the results of the poor group had stiff hands with restricted flexion. This applied to 10 patients while the recurrences were assigned to the fair group. SÖDERBERG (1951) in his special technique of partial fasciectomy which gave poor results in only 10 patients makes no mention of postoper-

## Postoperative Oedema

### *Review of the Literature*

It is generally known among surgeons, and for that matter also among the patients, that the postoperative course after surgery for Dupuytren's contracture is often extremely protracted and complicated by oedema and stiffness of the hand. However, it is far more difficult to glean absolute values from the literature. Most analyses of the operative results are classified into good, fair, and poor, the fair as well as poor group comprising both incomplete operations, recurrences and postoperative stiffness. For instance, TUBIANA (1955) and SKOOG (1957) who have almost exclusively good results, do not mention this complication, while CARSTAM, in a paper read in 1958, reported 22 cases of severe postoperative oedema and stiffness in 122 operations by 3 different techniques.

Nevertheless, a more detailed analysis of the published results discloses among them quite a number of "dystrophies". In 40 operations by the McIndoe technique ISELIN & DIECKMANN (1951) found limited flexion at follow-up in 7 patients, but they assigned only 2 to the poor group and 5 to the fair group. They do state, however, that the main complication of the operation is postoperative stiffness.

CHEVALIER (1951), analysing 39 total fasciectomy, reported that the patients of the poor group had stiff hands with restricted flexion. This applied to 3 patients, while the recurrences were assigned to the fair group. SÖDERBERG (1951) described a special technique of partial fasciectomy which gave poor results in only 6.6 %. He makes no mention of postoperative stiff-

ness, but a review of the case reports discloses that at follow-up there was limitation of flexion in a total of 5, all of whom had been classified as fair. In an otherwise extremely thorough study on Dupuytren's contracture, JAMES & TUBIANA (1962) do not even mention postoperative dystrophy. Nevertheless, they state that their 5 poor results out of 96 operations are due to oedema and consequent stiffness, but they do not discuss this syndrome further, merely stating that it occurs when the dressing is removed and that it is due to non-elevation and immobilization of the hand.

Out of 118 patients treated by total fasciectomy HAMLIN (1952) found a prolonged postoperative period in 4 who developed such severe stiffness that they had to stop working. He then abandoned radical surgery and recommended partial fasciectomy. LANGSTON & COWAN (1955) who analysed 125 total fasciectomy, found 8% poor and 32% fair results. These authors state that the most common and most serious cause of the poor results is a combination of arthritis in the finger joints and sympathetic dystrophy, but without presenting a further definition of this concept. SHAW & BARCLAY (1957) found, after radical fasciectomy, prolonged oedema in 9 out of 157 operations. Incidentally, they had poor results in 33 cases 8 of which were due to arthritis of the finger joints, 14 to stiffness of the hand following haematoma, one to oedema, and 3 to lacking collaboration, which probably also manifests itself by stiffness. In other words, there was postoperative restriction

of function in 26 out of 157 cases. According to LARSEN & POSCH (1958) postoperative stiffness is the most common and most important complication of operations for Dupuytren's contracture and frequently leaves lasting sequelae. In their series of 99, 22 patients had a major or minor limitation of flexion, but the follow-up period was short. In a selected group, i. e. patients of advanced age having stiffness of the joints prior to the operation or a broad, thick, and stiff workman's hand, 5 out of 10 had postoperative stiffness of the joints. After partial fasciectomy HUESTON

(1961) found prolonged postoperative oedema in 15.5 %. His criterion was that full flexion had not been obtained in 6 weeks. At the end of 12 weeks, however, all the patients had full flexion.

Thus, it is beyond doubt that operation for Dupuytren's contracture may leave the most serious sequelae. This is of particularly great importance, as even a severe Dupuytren's contracture frequently bothers the patients but little and seldom prevents them from working, while a stiff, dystrophic, possibly painful hand is a serious disability.

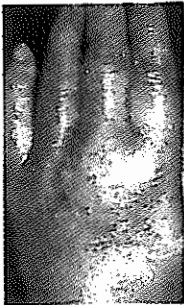
G. I

Examples of a normal and complicated postoperative course following operation for Dupuytren's contracture.

Photos 1-4 illustrate a normal course, photos 5-12 a prolonged course with oedema, photos 13-14 lasting flexion defect, and photos 15-16 a splint for postoperative use.



1. Immediately after the operation.



5. Oedema 2 weeks after the operation.



9. Extension and flexion 5 weeks after the operation.



13. Extension 7 months after contracture. E is a flexion defect.

FIG. 1

Examples of a normal and complicated postoperative course following operation for Dupuytren's contracture.

Photos 1-4 illustrate a normal course, photos 5-12 a prolonged course with oedema, photos 13-14 lasting flexion defect, and photos 15-16 a splint for postoperative use.



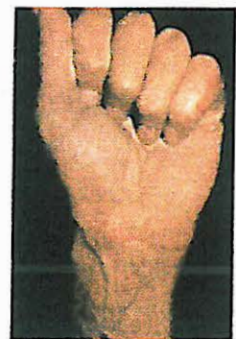
1. Immediately after the operation.



2. Flexion 10 days after the operation.



3. Extension 5 weeks after the operation.



4. Flexion 5 weeks after the operation.



5. Oedema 2 weeks after the operation.



6. Maximum flexion 2 weeks after the operation.



7. Oedema subsiding 4 weeks after the operation.



8. Maximum flexion 4 weeks after the operation.



9. Extension and scar 5 weeks after the operation.



10. Flexion 5 weeks after the operation.



11. Flexion 4 months after the operation.



12. extension 4 months after the operation.



13. Extension and 14. flexion 7 months after operation for Dupuytren's contracture. Extension is perfect, but there is a flexion defect and weakness of the hand.



15. Splint applied one week after operation for Dupuytren's contracture. The splint keeps the wound in the palm immobile, but permits flexion of the fingers.



P. 14

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## Present Investigations

### *Material and Methods*

To throw further light on the problem regarding the occurrence and course of dystrophy or, more correctly, of abnormally prolonged oedema and subsequent restriction of function following operations for Dupuytren's contracture, the author personally operated upon, after-treated and followed 100 patients and furthermore reviewed the records of and after-examined 73 patients who had previously been operated upon by another surgeon. The author's own patients had a number of specific investigations which will be described below.

The author's 100 patients had operations on a total of 103 hands. The surgical method was limited fasciectomy through a transverse incision into the palm supplemented, if necessary, by longitudinal incisions along the sides of the fingers. Only affected fascial tissue was removed; deep dissection of the palm was not done, but the bands in between the deeper structures were cut. Vessels, nerves, and tendon sheaths were located and as a rule had to be freed locally. The skin was freed to an extent which permitted removal of the affected tissue, all folds in the skin being straightened out as far as possible. Only a few skin graftings were done, since in most cases the skin could cover the wound. The operations were performed in a bloodless field, and haemostasis was secured while the bloodlessness was temporarily interrupted. After the operation the hand was bandaged on a straight plastic splint which was padded with cotton-wool and fluffed gauze. The fingers were extended as much

as possible without exerting tension on the wound to which a firm dressing had been applied before fitting the splint. On the day after the operation the wound was inspected and any haematoma evacuated. The next changing was one week later, and at that time the splint was usually removed. The sutures were removed at the end of two weeks. All the patients were carefully followed and given physiotherapy, in the form of active exercises, paraffin baths, and also occupational therapy when this was considered necessary.

The operations were performed on a consecutive series of patients from October 1960 to and including October 1961, and the follow-up study was carried out in February-March 1962.

The patients of the other series had been operated upon, through quite a number of years, by another surgeon who used total fasciectomy with careful dissection and removal of the entire palmar fascia. In this technique the approach was also through a transverse incision into the palm and lateral incisions on the fingers. Moreover, the methods of bandaging, follow-up and after-treatment were approximately the same as in the author's personal series.

The records kept for the latter series are not as comprehensive as might have been desired. This applies in particular to the preoperative objective examination and the description of the operation. However, on the basis of the data from the records, compared with the objective findings at follow-up, and the information supplied by the patients, it was possible to form a fairly good impression of the course.

This second series comprises 73 patients with 83 operated hands. The operations had been carried out during the period 1954-59, and the follow-up was done in February-March 1962.

Both series are fairly complete. Of the author's personal series only 2 patients could not be traced. One had died and the other one had gone abroad. Of the older series 11 patients could not be traced. These patients are not included in the analysis.

In analysing the material, the author paid no regard to the actual operative result, i.e. the effect upon the contracture, only to the postoperative course and findings which suggested dystrophy, especially the presence of oedema and stiffness.

In assessing the postoperative course, it was noted at which juncture after the operation the fist could be normally closed, as this indicates that oedema and stiffness have disappeared.

Any trauma - including operations - induces afflux of tissue fluid to the injured site. This is one of the defence reactions to the irritant. As a rule, this oedema disappears fairly soon, when healing is in progress or if the complications are treated, e.g. by incision of abscesses. However, any oedema, e.g. of a hand, involves a potential risk of dystrophy with subsequent disabling stiffness. (Fig. 1, Nos. 1-12).

But when can the postoperative course be called abnormal?

In the sequelae following operation for Dupuytren's contracture, the oedema appears to be the primary factor (*vide infra*), and one must fix a given juncture at which this oedema has to have subsided, if the postoperative course is to be taken

to be normal. ADAMS-RAY (1944), in a very large series of diverse injuries, stated that in the absence of complications the oedema must have disappeared within an average of 4 weeks after the injury, and according to WAKEFIELD (1960) the patients must be able to make a fist one month after the operation, if the result is to be classified as good. HUESTON (1961) demands full flexion 6 weeks after the operation.

In the present study, the author chose 6 weeks as the time within which all postoperative symptoms and signs must have subsided. All cases able to make a fist within 6 weeks of the operation were considered normal. Cases in which the hand is fit within 3 months are also acceptable, while oedema and stiffness beyond 3 months indicate an absolutely abnormal postoperative course.

### Results

The total number of operations in both series is 186, and the follow-up period ranges from 3 months to 7 years.

A total of 98 cases (52.2 %) had a completely uneventful postoperative course. An additional 11 cases had oedema estimated as more pronounced than usual, but nevertheless these hands were fully fit 6 weeks after the operation. Two months after the operation, a further 25 hands were fit and at the end of 3 months another 11. About 6 months after the operation a total of 164 hands were fit. There was a permanent restriction of flexion in 22 cases (11.8 %) throughout the follow-up period, but it must be mentioned that 5 of these patients were followed for less than 6 months. In 20 cases the restriction of flexion was of a minor

Time elapsing from oper:

6 weeks or less .....	.....
Approx. 2 months .....	.....
Approx. 3 months .....	.....
3-6 months .....	.....
Limitation of flexion throughout fol	.....

Total number .....	.....
--------------------	-------

extent (the finger tips being 1 cm short of reaching the palm) 2 had major limitation of flex instances the flexion defect inv the operated fingers, while in involved the non-operated fing.

These findings are recorded

The table shows that following for Dupuytren's contracture, pe experienced surgeons in a spec ment on a mixed series of patie manent limitation of flexion about 10 %. This result is in with previous analyses. Only a of the patients had a fairly

## Factors Conce the Prim

### Surgical Technique

It seems reasonable to start b the two series separately in orc tain whether a difference can the postoperative sequelae a

TABLE I  
Time elapsing from operation for Dupuytren's contracture until full flexion of the hand was attained.

	No. of hands	Comments
6 weeks or less .....	109 (62.7 %)	Incl. 11 with transient oedema
Approx. 2 months .....	25	
Approx. 3 months .....	11	
3-6 months .....	19	
Limitation of flexion throughout follow-up period	22 (11.8 %)	Incl. 5 followed for less than 6 months
<hr/>		
Total number .....	186	

extent (the finger tips being less than 1 cm short of reaching the palm), and only 2 had major limitation of flexion. In 10 instances the flexion defect involved only the operated fingers, while in 12 it also involved the non-operated fingers.

These findings are recorded in table I.

The table shows that following operations for Dupuytren's contracture, performed by experienced surgeons in a special department on a mixed series of patients, a permanent limitation of flexion occurs in about 10 %. This result is in accordance with previous analyses. Only about 60 % of the patients had a fairly uneventful

postoperative course, concluded within 6 weeks of the operation. The remaining 30 % obtained a hand having satisfactory flexion, it is true, but the recovery stage extended over a period of up to 6 months. Since prior to the operation all these hands had shown normal flexion, the results certainly give food for thought.

What is the reason of this prolonged, troublesome postoperative course characterized by oedema and stiffness?

On the basis the present material, supplemented by the experience of others, the author will now try to account for some of the possible causes.

## Factors Concerning the Operation Itself and the Primary Postoperative Course

### *Surgical Technique*

It seems reasonable to start by analysing the two series separately in order to ascertain whether a difference can be found in the postoperative sequelae according to

whether radical or limited fasciectomy is employed. The main items are set out in Table 2.

It will be seen that limited fasciectomy gives a smoother postoperative course than



TABLE 2  
Comparison of total and limited fasciectomy in Dupuytren's contracture.

