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Institute of Pathology. The operation diagrams were drawn by the Department of Illustration, University of Sydney. The surgery was performed by the members of the Thoracic Surgical Unit, Royal Prince Alfred Hospital, namely, Mr. A. F. Grant, Mr. B. Leckie and myself, except for the resections, which are a personal series.

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DUPUYTREN'S CONTRACTURE AND SPECIFIC INJURY

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This paper is solely concerned with the presentation of material in which an association is considered to have existed between a single specific injury and the initiation or aggravation of Dupuytren's contracture. This association with a single injury is considered, at present, to be quite distinct from the question of any possible relationship of Dupuytren's contracture to occupation or to manual labour.

A causal association has been previously suggested from a study of a limited number of patients in whom such a relationship was considered to have existed (Hueston, 1962, 1963), and the purpose of this paper is to report the further experience gained from the study of 400 patients with Dupuytren's contracture, in which an attempt was made to find any specific episode of injury to the hand or to the upper limb, which might be causally related. Many of these patients were referred specifically for assessment of this factor rather than for treatment, so that probably a higher proportion of the total is implicated than in an entirely random series.

A causal relationship was considered to have existed between an injury and the onset or aggravation of Dupuytren's contracture in 58 of the 400 cases, based on the onset or the clinical progression of Dupuytren's contracture within a few months of the injury.

One difficult factor to measure was the severity of the injury, which in most cases had been severe enough to have been reported, and usually had been associated with a period of swelling or total incapacity, but in some cases had not been severe enough to cause a patient to stop his normal work. These latter patients included those with a history of a forcible hyperextension of the fingers by a backwards fall, throwing the whole weight of the body on to the extended fingers. In the history of six patients this type of injury was convincingly described as being followed by localized pain and bruising in the palm and, within weeks, by the appearance of a typical nodule, which in some had progressed to band formation and deformity.

Another difficulty was the patient's ignorance of the state of his hand before the injury. Many patients with bilateral disease are unaware of an early lesion in the other hand. Therefore, their sincere assertion that the injured hand had no nodule before the accident cannot be taken as unassailable.

In 47 cases, injuries of the hand were followed within months by onset or progression of Dupuytren's contracture. These injuries were as follows:

Laceration	18
Crush and laceration	7
Crush only	7

Fracture of a metacarpal	2
Dislocation of an interphalangeal joint	2