Period elapsing from operation until full flexion of the hand was obtained	Total fasciectomy	Limited fasciectomy
6 weeks and less .....	44 hands (53.0 %)	65 hands (63.1 %)
Approx. 2 months .....	10 »	15 »
Approx. 3 months .....	4 »	7 »
3-6 months .....	15 »	4 »
Limitation of flexion throughout follow-up period .....	10 » (12.0 %)	12 » (11.7 % (6.8 %, 5 followed for less than 6 months))
Total .....	83 hands	103 hands

the total procedure. The hands sooner regain their flexion, and there are fewer permanent sequelae.

However, the difference is far from being striking enough to solve the problem. True, after limited fasciectomy 63.1 % were fit 6 weeks after the operation and a total of 77.6 % two months after the operation. Nevertheless, 22.4 % took more than 3 months to recover and 11.7 % or at least 6.8 % have permanent sequelae in the form of stiffness, restricted flexion and the consequent reduction in the power of grip.

The following considerations apply only

to the patients operated on by the author, partly because their data are more complete and partly because they make up a material in which one of the factors which influence postoperative oedema has been eliminated.

#### Anaesthesia

Among the 103 operations 85 were carried out under plexus anaesthesia which, however, had to be supplemented in 7 cases, because of lacking effect, with general anaesthesia. Eighteen had only general anaesthesia from the beginning. The distribution is shown in Table 3.

TABLE 3  
Relation between postoperative course in Dupuytren's contracture and type of anaesthesia (103 limited fasciectomies).

Period elapsing from operation until full flexion of the hand was obtained	Plexus anaesthesia	General anaesthesia	Combination
6 weeks and less .....	51	10	4
2 months .....	11	4	0
3 months .....	5	2	0
3-6 months .....	1	0	3
Limitation of flexion throughout the follow-up period .....	10	2	0
Total .....	78	18	7

Thus, out of the 80 patients hands were fit within 3 months operation 62, or 77.5 %, had plexus anaesthesia which had been employed in 16 or 79.9 % of the 20 cases a prolonged postoperative course.

Accordingly, the data indicate that the type of anaesthesia has no influence on the postoperative course.

#### Bloodlessness

Whether the establishment of a bloodless field during the operation in the postoperative oedema has been decided on the basis of the preoperative condition, as all the patients had the operation in a bloodless field, established by 5 minutes' elevation of the arm, at the end, we use a pneumatic tourniquet up to 280-300 mm Hg. In the limited fasciectomy the tourniquet time was less than 15 minutes as all the limited fasciectomies were completed within this period. The problem has been quite widely discussed and the opinions advanced will be found below. BRUNER (1951) has described a condition characterized by a swollen hand, stiff finger joints, reduced strength, and paraesthesia or numbness, i.e. dystrophy, following operation for Dupuytren's contracture. This complication was observed when the anaesthesia was changed for the first time. It is not stated how long after the operation this is done. BRUNER calls this condition the post-ischaemic hand and puts the chief blame on the tourniquet. However, he feels that certain factors are involved, e.g. age and general condition, duration and course of the operation and lastly a special "stiffening

Thus, out of the 80 patients whose hands were fit within 3 months after the operation 62, or 77.5 %, had received plexus anaesthesia which had been employed in 16 or 79.9 % of the 23 who had a prolonged postoperative course.

Accordingly, the data indicate that the type of anaesthesia has no influence upon the postoperative course.

### *Bloodlessness*

Whether the establishment of a bloodless field during the operation is a factor in the postoperative oedema cannot be decided on the basis of the present material, as all the patients had the operation in a bloodless field, established after about 5 minutes' elevation of the arm. To this end, we use a pneumatic tourniquet pumped up to 280–300 mm Hg. In all cases, the tourniquet time was less than one hour, as all the limited fasciectomy could be completed within this period. Since this problem has been quite widely discussed, the opinions advanced will be reviewed below. BRUNER (1951) has described a condition characterized by a smooth, slightly swollen hand, stiff finger joints, increased vasomotor activity, reduced muscle strength, and paraesthesia or sensations of numbness, i.e. dystrophy, following operation for Dupuytren's contracture. This complication was observed when the bandage was changed for the first time, but it is not stated how long after the operation this is done. BRUNER calls the condition the post-ischæmic hand syndrome and puts the chief blame on the tourniquet. However, he feels that other factors are involved, e.g. age and general condition, duration and course of the operation, and lastly a special "stiffening factor" in

the patient. According to SHAW (1951) and WEBSTER (1960), the duration of ischaemia is of great significance to the so-called reactive oedema, but they do not advance any proof. SPEIGEL & LEWIN (1945), MOLDAVER (1954) and others have described complications after establishing a bloodless field, but most of these complications were motor pareses caused by the pressure of the cuff. They recommend using a pneumatic tourniquet instead of rubber band. JAMES & TUBIANA (1952) use a bloodless field, established either by an Esmarch bandage or a cuff, and they found no complications on this account. BARCLAY (1959) performed tests using varying duration of bloodlessness and set up bloodlessness also in the non-operated arm during the operation. In his opinion, the application of a tourniquet can hardly be responsible for the postoperative oedema. In experiments on dogs PALETTA and associates (1960) found, on removing the cuff of a tourniquet left for up to 5 hours, oedema which increased greatly during the first 10 minutes, reached a peak in about 30 minutes, and subsided in a week. This course does not fit the oedema found following operation for Dupuytren's contracture. Lastly, GILL (1919) described a state resembling dystrophy following operations for Dupuytren's contracture without the use of a bloodless field.

Thus, it seems permissible to assume that the establishment of a bloodless field for a reasonable period, about one hour, does not contribute to the occurrence of postoperative oedema and stiffness.

### *Haematoma*

Despite the discontinuation of the bloodlessness towards the end of all the opera-

tions, careful haemostasis before suturing the skin, and a firm dressing, haematomas did occur in quite a large number of cases. When the bandage was changed on the following day the haematomas were evacuated, and these patients were inspected more often than the others, so that recurring haematomas could be evacuated immediately.

Out of the 103 operations haematomas occurred in 17, i.e. 16.6 %. This is a high percentage, but not essentially higher than in a number of other series. SHAW & BARCLAY (1957) had 15 % haematomas. WAKEFIELD (1960) stated that haematoma is by far the most serious complication following operations for Dupuytren's contracture and that it is the cause of dystrophy. However, he does not state any numerical values.

A comparison of the incidence of post-operative haematoma with the time it takes the hand to regain a useful degree of flexion shows that of the 80 hands which were fit within 3 months 10 (12.5 %) had developed haematoma, while among the 23 in which the stiffness persisted beyond 3 months 7 (30.4 %) had shown haematoma. This is a considerable difference (for details cf. Table 4).

From the present material and previous experience, then, it may be concluded that the occurrence of postoperative haematoma plays a role in the pathogenesis of oedema and stiffness following operation for Dupuytren's contracture.

#### Nerve Damage

In the 103 operations cutting of nerves occurred in only 3, so the values are too low to form the basis of conclusions. Two

of the 3 hands had recovered within 6 weeks and one within about 3 months of the operation. Previous authors have also not found any indication that cutting of finger nerves in the course of the operation should influence the occurrence of dystrophy (HUESTON 1952).

#### Skin

The present technique of a transverse incision in the palm often gives major or

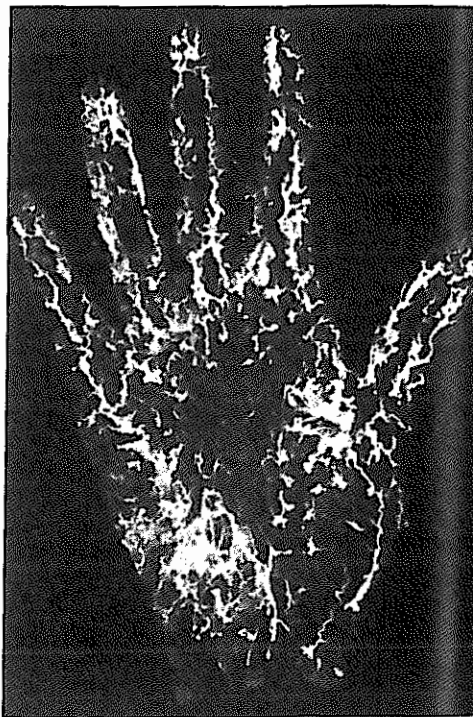


Fig. II.

Result of injecting thorium dioxide into the radial and ulnar nerves of corpses (from CONWAY & STARK, J. Bone & Joint Surg. 36-A 1954). In the middle of the palm there is a triangular area with poor arterial vascularization, while the thenar and hypothenar as well as that part of the palm which is peripheral to the distal palmar crease are well vascularized. This is possibly the explanation of delayed wound healing after transverse incision into the palm.

minor trouble with wound healing according to CHEVALIER (1951) patients acquire some necrosis of wound lips in the middle of the palm. JAMES & TUBIANA (1952) also found a minor cutaneous necrosis in 10 % of cases, very common, and LANGSTON (1955) had delayed wound healing in 10 % of 125 operations. The explanation is partly that the skin is frequently involved in the disease and therefore has been dissected quite closely and partly that the middle of the palm vascularization is poor. This was shown by CONWAY (1954) by injecting the radial and ulnar arteries of corpses after freeing subcutaneous tissue from the aponeurosis. Fig. II is borrowed from their paper.

In the author's series minor skin necrosis occurred in a total of 10 cases and major necrosis in 4. Among 100 cases in which full flexion was obtained within 2 months, 22 (22.2 %) had minor skin necrosis, and among 100 cases with a longer postoperative follow-up period 8 (34.8 %) had this complication.

Some operative complications in Dupuytren's contracture

Period elapsing from operation until full flexion of the hand was obtained	No. of operations
6 weeks and less .....	65
About 2 months .....	15
About 3 months .....	10
3-6 months .....	4
Limitation of flexion throughout follow-up period .....	15

The course was completely unevenly established less than 3 months after operation.

minor trouble with wound healing. According to CHEVALIER (1951) nearly all patients acquire some necrosis of the wound lips in the middle of the wound. JAMES & TUBIANA (1952) also state that a minor cutaneous necrosis in the scar is very common, and LANGSTON & COWAN (1955) had delayed wound healing in 50 out of 125 operations. The explanation is partly that the skin is frequently involved in the disease and therefore has to be dissected quite closely and partly that in the middle of the palm vascularization is fairly poor. This was shown by CONWAY & STARK (1954) by injecting the radial and ulnar arteries of corpses after freeing skin plus subcutaneous tissue from the aponeurosis. Fig. II is borrowed from their paper.

In the author's series minor cutaneous necrosis occurred in a total of 26 cases and major necrosis in 4. Among the 80 cases in which full flexion was attained within 2 months, 22 (22.2%) had major or minor skin necrosis, and among the 23 cases with a longer postoperative course 8 (34.8%) had this complication (for

details cf. Table 4). The figures are perhaps rather low for assessment, but the tendency is clear: The more complications during the healing, the more oedema and fibrosis.

At the time of the operation the skin was, in 27 cases, so involved that it was difficult to approximate the wound edges. In 3 instances a free graft had to be applied and in one case a free graft was applied secondarily to the skin defect. Details are apparent from Table 4.

#### Infection

There was no case of infection.

#### Dressing

As mentioned under "Material and Methods" all the patients were fitted with a firm dressing with fluffed gauze tampons. In addition, the hand was placed on a straight plastic splint, which, however, was padded with cotton-wool and gauze, allowing the fingers to be stretched only so that the skin was not taut. When the

TABLE 4  
Some operative complications in Dupuytren's contracture compared with the postoperative course (103 limited fasciectomy).

Period elapsing from operation until full flexion of the hand was obtained	No. of operated hands	Uncomplicated course	Haematoma	Cutting of nerves	Cutaneous necrosis		Skin involved at operation
					major	minor	
6 weeks and less	65	44	9	2	1	15	15 (1 prim. graft 1 sec. graft)
About 2 months	15	8	1	0	1	5	4
About 3 months	7	3	2	1	1	2	2 (1 prim. graft)
3-6 months	4	2	1	0	1	1	1
Limitation of flexion throughout follow-up period	12	5	4	0	0	3	5 (1 prim. graft)

The course was completely uneventful in 65% of the operations in which flexion was re-established less than 3 months after the operation and in 43.5% of those who had restricted flexion beyond 3 months.

bandage was changed on the following day, the splint was replaced. In the absence of complications, the splint was removed at the end of one week, but if necrosis occurred in the wound it was maintained longer, for up to 3 weeks.

Obviously, this dressing in extension is not good for the flexion ability of the fingers, but in cases where the wound healing in the palm gives trouble, the wound must be left immobile.

The author has designed and lately used the splint depicted in Fig. 1 Nos. 15 & 16 (McCash, 1961). This splint permits a small firm dressing in the palm and leaves the wound immobile, while at the same time it permits training of the fingers. The experience of this splint is still too limited to allow deductions regarding the results, but so far they seem promising.

#### Follow-up and Aftercare

All the patients of the present series were carefully followed and after-treated, but of course it was inevitable that a few failed to attend follow-up. Many could train the hand by themselves, but at signs of more severe oedema or stiffness they

had ambulatory active exercises, occupational therapy, and paraffin baths. Table 5 gives the distribution of the duration of physiotherapy in the various groups, the number of patients who lived in Copenhagen and environs and of those who lived farther away.

These values give no information at all. In a material followed at such short intervals as the present one, the most severe cases must obviously receive the most prolonged after-treatment. The case reports, which are given below, however, show that of the 12 patients who had limitation of flexion throughout the follow-up period 4 had physiotherapy which was too short-lasting or instituted too late.

It might be imagined that patients who live far away from the hospital had a prolonged recovery stage owing to the trouble of having to travel to and from to be inspected and after-treated, but this was not so in the present series. On the contrary, 11 of the 12 patients with permanent sequelae were domiciled in Copenhagen. This fact, however, cannot form the basis of conclusions, since as already mentioned 4 patients did not attend after-treatment and follow-up.

TABLE 5  
Relation between duration of physiotherapy, postoperative course following operations for Dupuytren's contracture, as well as the patient's domicile.

Period elapsing from operation until full flexion of the hand was obtained	Amb. physiother. < 1 mo.	Amb. physiother. 1-2 mo.	Amb. physiother. > 2 mo.	Self-training	Domiciled in Copenhagen	Domiciled in other parts of Denmark
6 weeks and less .....	21	2	0	42	43	22
About 2 months .....	7	3	0	5	11	4
About 3 months .....	0	3	2	2	4	3
3-6 months .....	1	2	0	1	3	1
Limitation of flexion throughout follow-up period .....	2	4	5	1	11	1

## Factors Conc

### Extent and Development of Fi

An attempt was made to whether the extent and severity of fibrosis could have influenced the operative course.

The finger contractures are divided into 3 groups, and in addition a few were recorded at the time of operation. Of particularly severe and extensive contractures and some because of elastic nodules the appearance was active.

In Table 6 these findings are given with the postoperative course. It is seen that the most complicated contracture course was found in the most severe and in the mildest forms, while in the intermediate group recovers faster.

Among the patients who had severe and restricted flexion beyond 52.2 % had had severe and 43.5 % had had contractures of the fingers. In the patients who could freely flex the fingers within 3 months 33.7 % had had severe and 30 % mild or no contractures.

#### Relation between severity

Period elapsing from operation until full flexion of the hand was obtained
6 weeks and less .....
About 2 months .....
About 3 months .....
3-6 months .....
Limitation of flexion throughout follow-up period .....
Total number .....

## Factors Concerning the Patient Himself

### *Extent and Development of Fibrosis*

An attempt was made to ascertain whether the extent and severity of the fibrosis could have influenced the postoperative course.

The finger contractures are divided into 3 groups, and in addition a few cases were recorded at the time of operation because of particularly severe and extensive fibrosis and some because of elastic nodules of an active appearance.

In Table 6 these findings are compared with the postoperative course. It will be seen that the most complicated postoperative course was found in the most severe and in the mildest forms, while the intermediate group recovers faster.

Among the patients who had oedema and restricted flexion beyond 3 months, 52.2 % had had severe and 43.5 mild contractures of the fingers. In the group of patients who could freely flex their hands within 3 months 33.7 % had had severe and 30 % mild or no contracture of the

fingers. Whether widespread changes or active nodules were present at the time of the operation does not appear to influence the time required for the hand to recover after the operation.

Among the group fit within 3 months there had been widespread changes in 36.3 %, while in the group having trouble beyond 3 months 26 % had severe and extensive Dupuytren fibrosis at operation. The so-called "active" nodules were found in 21.3 % of the best group and in 26 % of the poorest (cf. Table 6).

Summing up, the material shows a tendency to a prolonged postoperative course in the more widespread forms of Dupuytren's contracture, but this tendency is not particularly pronounced.

### *Duration of Disease.*

### *Symptoms and Signs.*

The local factors which may be imagined to influence the occurrence of postoperative oedema have now been descri-

TABLE 6  
Relation between severity of Dupuytren's contracture and postoperative course  
(103 local fasciectomyes).

Period elapsing from operation until full flexion of the hand was obtained	Severity of finger contracture			Widespread changes at operation	"Active" nodules
	Severe	Moderate	Mild or none		
6 weeks and less .....	20	24	21	21	15
About 2 months .....	7	5	3	8	2
About 3 months .....	3	0	4	1	3
3-6 months .....	2	1	1	1	1
Limitation of flexion throughout follow-up period .....	7	0	5	4	2
Total number .....	39	30	34	35	23

bed. Before proceeding to assess the general factors, let us investigate whether the duration of the disease and symptoms or signs, if any, have influenced the postoperative course. In 13 cases the patients reported that the contracture had been present for less than one year, in 49 cases 2-10 years, and in 41 more than 10 years. Among the 80 patients whose hands had regained their full flexion within 3 months after the operation only 10 % had had the disease for less than one year before the operation and 38.8 % for more than 10 years. Out of the 23 cases in whom flexion was compromised for more than 3 months after the operation 21.7 % had had their disease for less than one year and 43.5 % for more than 10 years before the operation (cf. also Table 7).

Acute exacerbation of the disease immediately before the operation was reported by a total of 22 patients, 15 in the good and 7 in the poor group. In other words, among the 23 patients having limitation of flexion beyond 3 months 30.4 % reported acute exacerbation immediately before the operation. In the group of patients

whose hands were fit 3 months after the operation there were only 18.8 % of this category.

Forty-six patients complained of pain and tenderness in the palm before the operation; 34 were in the good and 12 in the poor group. Thus, out of the 23 having limited flexion beyond 3 months 52.2 % had complained of pain in the palm prior to the operation, and in the group without flexion defect 42.5 % had this complaint.

Summing up, a rapid development of Dupuytren's contracture with acute flare-up immediately before the operation and pain in the palm is apt to result in a complicated postoperative course.

#### Age

The age distribution is recorded in Table 8 which shows that the postoperative course was not complicated by restriction of flexion in any patient under 40 years of age. In the age groups 40-50 and 50-60 almost 30 % had a flexion defect for more than 3 months, in the 60-70 group 21.7 %, and in the over-70 group 15.4 %.

TABLE 7  
Relation between duration and symptoms of Dupuytren's contracture and postoperative course (103 local fasciectomy).

Period elapsing from operation until full flexion of the hand was obtained	Duration of contracture			Acute exacerbation before operation	Pain in palm before operation
	< 1 yr.	2-10 yrs.	> 10 yrs.		
6 weeks and less .....	5	34	26	11	29
About 2 months .....	3	7	5	4	5
About 3 months .....	0	3	4	2	2
3-6 months .....	2	1	1	1	2
Limitation of flexion throughout follow-up period .....	3	4	5	4	8
Total number .....	13	49	41	22	46

#### Relation between age and

Time elapsing from operation until full flexion of the hand was obtained
6 weeks and less .....
About 2 months .....
About 3 months .....
3-6 months .....
Limitation of flexion throughout the follow-up period .....
Total .....

When the material is thus subdivided into the groups are rather small. Nevertheless the tabulation reveals that the postoperative stiffness does not increase with advancing age as has been claimed by some authors who have even taken advanced age to be a contra-indication to operation (ISELIN & DIECHMANN 1951, 1960, BRUNER 1951). The present series also does not corroborate the latter's (1961) claim that a particularly advanced age involves increased postoperative

#### Sex

Only 12 of the 103 operated females. In respect to postoperative course they are distributed as follows: 10 had normal flexion of the hand after the operation, while 2 had limited flexion beyond 3 months. In other words, the present series does not postulate increased operative risk for women (McINDOE 1958).

#### Heredity

As already mentioned in the introduction, Dupuytren's contracture is a familial disease. A family history was present in 1

TABLE 8  
Relation between age and postoperative course in Dupuytren's contracture.

Time elapsing from operation until full flexion of the hand was obtained	< 30 years	30-40 years	40-50 years	50-60 years	60-70 years	> 70 years
6 weeks and less .....	2	7	12	21	15	8
About 2 months .....	0	0	0	9	3	3
About 3 months .....	0	0	2	2	3	0
3-6 months .....	0	0	0	2	1	1
Limitation of flexion throughout the follow-up period .....	0	0	2	8	1	1
Total .....	2	7	16	44	23	13

When the material is thus sub-divided, the groups are rather small. Nevertheless, the tabulation reveals that the postoperative stiffness does not increase with advancing age as has been claimed by several authors who have even taken advanced age to be a contra-indication to operation (ISELIN & DIECHMANN 1951, WEBSTER 1960, BRUNER 1951). The present series also does not corroborate HUESTON'S (1961) claim that a particularly early age involves increased postoperative stiffness.

#### Sex

Only 12 of the 103 operated cases were females. In respect to postoperative course, they are distributed as follows: 10 could flex the hand normally within 3 months after the operation, while 2 had restriction of flexion beyond 3 months. In other words, the present series does not show the postulated increased operative risk for women (MCINDOE 1958).

#### Heredity

As already mentioned in the introduction, Dupuytren's contracture is hereditary. A family history was reported in

only 39 of the 103 present cases. In Table 9 the inherited cases are grouped in relation to the postoperative course.

Out of the 80 cases who were fit within 3 months 30 or 37.5 %, had a family history, and among the 23 whose flexion was compromised for more than 3 months 9 or 39.1 %. Thus, it seems immaterial to the postoperative course whether or not the disease is inherited. However, this finding can only be accepted with reserve, as the information regarding heredity is based exclusively upon the patients' knowledge and memory.

#### Other Rheumatic Diseases

As mentioned above, it is commonly believed that Dupuytren's contracture is due to a systemic connective-tissue disorder. It is reasonable, therefore, to investigate whether postoperative oedema with subsequent fibrosis is more apt to occur in patients having manifestations in other sites as well. Only 8 patients had plantar fibrosis and one had Peyronie's disease. Twenty had other rheumatic diseases, viz. humeral peri-arthritis in 10, peritendinitis of the forearm in 3, disc degeneration in



TABLE 9  
Relation between inherited predisposition and postoperative course in 103 operated cases of Dupuytren's contracture.

Period elapsing from operation until full flexion of the hand was obtained	Family history	No family history
6 weeks or less .....	23	42
About 2 months .....	7	8
About 3 months .....	3	4
3-6 months .....	1	3
Limitation of flexion throughout the follow-up period ...	5	7
Total .....	39	64

3, chondromalacia in 2, generalized rheumatic pain in 3, and 17 reported swelling of the finger joints before the operation. Rheumatic nodules were found in 47. For details consult Table 10.

The values are too small for accurate assessment, but when considering also the case histories it seems to be a factor of importance whether the patients have had symptoms from the shoulder prior to the operation, while the presence of e.g. rheumatic nodules, does not appear to influence the postoperative course.

Plantar fibrosis was present in 4 of the 23 patients with a prolonged course and

in 4 of the 80 who soon recovered. These figures indicate that patients having fibrosis in sites other than the hands will have a more troublesome postoperative course.

#### General Condition and Intercurrent Diseases

The course of any operation is influenced by the patient's general condition prior to the operation, and this applies also to operations for Dupuytren's contracture. By evaluating the general condition, BARCLAY (1959) claimed to be able to pick out those patients who were predisposed to a

TABLE 10  
Relation between rheumatic diseases of other sites and postoperative course in 103 operated cases of Dupuytren's contracture.

Period elapsing from operation until full flexion of the hand was obtained	Plantar fibrosis	Peyronie's disease	Humeral peri-arthritis	Peritendinitis of forearm	Disc degeneration	Generalized rheumatic pain	Chondromalacia	Arthritis of finger joints	Rheumatic nodules
6 weeks and less .....	4	1	3	2	2	2	1	7	30
About 2 months .....	0	0	4	0	0	0	1	2	6
About 3 months .....	1	0	0	0	0	1	0	0	3
3-6 months .....	1	0	0	0	0	0	0	1	2
Limitation of flexion throughout the follow-up period .....	2	0	3	1	1	0	0	5	6

Relation between intercurrent diseases and postoperative course for Dupuytren's contracture

Diseases	Period
	< 6 weeks (65 cases)
Epilepsy .....	2
Diabetes .....	2
Gastric ulcer .....	6
Heart disease .....	3
Hepatic disease .....	
Slipped disc .....	
History of syphilis .....	2
Dysbasia .....	2
Varicose veins .....	
Hypercholesterolaemia .....	
K-Z syndrome .....	1
Nervousness .....	4

complicated postoperative course. Concerning body weight, tonus of muscle, and elasticity of the skin, he stated that a greater body weight had a greater tendency to oedema. ILLIUS (1955) and COWAN (1955) felt they could pick out patients tending to develop dysbasia following operation, viz. the high business man, overweight with a nervous system and a "flabby" body. Such an assessment was done in this series, and no patient showed signs of a poor general condition prior to the operation. A total of 34 had intercurrent diseases which are listed in

Table 11. Although the small number of patients in each group hardly allow conclusions, it is interesting to note that a greater number of patients in the group developing permanent contracture after the operation seems to come from a relatively large number of patients with intercurrent diseases.

TABLE 11  
Relation between intercurrent diseases and postoperative course following operation  
for Dupuytren's contracture in 103 cases.

Diseases	Period elapsing from operation until maximum flexion of the hand was obtained				Limitation of flexion throughout the follow-up period (12 hands)
	< 6 weeks (65 hands)	About 2 months (15 hands)	About 3 months (7 hands)	3-6 months (4 hands)	
Epilepsy .....	2		1		1
Diabetes .....	2				1
Gastric ulcer .....	6(1 with gastric carc.)		1		1
Heart disease .....	3			1	
Hepatic disease .....					1
Slipped disc .....		2			
History of syphilis .....	2				
Dysbasia .....	2				
Varicose veins .....		1			
Hypercholesterolaemia ....					1
K-Z syndrome .....	1				
Nervousness .....	4	1	1		2

complicated postoperative course. Assessing body weight, tonus of muscles, and elasticity of the skin, he stated, for example, that a greater body weight involves a greater tendency to oedema. LANGSTON & COWAN (1955) felt they could set up a type tending to develop dystrophy following operation, viz. the high-pressure business man, overweight with a tense nervous system and a "flabby palm". No such assessment was done in the author's series, and no patient showed any striking signs of a poor general condition prior to the operation. A total of 34 had intercurrent diseases which are listed in Table 11.

Although the small number of cases in each group hardly allow conclusions, the group developing permanent sequelae after the operation seems to contain a relatively large number of patients suffering from intercurrent diseases.

#### *Type of Work*

Whether the type of work is of any significance to the occurrence of postoperative complications cannot be decided on the basis of the present series, as the great majority of patients had manual work. Out of the 65 who were fit within 6 weeks 37 reported that they had had heavy and 23 lighter manual work, while 5 had never had manual work. Out of the 12 having limited flexion during the follow-up period 7 stated that they had had heavy and 4 lighter manual work, while one had never had manual work. In other words, an equal distribution within both groups.

WEBSTER (1960) warns against operating upon "working hands", stating that such a hand will often develop postoperative stiffness. Reversely, it might be imagined that patients who use their hands

would more easily train them up after the operation. Neither view, however, is reflected in the present results.

In workers using pneumatic tools CURDJIAN & WALKER (1945) have described a condition reminiscent of dystrophy which they ascribe to vasospasms. BÜSING (1936) reported a similar syndrome in miners and brewery coachmen, but interpreted the condition in most cases as compensation neurosis.

### *Character*

Patients with dystrophy often have a peculiar character. It has always been a moot point whether dystrophy is due to existing mental abnormalities or whether the neurotic symptoms and signs so frequently observed in patients with dystrophy develop during the prolonged and troublesome course. In the material which formed the basis of HALDBO's thesis (1957) about 70 % of the patients with dystrophy exhibited mental symptoms, but in cases where the dystrophy was cured the mental symptoms usually disappeared as well. In HALDBO's opinion, therefore, the peculiar character found in patients with dystrophy is a consequence rather than a cause of the dystrophy. BERTELSEN (1958) is of the same opinion, but a number of other workers have attributed great importance to the patient's mental make-up in the genesis of dystrophy. KINGSBURY (1891) cured a painful Dupuytren's contracture by hypnosis. RAESCHE (1927) and ORBACH (1934) described the so-called "chronic, traumatic oedema", which is no doubt identical with a state of dystrophy, and stated that it occurred in neurotic patients. According to NIPPERT (1929), patients who are apt to get irritated often develop dystrophy

following trauma, and DE TAKATS (1937), analysing 5 cases of dystrophy, found one oligophrenic, 3 imbalanced, and only one mentally normal. DE TAKATS & MILLER (1943) state that the mental make-up is of great importance to autonomic reflexes and thus to the development of dystrophy, and they point out that traumatic neurosis resembles dystrophy. As already mentioned, LANGSTON & COWAN (1955) set up a type said to be predisposed to dystrophy, viz. high-pressure and with a tense nervous system.

From the present series it is impossible to glean accurate data in this respect, as the patient's mental condition was not accurately assessed. However, it is evident from the case histories that out of the 5 patients who had the most severe sequelae after the operation, 2 had compensation neurosis. Another 2 were mentally peculiar, one by fixing on prescribed physiotherapy which was not carried out and the other one by refusing to submit to psychiatric investigation and showing a completely abnormal reaction to the suggestion. The fifth patient was very obstinate in demanding amputation of the finger, and one had just been away from his work because of »nerves« and trouble at the workplace.

Thus, it might be imagined that mental traits might influence the patients' mode of reaction to the surgical trauma and thus the development of dystrophy.

During one period, therefore, the author tried to estimate, prior to the operation, whether the patients were of a type that would develop postoperative dystrophy. However, this estimate very seldom fitted, so a collaboration was set up with a psychiatrist (H. Ehlers).

Preoperatively, all the patients seen by the psychiatrist who assessed their character and gave a statement regarding their presumptive course. The author was ignorant of the contents of this statement until all the patients were subjected to surgical procedure and after a few months later, the postoperative course presumed by the psychiatrist was compared with the real course.

Beforehand it might be expected that the traits needed to develop dystrophy would be of the hitherto known "martyr" type nature, but 2 patients with a history of dystrophy showed symptoms of asserting, and querulous traits which bordered on a character of paranoia and which were not to be secondary to operation or to the operation. Bearing these findings in mind, an attempt was made to trace — in candidates for operation — still existing Dupuytren's contracture — still asserting traits combined with still existing reactions and thereby foretell a postoperative course.

A total of 47 male patients were included in this psychiatric assessment. It shows that 43 had a postoperative course in conformity with that predicted by the psychiatrist.

In 32 cases the psychiatrist believed there was a risk of a postoperative course. Among these patients 7 who were normal, 6 demented and 17 who displayed unstable mental traits while 2 had real mental disease. In 10 cases the psychiatric assessment covered a quiet postoperative course which was covered in less than 2 months.

In 10 cases the psychiatric assessment covered traits which might be imagined

Preoperatively, all the patients were seen by the psychiatrist who assessed their character and gave a statement containing a presumption regarding the postoperative course. The author was not cognizant of the contents of this statement, and all the patients were subjected to the same surgical procedure and after-care. A few months later, the postoperative course presumed by the psychiatrist was compared with the real course.

Beforehand it might be expected that the traits needed to develop a state of dystrophy would be of the hysteriform, "martyr" type nature, but 2 patients with a history of dystrophy showed sthenic, self-asserting, and querulous traits to an extent which bordered on a characterogenic paranoia and which were not believed to be secondary to operation or complications. Bearing these findings and reflections in mind, an attempt was made to trace – in candidates for operations on Dupuytren's contracture – sthenic, self-asserting traits combined with hysteriform reactions and thereby foretell a protracted postoperative course.

A total of 47 male patients were included in this psychiatric assessment. Table 12 shows that 43 had a postoperative course in conformity with that expected by the psychiatrist.

In 32 cases the psychiatrist did not believe there was a risk of a protracted course. Among these patients there were 7 who were normal, 6 demented and old, and 17 who displayed unstable traits, while 2 had real mental diseases. All had a quiet postoperative course and had recovered in less than 2 months.

In 10 cases the psychiatrist did find traits which might be imagined to give

rise to postoperative complications, but these patients were not believed to possess sufficient strength of character to maintain this state for any length of time. This fitted in 8 cases who had a fairly prolonged course of oedema, fibrosis and stiffness, but were restored in about 3 months, while 2 had a completely uneventful course.

In 5 cases the psychiatrist expected a serious risk of protracted postoperative complications, possibly with permanent sequelae, finding a sthenic character as well as the special features which are believed to make up the basis of postoperative complications. These 5 patients will be described in some detail.

No. I was described as being aggressive, paranoid, aggrieved, and self-opinionated. The psychiatrist feared a troublesome postoperative course. And indeed, the patient developed severe postoperative complications, a full-blown state of dystrophy, and 4 months after the operation the hand was not yet fully restored.

No. II was designated as a bitter, dissatisfied, self-centred person with hysteriform traits, so he was expected to develop dystrophy. His postoperative complications were accurately localized to the operated finger which was stiff and swollen for a long time – and it was 4 months before he had recovered.

No. III was a difficult patient who was characterized as an emotional, clingy person with sexual neurosis. Primarily, it was not believed that postoperative complications would occur, as the patient stated – as soon as the psychiatric examination had started – that after an operation he was suffering from urinary incontinence and

TABLE 12  
Preoperative psyche in relation to postoperative course.

Psychiatric assessment	No. of cases	Presumed post-operative course	Actual postoperative course conformable	Actual postoperative course not conformable
Normal	7	Uncomplicated	7	
Unstable	17	Uncomplicated	17	
Demented and arterio-sclerotic	6	Uncomplicated	6	
Psychopathic	1	Uncomplicated	1	
Schizophrenic	1	Uncomplicated	1	1
Aggression inhibited. Defeatist attitude. Self-pitying. Perfectionistic. Non-sthenic	10	Short-lasting difficulties in restitution	3	2
Aggression inhibited. Martyr type. Self-pitying. Aggressive. Self-opinionated. Ambitious. Hysterical. Sthenic		Long-lasting severe complications	3	2
Total number	47		43	4

always wore a diaper. The psychiatrist was, therefore, inclined to put his abnormal features down to this account, but it was later found that he was not suffering from urinary incontinence at all. He must, therefore, be classified as an hysteric, and this affords the explanation of the protracted postoperative course of oedema, fibrosis, and stiffness for 4 months.

No. IV was described as an intelligent, sthenic, ambitious person with hysteriform traits who was expected to develop a state of dystrophy. However, in this case the postoperative course was entirely uneventful. The patient was remarkably energetic in training his hand. It must be presumed

that for some reason or other his ambitious character has manifested itself in the striking rapidity with which he got going again, while under different conditions the same traits might have given rise to dystrophy.

No. V was found to be mentally abnormal. He was psychopathic, homosexual, self-opinionated with hysteriform traits, and it was expected that he would get complications. Like No. IV, he was very energetic in training the hand, and he had a remarkably short postoperative course. Maybe the reason was that he was a blind piano player, so it was very important to him to regain the use of his hand quickly.

Accordingly, there was quite conformity between the post course expected by the psychiatrist and actual course. It must be mentioned that no postoperative complications in any of the patients whose post course had been presumed to be complicated.

On the basis of these findings, it can be concluded that an interested psychiatrist, who has familiarized himself with these special problems, can for

Accordingly, there was quite a close conformity between the postoperative course expected by the psychiatrist and the actual course. It must be mentioned that no postoperative complications occurred in any of the patients whose postoperative course had been presumed to be uncomplicated.

On the basis of these findings it may be concluded that an interested psychiatrist, who has familiarized himself with these special problems, can foretell with

great likelihood whether postoperative complications – in the form of oedema, fibrosis, and stiffness – are going to occur in a candidate for surgery on Dupuytren's contracture.

It is obvious, then, that the patients' mental status prior to the operation influences the development of postoperative dystrophy. Although these mental factors are probably not the sole explanation, they no doubt constitute an important detail in the syndrome.

## Case Reports

(Patients who could not make a tight fist within 3 months after the operation).

### I. Case rec. 8759/60.

♂, a 66-year-old tailor who had always been in good health. Bilateral Dupuytren's contracture developed in a couple of years. On the right there had been rapid progression during the past 3 or 4 months with pain in the palm and tingling in the fingers. His family history was positive, and he also had plantar fibrosis, but no rheumatic nodules or other rheumatic disease. He had always had light manual work as a tailor and no history of trauma.

On admission his general condition was good. However, the E.S.R. was 40 mm, and chest radiography revealed the sequelae of an old pleurisy.

Operation on the right hand showed a rather narrow fibrous band extending from a site proximally in the palm to the radial aspect of the metacarpophalangeal joint of the little finger. No contractures of the fingers, and except for the localized fibrosis the fascia looked normal. The operation, performed under plexus anaesthesia and with a bloodless field, was uncomplicated. On the following day, a moderate haematoma was evacuated, but recurred and had to be evacuated again 3 days later. The wound had healed two weeks after the operation. At that time there was no oedema, but the fingers were a bit stiff. Physiotherapy for only two weeks. About 2 months after the operation he developed a tingling sensation in the fingers. Objective examination showed slight, diffuse swelling and restricted flexion. Oscillometric index, skin temperature, and sweat test showed no abnormalities. No pain in the hand or shoulder, and the mobility was improved by renewed physiotherapy. At follow-up, one year later, the hand was of normal appearance, but flexion of all fingers was limited, the tips being  $\frac{1}{2}$  cm short of reaching the palm. Sweat test normal.

*Conclusion:* Oedema with subsequent fibrosis and permanent stiffness of the hand.

*Possible causes:* (1) Advanced age, (2) E.S.R. 40 mm, sequelae to pleurisy, (3) rheumatic diathesis (familial predisposition, bilateral Dupuytren, plantar fibrosis), (4) active stage (acute progression, pain, and tingling), (5) haematoma, (6) short-lasting physiotherapy.

### II. Case rec. 4421/60.

♂, a 53-year-old foreman. For many years gastric ulcer, never treated surgically, but several times medically. Long-standing symptoms of osteoarthritis in both knees with moderate radiological changes. For a year or so a small Dupuytren nodule in the right hand with pain in the palm and tingling sensations on grasping tools. Moreover, less marked pain in the wrist and shoulder. No family history, no trauma, and no abnormality of the other hand or of the feet. Operation upon the right hand, under plexus anaesthesia and with a bloodless field, revealed a localized, hazel nut-sized fibrous nodule. Otherwise, the fascia was normal-looking, and there was no abnormality of the fingers. The operation was uncomplicated, and the wound healed in two weeks. One month after the operation the patient was complaining of pain in the right hand which showed diffuse swelling, but no other signs of dystrophy. By mistake the patient had not had the prescribed laboratory tests and physiotherapy. Within the next couple of weeks he developed a full-blown dystrophy of the hand with increasing pain, swelling, a smooth skin, increased sweating, and raised skin temperature, but normal oscillometric findings. Radiography disclosed mild, patchy halisteresis. The patient himself realized that a mistake had been made and took it very much to heart.

The objective signs of dystrophy yielded to physiotherapy and stellate blocks in 6 weeks, but the patient obstinately went on complaining of pain and stiffness. All the complaints

were constantly localized to the palm, especially the palm, no symptoms from the shoulder, where he had had pain before the operation. At follow-up one year later he complained particularly of sensitivity to cold in the hand, and moreover periodical pains, allegedly most marked when the hand was being used. The hand looked entirely normal. It was observed that when he tried to make a fist, he could not do so the fingers were short of reaching the palm. Radiography showed normal appearances. Ninhydrin test normal. The patient at least admitted that present pain in the hand was not had been before the operation.

*Conclusion:* Typical dystrophy permanent complaints.

*Possible causes:* (1) Gastric ulcer, (2) history of humeral peritendinitis of the forearm, and of the knees, (3) rapidly developed pain and paraesthesiae, (4) by treated primarily by physiotherapy

### III. Case rec. 5435/61.

♂, a 51-year-old gardener, who had been in good health. For about the past year rapid progression in the left hand, especially when grasping tools. He had always had fairly light manual work as a gardener, no trauma, but a family history of swelling and tenderness of the finger joints and a tendency to localized contractures. Operation on the left hand, under ether anaesthesia with a bloodless field, revealed a 2 narrow, but very dense fibrous band at a site proximally in the palm to the ring and little fingers. The band was adhering, either to the skin or to the underlying structures. A strong fibrous band from the radial side of the thumb to the little finger was uncomplicated. A small nodule appeared in the wound which, after being removed, healed in a month. Physiotherapy for one month after the operation, but limitation of flexion were noted a splint was removed, two weeks after the operation. There were traces of pressure

were constantly localized to the hand, especially the palm, no symptoms from the wrist or shoulder, where he had had pain prior to the operation. At follow-up one year later he complained particularly of sensitivity to cold in the hand, and moreover periodical pain and stiffness, allegedly most marked when he was feeling nervous. The hand looked entirely normal. It was observed that when he thought he was unnoticed, he could make a fist, but when he was asked to do so the fingers were  $\frac{1}{2}$ -1 cm short of reaching the palm. Radiography now showed normal appearances. Ninhydrin test normal. The patient at least admitted that the present pain in the hand was not as bad as it had been before the operation.

*Conclusion:* Typical dystrophy with mild, permanent complaints.

*Possible causes:* (1) Gastric ulcer, mental make-up, (2) history of humeral peri-arthritis, peritendinitis of the forearm, and osteoarthritis of the knees, (3) rapidly developed nodules + pain and paraesthesiae, (4) by mistake not treated primarily by physiotherapy.

### III. Case rec. 5435/61.

♂, a 51-year-old gardener, who had always been in good health. For about 20 years increasing tightening in both palms. During the past year rapid progression in the left hand and pain, especially when grasping tools. Said he had always had fairly light manual work as a gardener, no trauma, but a familial predisposition. Frequently swelling and tenderness of the finger joints and a tendency to low-back pain. Operation on the left hand, under O<sub>2</sub>-N<sub>2</sub>O-ether anaesthesia with a bloodless field, showed 2 narrow, but very dense fibrous bands from a site proximally in the palm to the root of the ring and little fingers. The bands were not adhering, either to the skin or the underlying structures. A strong fibrous band was removed from the radial side of the thumb. The operation was uncomplicated. A small necrosis appeared in the wound which, however, had healed in a month. Physiotherapy was started one month after the operation, but oedema and limitation of flexion were noted as soon as the splint was removed, two weeks after the operation. There were traces of pressure on the ulnar

aspect of the thumb and radial aspect of the hand, as if the thumb had been pressed against the hand in the dressing. The patient was given physiotherapy for a total of 10 weeks during which the oedema and fibrosis in the palm disappeared. There had not at any time been pain in the hand or shoulder. Skin temperature and oscillometric index normal. Sweat test revealed increased sweating on the left arm and hand 3 months after the operation. The stiffness of the fingers persisted for a long time, and at follow-up 6 months later flexion was still slightly limited, as all the finger tips were a little short of reaching the palm. Ninhydrin test showed increased sweating on the operated side.

*Conclusion:* Oedema, fibrosis, and stiffness through 6 months.

*Possible causes:* (1) Familial predisposition, bilateral Dupuytren with acute progression and pain, (2) arthritis of the finger joints and low-back pain, (3) necrosis in the wound with fibrosis, (4) pressure by the dressing.

### IV. Case rec. 5755/61.

♂, a 53-year-old mechanic. For 25 years epilepsy with about 3 seizures a year, treated with phenobarbitone. Also increased gastric acidity. He claims to have always had heavy manual work. No trauma, no familial predisposition, no rheumatic diseases. For approx. 10 years increasing tightening in both palms with periodical pain on this account in the palms. However, the main complaint was a restriction of extension in both little fingers. Operation on the left hand, under plexus anaesthesia and with a bloodless field, showed a couple of moderate bands extending from a site proximally in the palm to the root of the ring finger and to a site distal to the proximal interphalangeal joint of the little finger. Fascia otherwise normal. No complications at the operation, and the wound healed in two weeks, but a couple of days after the operation there was pronounced swelling of the entire hand and highly restricted flexion of the fingers. No pain in the hand or shoulder at any time. Oscillometric index, sweat test and Landis test showed no abnormalities and radiography no halisteresis. During physiotherapy for 3 months the oedema



decreased and mobility improved, but at follow-up 6 months after the operation all the fingers were still  $1\frac{1}{4}$  cm short of reaching the palm. Objectively, the hand looked normal. Radiography showed no halisteresis, and the sweat test was normal.

*Conclusion:* Pronounced oedema shortly after the operation followed by limited flexion of the fingers lasting for more than 6 months.

*Possible causes:* (1) Epilepsy + phenobarbitone, (2) heavy manual work, (3) bilateral Dupuytren.

#### V. Case rec. 7304/57.

♀, a 55-year-old housewife, who had always been in good health. For about 5 years some thickening in the palm, extending to the little finger on the left. During the past couple of months marked progression of the contracture with tenderness of the hand and pain in the shoulder. Reported that she had always had heavy manual work; no history of trauma. There was a family history of pain in the shoulder and in addition to the pain in the shoulder the patient had a tendency to swollen finger joints as well as rheumatic nodules. Operation on the left hand, under plexus anaesthesia with a bloodless field, revealed 2 large, localized nodules in the palm and a short, strong fibrous band on the ulnar aspect. The fibroses did not adhere to the skin or underlying structures. The operation was uncomplicated, and the wound healed in two weeks. Soon after the operation the patient complained of increasing shoulder pain, and she developed mild, diffuse swelling of the hand as well as stiffness. Physiotherapy to the shoulder and hand for 3 months with a favourable effect. At no time pain in the hand. Radiography showed, 3 months after the operation, patchy halisteresis of the left hand. Oscillometry was normal, skin temperature normal, and iodine-starch test showed increased sweating on the left. At follow-up 6 months after the operation the patient had no complaints from the shoulder or hand. The hand looked normal. All the fingers showed normal flexion except the operated little finger whose pulp was a few mm short of reaching the palm. Radiography showed no halisteresis. Ninhydrin test normal.

*Conclusion:* Shoulder pain from before the operation combined with oedema and stiffness of the hand of less than 6 months' duration.

*Possible causes:* (1) Sex, (2) heavy manual work, (3) bilateral Dupuytren's contracture with acute progression and pain, humeral peri-arthritis, arthritis of finger joints, rheumatic nodules, and a familial predisposition.

#### VI. Case rec. 8832/60.

♂, an 82-year-old schoolmaster. Fifteen years ago rheumatic fever and since that time quite often backache. In addition, hypertension 220/110 without symptoms. In the course of one year he had developed rapidly progressing Dupuytren's contracture in both hands, more severe in the left in which the little finger was 90° flexed in the metacarpophalangeal joint. Pain and tenderness in the palms. Never manual work, no trauma, and no familial predisposition. He had rheumatic nodules and swollen, slightly tender finger joints. Operation on the left hand, under plexus anaesthesia and with a bloodless field, comprised, because of the patient's advanced age and general condition, removal of only one taut band from a site proximally in the palm to the little finger. The operation was uncomplicated, and the wound healed in 10 days. Then, physiotherapy was started, and immediately severe oedema of the entire hand appeared. The oedema subsided in a month, and there was no palmar fibrosis, but flexion was still limited, and at follow-up one year after the operation the operated little finger was  $1\frac{1}{2}$  short of reaching the palm, the other fingers only a few mm. At no time pain or other signs of dystrophy.

*Conclusion:* Oedema and stiffness immediately after the operation and permanent limitation of flexion.

*Possible causes:* (1) Advanced age, (2) rapidly progressing bilateral Dupuytren's contracture with pain, rheumatic nodules, and arthritis of finger joints.

#### VII. Case rec. 1616/47.

♂, a 54-year-old former mill hand, now receiving disability pension because of slipped disc. For many years peri-arthritis of both shoulders. For more than 10 years slowly progressing

Dupuytren's contracture of both hands causing mechanical complaints, particularly of the left little finger in which was 60° restricted. Rheumatic nodules rather thick, stiff finger joints, but no predisposition. Previously heavy work and several times trauma to the left little finger. Operation on the left hand, under plexus anaesthesia and with a bloodless field, showed a fibrous band from a site proximally in the palm extending to the base of the second phalanx of the little finger. The skin was quite unaffected. The operation was uncomplicated, and the wound healed in two weeks. Physiotherapy had been prescribed, but the patient did not attend, and did not present himself for follow-up because he did not "dare". He was disabled, because the little finger had no extension, as he had wanted. At follow-up 6 months after the operation he complained of swelling and tenderness in the proximal interphalangeal joint of the little finger. The hand looked all right, but the little finger was 1 cm short of reaching the palm, the other fingers could just touch the palm.

*Conclusion:* Stiffness of operated little finger and stiffness of the other fingers.

*Possible causes:* (1) Mental depression, (2) peri-arthritis and slipped disc, (3) rheumatic nodules, arthritis of finger joints, history of injury to the finger, (4) failure to attend physiotherapy and follow-up.

#### VIII. Case rec. 6091/61.

♂, a 49-year-old baker. Several years ago he had a liver disease the details of which are not known. Now, he had been away from work for a couple of months because of over-exertion of "nerves". Since his youth the patient had steadily progressing Dupuytren's contracture of both hands, with increasing contracture of the ring and little fingers. Only mechanical complaints. Said he had always had heavy manual work, no trauma. There was a family predisposition, but no rheumatic nodules. Operation on the right hand, under plexus anaesthesia and with a bloodless field, revealed extremely pronounced changes in the skin. Two strong bands, extending from the site proximally in the palm to both

Dupuytren's contracture of both hands, only causing mechanical complaints, particularly because of the left little finger in which extension was 60° restricted. Rheumatic nodules and rather thick, stiff finger joints, but no familial predisposition. Previously heavy work and several times trauma to the left little finger. Operation on the left hand, under plexus anaesthesia and with a bloodless field, showed a very strong fibrous band from a site proximally in the palm extending to the base of the second phalanx of the little finger. The skin was quite severely affected. The operation was uncomplicated, and the wound healed in two weeks. Physiotherapy had been prescribed, but the patient did not attend, and did not present himself until later, because he did not "dare". He was also offended, because the little finger had not been amputated, as he had wanted. At follow-up 4 months after the operation he complained of swelling and tenderness in the proximal interphalangeal joint of the little finger. Objectively, the hand looked all right, but the little finger was 1 cm short of reaching the palm. The other fingers could just touch the palm.

*Conclusion:* Stiffness of operated finger, less stiffness of the other fingers.

*Possible causes:* (1) Mental make-up, (2) peri-arthritis and slipped disc, (3) rheumatic nodules, arthritis of finger joints, history of injury to the finger, (4) failure to attend physiotherapy and follow-up.

#### VIII. Case rec. 6091/61.

♂, a 49-year-old baker. Several years ago he had a liver disease the details of which are unknown. Now, he had been away from work for a couple of months because of over-exertion and "nerves". Since his youth the patient had had steadily progressing Dupuytren's contracture of both hands, with increasing contracture of the ring and little fingers. Only mechanical complaints. Said he had always had light manual work, no trauma. There was a familial predisposition, but no rheumatic manifestations. Operation on the right hand, under plexus anaesthesia and with a bloodless field, showed extremely pronounced changes involving also the skin. Two strong bands, extending from a site proximally in the palm to both sides of the

5th finger, were removed. This caused a large cutaneous defect which was left open according to the method of McCash. The wound healed in one month. The splint was left on for 3 weeks before physiotherapy was started. At that time the hand was very swollen and the fingers stiff. On physiotherapy the mobility improved, and the oedema had subsided 2 months after the operation. At no time pain or other signs of dystrophy. Radiography did not show halisteresis. At follow-up 4 months after the operation the hand looked all right, but all the fingers were 1 cm short of reaching the palm.

*Conclusion:* Oedema and stiffness, limitation of flexion throughout the follow-up period (4 months).

*Possible causes:* (1) Hepatic disease and nervous disease, (2) bilateral Dupuytren's contracture with extensive changes, familial predisposition, (3) surgical technique and prolonged dressing.

#### IX. Case rec. 7690/56.

♂, a 56-year-old gardener. Insulin-treated diabetes from his youth. For 5-6 years increasing tightening in both palms with progressing contracture of the long, ring, and little fingers. Only mechanical complaints. Said he had always had heavy work; no trauma, no familial predisposition, but a tendency to stiff finger joints and rheumatic nodules. Operation on the right hand, under plexus anaesthesia and with a bloodless field, showed extremely extensive changes, the entire fascia being one firm fibrous plate with strong bands to the ring and little fingers. The fascia had to be removed almost *in toto*. The skin was greatly involved. The operation was uncomplicated, but the next two days large haematomas were evacuated, and a necrosis appeared in the middle of the wound which had not healed until 7 weeks after the operation. Physiotherapy was instituted 4 weeks after the operation. Palmar fibrosis followed the haematomas, and the hand became swollen and extremely stiff. At no time pain in the hand or shoulder. Skin temperature and oscillometric findings normal, radiography showed no halisteresis, iodine-starch test showed increased sweating on the operated side two months after the operation. At follow-up more than one year

after the operation he complained of stiffness in the finger joints and a sensitive skin in the palm. Objectively, the hand looked all right, but the long, ring, and little fingers (the operated ones) were 1 cm short of reaching the palm, while the mobility of the thumb and index finger was normal.

*Conclusion:* Oedema and stiffness, permanent limitation of flexion.

*Possible causes:* (1) Diabetes, heavy work, (2) bilateral widespread changes, rheumatic nodules, and arthritis of the finger joints, (3) haematoma and necrosis.

#### X. Case rec. 1845/61.

♂, a 59-year-old cigar maker who had always been in good health. For about 10 years tightening in both palms, during the past few months with marked progression on the left, restricted extension of the little finger, and tenderness in the palm. The patient had had heavy work in his youth, no trauma, no familial predisposition, and no rheumatic manifestations apart from a few nodules. Operation on the left hand, under plexus anaesthesia and with a bloodless field, revealed widespread changes. There was mild thickening of the aponeurosis throughout. A strong band extending to the little finger and two pronounced nodules in the palm, in continuation of the long and ring fingers, were removed. The skin was involved. No operative complications, but on the next day a small haematoma was evacuated. Two weeks later the wound had healed, and the patient was started on occupational therapy. The hand was swollen and stiff. On continued training the swelling subsided in a month, but the stiffness persisted, and at follow-up, 10 months after the operation, the long, ring, and little fingers were ½ cm short of reaching the palm. The thumb and index finger were normal. At no time pain in the hand or shoulder or other signs of dystrophy.

*Conclusion:* Oedema and stiffness, limitation of flexion for more than 6 months.

*Possible causes:* (1) Heavy work, (2) bilateral Dupuytren with acute progression and tenderness, rheumatic nodules, (3) haematoma.

#### XI. Case rec. 6813/49.

♂, a 46-year-old naval commander who reported that he had hypercholesterolaemia. Two years previously cerebral embolus without lasting sequelae. Moreover, extrasystoles. For more than 10 years Dupuytren's contracture of both hands. In 1947 he had had an operation on the right hand, but with recurrence. In 1949 a metacarpal fracture of the same hand. Now, severe contracture of the ring and little fingers. There was a familial predisposition, plantar fibrosis, and rheumatic nodules. He reported having had heavy work in his youth. Operation on the right hand, under general anaesthesia and with a bloodless field, showed violent, scar-like fibrosis in the entire palm and a strong band extending to the little finger. The fascia was removed almost *in toto*. The skin was severely involved, and 2 free full thickness skin grafts were applied. Necrosis of the skin flaps and of the wound lips, necessitating secondary grafting 4 weeks after the operation. Thereafter, the wound healed in 3 weeks. Only moderate swelling of the hand, but marked stiffness. No pain in the hand or shoulder or any other signs of dystrophy. Physiotherapy for one month, after which the patient went on training the hand by himself. At follow-up, 6 months after the operation, no complaints. The hand looked all right, but the ring and little fingers were ½ cm short of reaching the palm. The other fingers normal.

*Conclusion:* Oedema and stiffness, limited flexion of the operated fingers.

*Possible causes:* (1) Hypercholesterolaemia, cerebral embolism, extrasystoles, heavy work, (2) recurrence, bilateral disease with extensive changes, rheumatic nodules, plantar fibrosis, familial predisposition, (3) primary and secondary grafting, protracted immobilization, (4) short-lasting physiotherapy.

#### XII. Case rec. 4389/59.

♂, a 47-year-old policeman who had always been in good health. Nine months before he presented himself, his hand had been pulled severely backward when he was chasing a criminal. Swelling appeared immediately, and a tender and painful nodule appeared in the palm. He showed the typical changes of a

Dupuytren contracture and was treated with local injections of hydrocortisone but without effect. No changes in hand, no familial predisposition, no rheumatic manifestations. Operation on hand, under plexus anaesthesia a bloodless field, showed a localized, Dupuytren band in the palm in contact with the little finger. Fascia otherwise normal. Operation was uncomplicated, but with small secondary haematoma and a small area of cutaneous necrosis. Five weeks after the operation the wound had healed, with moderate tenderness in the hand was then stiff, especially the little fingers. Treated with paraffin made the fibrosis subside and improved mobility. The patient went on occupational therapy. Pain at the metacarpophalangeal joint of the little finger and limitation of flexion in the shoulder and no signs of dystrophy. At follow-up, 18 months after the operation, the patient was still complaining of pain from the little finger. He shook hands with the little fingers bent in the palm, but with active extension of all fingers and no pain of all but the little finger which was short of reaching the palm. The patient's impression of being neurotic. He said the little finger refused to obey, because something was wrong with the "contact to the bone". Other investigators made a diagnosis of neurotic neurosis.

*Conclusion:* Fibrosis and stiffness, characteristic limitation of function.

*Possible causes:* (1) Trauma, (2) cutaneous necrosis, (3) contracture.

#### XIII. Case rec. 8631/60.

♀, a 50-year-old waitress who had always been in good health. Six months before she presented herself, she had had an injury at her work, sustaining a wound in the palm with infection requiring surgical treatment after, 3 palmar nodules which were tender to touch. Objective examination showed mild Dupuytren's contracture, a small band in the palm. Always heavy work, no trauma, no rheumatic manifestations.

Dupuytren contracture and was treated first with local injections of hydrocortisone acetate, but without effect. No changes in the other hand, no familial predisposition, and no rheumatic manifestations. Operation on the right hand, under plexus anaesthesia and with a bloodless field, showed a localized, typical Dupuytren band in the palm in continuation of the little finger. Fascia otherwise normal. The operation was uncomplicated, but there was a small secondary haematoma and a small cutaneous necrosis. Five weeks after the operation the wound had healed, with moderate fibrosis. The hand was then stiff, especially the ring and little fingers. Treated with paraffin baths which made the fibrosis subside and improved the mobility. The patient went on complaining of pain at the metacarpophalangeal joint of the little finger and limitation of flexion. No pain in the shoulder and no signs of dystrophy. At follow-up, 18 months after the operation, he was still complaining of pain from the little finger. He shook hands with the long, ring, and little fingers bent in the palm, but he had full, active extension of all fingers and full flexion of all but the little finger which was 1 cm short of reaching the palm. The patient made an impression of being neurotic. He stated that the finger refused to obey, because something was wrong with the "contact to the brain". Several other investigators made a diagnosis of traumatic neurosis.

*Conclusion:* Fibrosis and stiffness, uncharacteristic limitation of function.

*Possible causes:* (1) Trauma, (2) haematoma and cutaneous necrosis, (3) compensation neurosis.

#### XIII. Case rec. 8631/60.

♀, a 50-year-old waitress who had always been in good health. Six months before she presented herself, she had had an accident during her work, sustaining a wound in the left palm with infection requiring surgical incision. Thereafter, 3 palmar nodules which were painful and tender to touch. Objective examination revealed mild Dupuytren's contracture, also in the other palm. Always heavy work, no familial predisposition, and no rheumatic manifestations. Ope-

ration on the left hand, under plexus anaesthesia supplemented by general anaesthesia, and with a bloodless field, revealed 3 fibrous nodules in the palm which, grossly as well as microscopically, were typical Dupuytren tissue. No abnormalities on the fingers. No complications at the operation, and the wound healed in 12 days. Two weeks after that time, she complained of tenderness in the hand which showed some diffuse swelling and fibrosis at the scar. Started on paraffin baths and had local injections of hydrocortisone acetate. The swelling and fibrosis subsided in a little more than 3 months but the patient went on complaining of pain, and at follow-up, 15 months after the operation, it was discovered that the patient was still receiving daily benefit from the Directorate of Accident Insurance, although she had been told to start working 3 months after the operation. She had not at any time had pain in the shoulder or any signs of dystrophy apart from the pain in the hand which must be interpreted as a sign of compensation neurosis. At follow-up the hand was completely all right.

*Conclusion:* Mild oedema and fibrosis for about 3 months.

*Possible causes:* (1) Sex, (2) traumatic origin, rapid progression with pain, (3) compensation neurosis.

#### XIV. Case rec. 3439/61.

♂, a 51-year-old superintendent who had always been in good health. For a year or so tightening in both palms with fairly rapid development of a contracture of the right little finger. Only mechanical complaints. Had had heavy work, no trauma or familial predisposition. Rheumatic nodules and a tendency to swollen finger joints. Operation on the right hand, under plexus anaesthesia and with a bloodless field, complicated by difficulties due to the cuff, revealed a very strong band from a proximal site in the palm on to the little finger. No complications to the operation. The wound had healed in 12 days, and physiotherapy was started. Moderate oedema and pronounced stiffness of the hand. The physiotherapy was continued for two weeks after which the patient wanted to train the hand by himself as he had to return to his work. The

oedema soon subsided, but he could not close his fist until 6 months after the operation. At no time pain in the hand or shoulder or other signs of dystrophy.

*Conclusion:* Moderate oedema, pronounced stiffness.

*Possible causes:* (1) Heavy work, (2) bilateral Dupuytren's contracture of rapid onset, arthritis of the finger joints, rheumatic nodules, (3) short-lasting physiotherapy.

#### XV. Case rec. 223/55.

♂, a 63-year-old dockerman with chronic bronchitis and cardiac symptoms and who, moreover, looked prematurely aged and arteriosclerotic. For more than 10 years slowly progressing Dupuytren's contracture in both hands. Only mechanical complaints. The patient had always had heavy work, no trauma. There was a familial predisposition, plantar fibrosis, and rheumatic nodules. Operation on the left hand, under plexus anaesthesia supplemented by general anaesthesia and with a bloodless field, revealed widespread changes with strong fibrous bands from a site proximal in the palm on to the long and little fingers. Otherwise, the fascia was normal. The operation was performed without complications, but secondarily a large haematoma had to be evacuated several times. This was followed by cutaneous necrosis in the middle of the wound which had not healed until 6 weeks after the operation, with considerable fibrosis in the palm. Soon after the operation diffuse swelling and stiffness, and despite physiotherapy he could not make a tight fist until 5 months after the operation. At no time pain in the hand or shoulder, and no signs of dystrophy.

*Conclusion:* Oedema and stiffness for about 5 months.

*Possible causes:* (1) Arteriosclerosis and bronchitis, heavy work, (2) familial predisposition, bilateral disease, plantar fibrosis, rheumatic nodules, (3) haematoma and cutaneous necrosis.

#### XVI. Case rec. 3835/61.

♂, a 74-year-old, retired male who had always been in good health. For about 10 years increasing tightening in both palms. During

the past 6 months a tender, soft nodule had developed on the proximal phalanx of the long finger and a tense band on the ulnar aspect of the same finger which showed a 60° limitation of extension. Had always had heavy work, no trauma and no rheumatic manifestations. Operation on the left hand, under plexus anaesthesia and with a bloodless field, showed a very strong band from a site proximally on the palm on to the long and ring fingers. Skin involved. The operation was uncomplicated, but afterwards a small marginal necrosis appeared. The wound healed in 5 weeks. No striking oedema, but he had difficulty in flexing his fingers and could not close his fist tightly until 4 months after the operation despite physiotherapy which was started 3 weeks after the operation and continued for 2 months. At no time pain in the hand or shoulder or signs of dystrophy.

*Conclusion:* Mild oedema, pronounced stiffness for about 4 months.

*Possible causes:* (1) Advanced age, heavy work, (2) bilateral disease with acute progression, severe changes, (3) necrosis in the wound.

#### XVII. Case rec. 8648/60.

♂, a 57-year-old chef who had always been in good health. For more than 10 years progressing Dupuytren's contracture of both hands, now with very severe contracture of the left ring and little fingers. Only mechanical complaints. Familial predisposition, but no rheumatic manifestations. Light manual work, no trauma. Operation on the left hand, under plexus anaesthesia with a bloodless field, showed severe, diffuse fibrosis of the fascia with strong bands profound to it. At the operation a digital nerve was cut. A secondary haematoma had to be evacuated twice. Thereafter, cutaneous necrosis developed. Physiotherapy was started 3 weeks after the operation. The wound had healed in 5 weeks. Severe oedema of the entire hand as soon as the wound was inspected for the first time on the day after the operation, followed by fibrosis of the palm and stiffness of the fingers, but at no time pain in the hand or shoulder and no signs of dystrophy.

*Conclusion:* Oedema, fibrosis, and stiffness for about 3 months.

*Possible causes:* (1) Bilateral (2) haematoma and cutaneous necrosis.

#### XVIII. Case rec. 6409/60.

♂, a 37-year-old brush-maker with congenital blindness and epilepsy, treated with antiepileptics (Mysoline, Trilafon, Dilantin) for a couple of years tightening in both hands involving pain and tenderness on the left hand. He had heavy work, no trauma, no rheumatic nodules, no rheumatic manifestations. Operation on the left hand under general anaesthesia with a bloodless field, showed one strong, "active-looking" band proximally in the palm to the ring and little fingers. No abnormality of the fascia. The operation was uncomplicated, but later a large, partially clotted haematoma was evacuated. Small necrosis in the middle of the wound had not healed until 6 weeks after the operation. Immediately after the drainage moved there was moderate diffuse swelling of the hand and stiffness of the fingers. Despite physiotherapy, as the patient had always had heavy work, he could not make a tight fist until 3 months after the operation. At no time pain in the hand or arm or other signs of dystrophy.

*Conclusion:* Oedema and stiffness for about 3 months.

*Possible causes:* (1) Epilepsy (2) bilateral disease which develops with pain, and an "active" band, (3) cutaneous necrosis, (4) no physiotherapy.

#### XIX. Case rec. 7503/60.

♂, a 58-year-old railway worker who had always been in good health. For about 10 years increasing tightening in both palms with nodules in both palms with increasing limitation of extension of the ring and little fingers. Only mechanical complaints. Heavy work, no familial predisposition, and no rheumatic manifestations. Operation on the left hand under plexus anaesthesia and with a bloodless field, revealed strong fibrous bands from a site proximal to the ring and little fingers as well as a nodule in the middle of the proximal part of the long finger. The operation was uncomplicated, but a haematoma had to be evacuated twice. It was followed by marginal necrosis and a cutaneous necrosis.

*Possible causes:* (1) Bilateral severe disease, (2) haematoma and cutaneous necrosis.

*XVIII. Case rec. 6409/60.*

♂, a 37-year-old brush-maker with congenital blindness and epilepsy, treated with anti-epileptics (Mysoline, Trilafon, Difhydan). For a couple of years tightening in both palms, involving pain and tenderness on the left. Said he had heavy work, no trauma. Apart from rheumatic nodules, no rheumatic manifestations. Operation on the left hand, under general anaesthesia with a bloodless field, showed one strong, "active-looking" band from a site proximally in the palm to the root of the ring finger. No abnormality of the fingers. The operation was uncomplicated, but one week later a large, partially clotted haematoma was evacuated. Small necrosis in the wound which had not healed until 6 weeks after the operation. Immediately after the dressing was removed there was moderate diffuse swelling of the hand and stiffness of the fingers. No physiotherapy, as the patient had his home far away. He could not make a tight fist until 3 months after the operation. At no time pain in the hand or arm or other signs of dystrophy.

*Conclusion:* Oedema and stiffness of the fingers for about 3 months.

*Possible causes:* (1) Epilepsy, heavy work, (2) bilateral disease which developed rapidly, pain, and an "active" band, (3) haematoma + cutaneous necrosis, (4) no physiotherapy.

*XIX. Case rec. 7503/60.*

♂, a 58-year-old railway worker who had always been in good health. For 5-6 years nodules in both palms with increasing limitation of extension of the ring and little fingers. Only mechanical complaints. Heavy work, no trauma, no familial predisposition, and no rheumatic manifestations. Operation of the right hand, under plexus anaesthesia and with a bloodless field, revealed strong fibrous bands on to the ring and little fingers as well as a localized nodule in the middle of the palm in continuation of the long finger. The operation was uncomplicated, but a haematoma developed and had to be evacuated twice. It was followed by marginal necrosis and a cutaneous defect,

so that the wound had not healed until 7 weeks after the operation. Three weeks after the operation physiotherapy was started. From that time, oedema of the entire hand and limitation of movement in the fingers. The oedema subsided in one month, but the fist could not be closed tightly until 3 months after the operation. At no time pain in the hand or shoulder and no signs of dystrophy.

*Conclusion:* Oedema and stiffness for about 3 months.

*Possible causes:* (1) Heavy work, (2) haematoma and cutaneous necrosis.

Three months after this operation, the patient had an operation on the other hand. This time too he developed haematoma and cutaneous necrosis, but 6 weeks after the operation the hand was fit.

*XX. Case rec. 5611/61.*

♂, a 58-year-old bookseller who had always been in good health. For about 10 years steadily progressing Dupuytren's contracture of both palms, now involving pronounced limitation of extension of the ring and little fingers. Light manual work, no trauma. Familial predisposition, plantar fibrosis, and rheumatic nodules. Moreover, he was complaining of "rheumatism all over", but not in the finger joints. Operation on the right hand, under plexus anaesthesia and with a bloodless field, showed a strong, but localized fibrous band from a site proximally in the palm on to the little and ring fingers. The operation was uncomplicated. There was negligible marginal necrosis in the wound which had healed in two weeks. At that time there was oedema of the hand and stiffness of the fingers. Despite physiotherapy, he developed, within the next month, a state of dystrophy with mild pain in the hand, but not in the shoulder, a smooth shiny skin, greatly increased sweating at the iodine-starch test, but normal oscillometric findings and skin temperature. The patient was greatly affected mentally, depressed and restless. Two months after the operation the condition began to improve, and 3 months after the operation the hand was completely all right. The physiotherapy had been continued for 2½ months.

*Conclusion:* Dystrophy without subsequent complaints.

*Possible causes:* (1) Advanced age and mental make-up, (2) familial predisposition, plantar fibrosis, rheumatic nodules, generalized rheumatic pain.

*XXI. Case rec. 3175/59.*

♂, a 61-year-old railway worker who had always been in good health. For 7-8 years increasing Dupuytren's contracture of both hands, now involving a severe limitation of extension in the long finger and especially the ring finger. Only mechanical complaints. Manual, fairly light work, no trauma, no familial predisposition, and no rheumatic manifestations. Operation on the right hand, under general anaesthesia and with a bloodless field, revealed extensive changes with dense bands on to the long and ring fingers. The operation was uncomplicated, but a secondary large haematoma and large cutaneous necrosis developed. The wound had not healed until 2 months after the operation and then involved a large fibrosis of the palm and oedema of the hand. Physiotherapy was started one month after the operation, but it was difficult to train the fingers. The fist could be closed tightly 3 months after the operation. At no time pain in the hand or shoulder or any signs of dystrophy.

*Conclusion:* Fibrosis, oedema and stiffness for about 3 months.

*Possible causes:* (1) Bilateral, extensive Dupuytren, (2) haematoma and large cutaneous necrosis.

*XXII. Case rec. 5782/49.*

♂, a 42-year-old instrument maker who had always been in good health. For 3 years Dupuytren's contracture of the right hand. Acute exacerbation during the past 6 months. Slight limitation of extension in the ring finger. Light manual work, no trauma, no familial predisposition or rheumatic manifestations. Eight years previously he had had an operation for Dupuytren's contracture in the other hand and had developed violent dystrophy which, however, yielded to stellate blocks and had left no sequelae. Operation on the right hand, under plexus anaesthesia and with a bloodless field, revealed an almond-sized, firm elastic, isolated nodule in the middle of the palm. The operation was uncomplicated, and the wound healed in two weeks. Thereafter, the fingers were rather stiff, and there was mild, diffuse swelling of the hand. A favourable effect of physiotherapy, and 3 months after the operation the patient could close his fist tightly. At no time pain in the hand or shoulder and no signs of dystrophy.

*Conclusion:* Oedema and stiffness, no pain.

*Possible causes:* (1) Previous dystrophy following a similar operation on the other hand, (2) "active" nodule.

## Conclu

When considering these cases individually, as the author has done in the heading "Possible causes", to find a plausible explanation for each case. This may have been a haematoma, cutaneous necrosis, or the extent and nature of the wound, fibroplasia, or the extent and nature of the wound. However, when these findings are compared with the figures from the literature, the causes are so obvious.

When comparing the data obtained from the entire material with other data obtained from the literature, the causes are so obvious.

*Factors of significance to the course in operations on contracture:*

- (1) Type of surgery.
- (2) Haematoma.
- (3) Cutaneous necrosis.
- (4) Dressing.
- (5) Follow-up and after treatment.
- (6) Severity of fibrosis.
- (7) Duration of the disease symptoms.
- (8) Other rheumatic nodules.
- (9) General condition and current diseases.
- (10) Mental make-up.

## Conclusions and Reflections

When considering these case histories individually, as the author has done under the heading "Possible causes", it is easy to find a plausible explanation in each case. This may have been a haematoma, necrosis in the wound, fibroplastic diathesis, or the extent and nature of the disease. However, when these findings are compared with the figures from the first analysis of the material, the causes are not quite so obvious.

When comparing the data found by analysing the entire material with the further data obtained from the histories of cases having a protracted course, the following applies:

*Factors of significance to the postoperative course in operations on Dupuytren's contracture:*

- (1) Type of surgery.
- (2) Haematoma.
- (3) Cutaneous necrosis.
- (4) Dressing.
- (5) Follow-up and after-care.
- (6) Severity of fibrosis.
- (7) Duration of the disease and symptoms.
- (8) Other rheumatic manifestations.
- (9) General condition and inter-current diseases.
- (10) Mental make-up.

*factors of no significance to the postoperative course in operations on Dupuytren's contracture:*

- (1) Type of anaesthesia.
- (2) Bloodlessness during the operation.
- (3) Damage to nerves.
- (4) Age.
- (5) Sex.
- (6) Heredity.
- (7) Distance of domicile from hospital.
- (8) Type of work.

However, none of these factors shows any great percental preponderance in the good and poor groups respectively. For example, the occurrence of haematoma after the operation is 30.4 % in the group having a postoperative course beyond 3 months, but even in the best group 12.5 % had such postoperative haematoma. And the occurrence of haematoma in the wound is even one of the factors which apparently has most influence upon the duration of the postoperative course, the other factors being less significant.

Of the 103 patients with Dupuytren's contracture operated upon by the author using limited fasciectomy, 23 had an abnormally long postoperative course, characterized by oedema, fibrosis and stiffness,



and in some cases pain. Five patients complained of pain (Case reports II, V, XII, XIII, XX). Two (XII and XIII) exhibited an obvious traumatic neurosis, one (V) developed a shoulder-hand syndrome on the basis of previous humeral peri-arthritis, and two (II and XX) showed what may be called typical reflex dystrophy which, however, responded favourably to treatment. The remaining 19 only had abnormally severe oedema, more severe than justified by the extent of the operation and, if compared with the reaction following other operations, of a degree which corresponds only to extensive trauma involving crushing of tissue. The author had previously after-examined 137 patients

who had undergone suture of nerves in the wrist and hand, a total of 186 operations. More than half of these patients had simultaneously had tendon operations, osteosynthesis, and soft-tissue repair. Another investigator in the same Department (Agner) has after-examined 55 patients who had undergone operations for fractures of the scaphoid bone - 48 by Camitz-Benzon's technique and 7 with insertion of acryl prostheses. Yet another investigator (T. Reumert) has after-examined patients who had had tendon transplantations on the hand and forearm. None of all these patients had a course like that seen following operations for Dupuytren's contracture.

## Theory on the Contracture

Whether the protracted course following operations on Dupuytren's contracture is to be called dystrophy is a matter for discussion. It is characterized by oedema, fibrosis, and stiffness of the hand, and is accompanied by pain. In all definitions of reflex dystrophy, pain is invariably an important symptom in the initial stage and is probably what initiates the "reflex dystrophy." In the author's opinion, however, the typical postoperative course in the cases represents a dystrophy-like condition.

On further consideration, many points of similarity between the acute stages of Dupuytren's contracture and reflex dystrophy are seen. In the first, the patient has pain and mild oedema of the hand reminiscent of the initial stage of reflex dystrophy. Moreover, in the cases, showing severe fibrosis and contracture of the fingers, the appearance may remind one of the sequelae of reflex dystrophy.

Changes exactly like those seen in reflex dystrophy with Dupuytren's contracture are seen in the presence of painful disease of the shoulder with subsequent immobilization of the hand, oedema, and fibrosis (BERG 1955), i. e. dystrophy-like changes. They may be observed in cases of myocardial infarction (KEHL 1943) and in cases of immobilization of the extremities. They are of pain, but may also be due to changes in the sympathetic ganglia, i. e. changes similar to that which is assumed in reflex dystrophy. In the author's opinion, Dupuytren's contracture is a disease *sui generis*, but one :

## Theory on the Aetiology of Dupuytren's Contracture and Dystrophy

Whether the protracted course following operations on Dupuytren's contracture is to be called dystrophy is a matter of discussion. It is characterized by oedema, fibrosis, and stiffness of the hand, but seldom by pain. In all definitions of dystrophy, pain is invariably an important symptom in the initial stage and is presumed to be what initiates the "reflex". In the author's opinion, however, the complicated postoperative course in the present 23 cases represents a dystrophy-like state.

On further consideration, there are many points of similarity between dystrophy and Dupuytren's contracture. In the acute stages of Dupuytren's contracture the patient has pain and mild swelling of the hand reminiscent of the milder forms of dystrophy. Moreover, in the inveterated cases, showing severe fibrosis of the palm and contracture of the fingers, the hand may remind one of the sequelae to dystrophy.

Changes exactly like those seen in hands with Dupuytren's contracture may arise in the presence of painful diseases of the shoulder with subsequent immobilization of the hand, oedema, and fibrosis (MOBERG 1955), i. e. dystrophy-like changes. They may be observed in cases of coronary infarction (KEHL 1943) and are then due to immobilization of the extremity because of pain, but may also be due to irritation of sympathetic ganglia, i. e. a mechanism similar to that which is assumed to cause reflex dystrophy. In POWERS' (1934) opinion, Dupuytren's contracture is not a disease *sui generis*, but one sign of a sys-

temic disease. He listed a number of allied diseases: Epilepsy, Raynaud's disease, scleroderma, osteoarthropathy, neuritis, neurosis, and various dystrophy-like conditions, e.g. hyperhidrosis. These conditions were assumed to be due to some intrathoracic action upon the sympathetic nervous system due to cardiac or pulmonary disease, and the nature of the manifestations was said to depend upon the type of action upon the sympathetic nervous system.

The uncharacteristic histological appearances found in the fibrosis of Dupuytren's contracture may, furthermore, suggest that it is merely a manifestation of another, more generalized disease.

Prior to the operation several of JAMES & TUBIANA'S (1952) patients had vascular disturbances of the affected hand which was either warmer or colder than the other and sometimes showed oscillometric changes. They state that this spells a poorer operative prognosis, but do not further elucidate the problem.

MOGENS LUND (1941) found a definite relationship between epilepsy and Dupuytren's contracture. In his opinion the vasomotor disturbances seen in epileptic paroxysms may promote the development of Dupuytren's contracture. He states, moreover, that the microscopic vascular changes found in the central nervous system in epilepsy – thickening of arteriolar walls and perivascular gliosis – are exactly the same as the changes seen in the fibrosis of Dupuytren's contracture in which there is also thickening of the arteriolar walls

and perivascular infiltration. In addition, he studied vasomotor reactions. He measured the temperature of the skin, then cooled the hand for 10 minutes to 15° C, and measured the temperature again. Twenty minutes later the skin temperature of normal subjects had almost reached the initial level, while in Dupuytren patients it fell further or rose by only a few degrees. In unilateral cases, the unaffected hand behaved in the same way. By means of a photoelectric plethysmograph PALETTA et al. (1957) studied the pulse amplitude, changes in volume and vasomotor reaction in patients with Dupuytren's contracture. All these parameters were found to be reduced, both on the affected side and, in

unilateral cases, on the unaffected hand. They put this down to predisposition and concluded that these findings were connected with the aetiology of Dupuytren's contracture. PALETTA and associates planned studies on the sudomotor reaction, but found the iodine-starch method too unreliable.

Thus, if we dare assume a common aetiology of Dupuytren's contracture and dystrophy, *via* an action upon the sympathetic nervous system, all the advanced theories may be fitted in. The reason why some authors seem to be sharply opposed may be that they are attacking different ends of the problem.

Prese:

In order to elaborate the theory the author has started experiments intended to demonstrate in Dupuytren patients, even before operation, exhibit changes which interpreted as an abnormal response of the sympathetic nervous system.

As already mentioned, M. early as 1941, found an abnormal reaction on both hands suffering from Dupuytren's and PALETTA et al. (1957) found pulse amplitude, changes in vasomotor reaction.

The author decided first to study the sudomotor reaction.

#### *Investigations into Sudomotor*

The original plan was to study sudomotor function in a number of patients with Dupuytren's contracture to ascertain whether the patients exhibit changes similar to the vasomotor changes found by e.g. PALETTA et al. (1957).

To this end the ninhydrin test was used, as advocated by MÖBERG (1958). The principle of this test is that the amino acids of the sweat combine with ninhydrin which stains blue on heating. The test is carried out as follows: A patient has washed and dried his hands and presses his finger tips against special paper which is then immersed in a solution of ninhydrin in acetone. A few drops of this solution have been added a few drops of water. After air-drying, the paper is heated for 5 minutes to about 100° C, whereupon the finger prints stand out distinctly. The preparation is fixed by immer-

## Present Studies in Progress

In order to elaborate the advanced theory the author has started investigations intended to demonstrate whether Dupuytren patients, even before the operation, exhibit changes which may be interpreted as an abnormal response by the sympathetic nervous system.

As already mentioned, M. LUND, as early as 1941, found an abnormal vasomotor reaction on both hands of patients suffering from Dupuytren's contracture, and PALETTA et al. (1957) found a reduced pulse amplitude, changes in volume, and vasomotor reaction.

The author decided first to study the sudomotor reaction.

### *Investigations into Sudomotor Function*

The original plan was to study sudomotor function in a number of patients with Dupuytren's contracture in order to ascertain whether the patients showed changes similar to the vasomotor changes found by e.g. PALETTA et al. (1957).

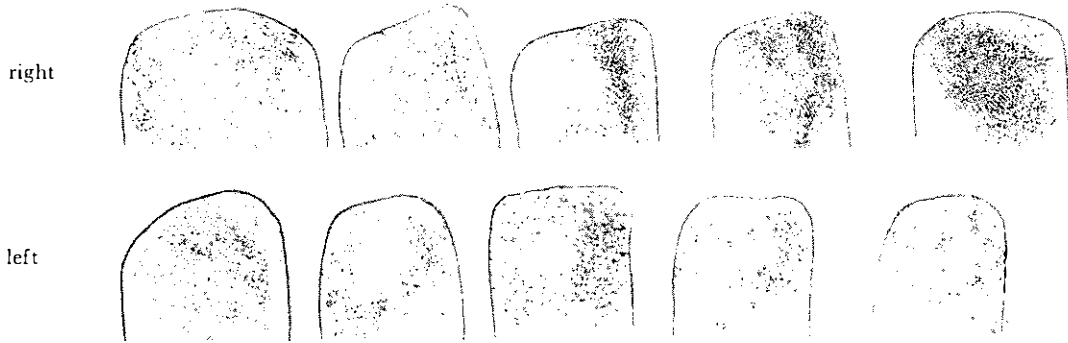
To this end the ninhydrin test as advocated by MOBERG (1958) was selected. The principle of this test is that the amino acids of the sweat combine with ninhydrin which stains blue on heating. In practice, it is carried out as follows: After the patient has washed and dried his hands, he presses his finger tips against smooth white paper which is then immersed in a 1 % solution of ninhydrin in acetone to which have been added a few drops of acetic acid. After air-drying, the paper is heated for 5 minutes to about 100° C, and now the finger prints stand out distinctly blue. The preparation is fixed by immersion into 1 %

copper sulphate in acetone which turns the finger prints red.

However, the secretion of sweat differs so much individually that information regarding possible abnormalities can be obtained only by comparing the two hands of the same person. In all the Dupuytren patients investigated in this way by the author prior to operation, the prints were identical on both sides, also when the disease was unilateral. This fits well in with previous studies on the vasomotor reaction (M. LUND 1941, PALETTA 1958). Since, for these reasons, it was impossible to procure a normal series, it was not felt that conclusions could be drawn on the basis of one sweat test on a series of patients with Dupuytren's contracture.

In a new series, ninhydrin tests were done on the patients on the day before the operation and at regular intervals after the operation. This was done on a total of 16 patients not included in the original material as they had their operations later than November 1961. Before the operation, the ninhydrin tests gave the same results on both hands, while during the first 3-10 days after the operation the reaction on the operated hand was reduced. This was followed by a period - from the 10th to the 30th postoperative day - during which the secretion of sweat was increased on the operated side, and thereafter the reaction was again equal on both hands. One of the patients still showed an increased ninhydrin test two months after the operation. This patient, in whom the operation had been very difficult because of extensive changes, had

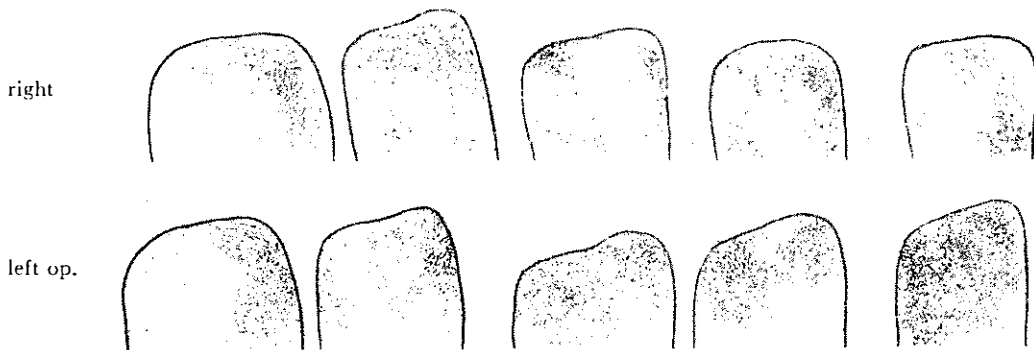
FIG. III



Results of ninhydrin test identical on both hands on the day prior to operation for Dupuytren's contracture



Ninhydrin test shows increased sweating on the operated side 2 weeks after the operation



Results of ninhydrin test again identical on both hands 4 weeks after the operation

a prolonged postoperative co-  
oedema and stiffness, but witho-

In all the other patients the  
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was fit in less than 6 weeks.  
there were minor differences in  
of the ninhydrin tests. Three p.  
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a prolonged postoperative course with oedema and stiffness, but without pain.

In all the other patients the postoperative course was uneventful and the hand was fit in less than 6 weeks. However, there were minor differences in the results of the ninhydrin tests. Three patients, who had an extremely smooth postoperative course, had no period of increased sweat secretion. After a few days of reduced sweat secretion on the operated side, the tests gave the same results on both hands.

The investigation indicates that an operation for Dupuytren's contracture is always followed by reduced secretion of sweat on the operated side. In cases showing little postoperative reaction, the ninhydrin test returns to normal in a week or so, but in the event of some postoperative complication, such as haematoma, necrosis, or oedema, this period of reduced sweating is followed by a period of increased sweating. The duration of the latter period depends upon the time at which the postoperative complications subside.

In cases of dystrophy, a short-lasting stage of reduced sweat secretion is always followed by increased secretion of sweat on the affected limb. This again leads us to the idea that the very slightest complication following any operation involves latent dystrophy. HALDBO (1942) found that simple traumas too are followed by disturbances in sweat function.

As already mentioned, operations on Dupuytren's contracture are followed, with striking frequency, by abnormally severe oedema which may easily develop into a state resembling dystrophy. This may be explained by the theory advanced, viz. that Dupuytren's contracture and dystrophy are of related aetiology.

#### *Determination of Capillary Flow*

In an effort to throw further light on the named problems, we have also started an investigation of capillary flow, a function which is influenced by the sympathetic nervous system. This investigation is being carried out in collaboration with two colleagues in the Orthopaedic Hospital (E. Olesen & H. Bohr) and is in progress at present.

The capillary flow is studied by means of radioactive sodium ( $\text{Na}^{22}$ ) by a method described by VEALL & VETTER (1958).

A very small, known amount of  $\text{Na}^{22}$  is injected subcutaneously into the dorsal aspect of the 3rd interstice on the hand, and under standard conditions the half-life is measured by a Geiger counter for 20 minutes. The recorded values form the basis of a curve showing the rate of elimination.

So far, 19 patients have been studied by this method, but as we do not yet have a normal series, it is too early to state any results.

## Answer to the Posed Questions. — Comments

On the basis of the above findings and reflections, it will be attempted now to answer the question posed.

*The incidence* of dystrophy following operations for Dupuytren's contracture depends upon the definition of this condition. In a material of 103 cases operated upon and followed up by the author, there are 2 showing a condition which by classical definitions may be called true reflex dystrophy, 2 with traumatic neurosis which is in many respects reminiscent of dystrophy, and one with a shoulder-hand syndrome. In addition to these 5 patients, 18 had a very protracted postoperative course, characterized by oedema, fibrosis and stiffness, but without pain in the hand or shoulder. In other words, almost 2 % had true dystrophy, 4.9 % dystrophy-like states, and an additional 17.5 % what might be called latent dystrophy.

*The course* may be described as follows: Any trauma initiates reactions which may — it is true — be interpreted as defence mechanisms on the part of the body, but which also involve the same factors which give rise to conditions reminiscent of dystrophy. I am referring particularly to oedema, which normally subsides quickly without leaving lasting damage but which in some cases may become severe, last long, and give rise to fibrosis and stiffness of the tissues. (Fig. I Nos. 1–14).

Following operations for Dupuytren's

contracture, such a prolonged oedema occurs with striking frequency. Even of the hands which were fit within less than 6 weeks, one-third showed more severe oedema than would be expected.

Various factors influencing the duration of the postoperative course may be mentioned. Among the more important ones there are: Surgical method, occurrence of postoperative haematoma and cutaneous necrosis, the extent of fibrosis, symptoms, general condition, and mental make-up. In addition, after-care and follow-up are of importance.

But even when regard is paid to all these factors, the reaction following operations on Dupuytren's contracture is more severe than expected.

The theory is advanced that postoperative oedema and the pronounced tendency to turn the normal postoperative course into the direction of dystrophy might be due to a predisposition inherent in Dupuytren patients and connected with the aetiology of their disease. A possible explanation is that a group of diseases, including both Dupuytren's contracture and dystrophy, have a common aetiology including a certain action on the sympathetic nervous system.

Investigations have been started by the author, alone and in collaboration with others, in order to elucidate these problems.

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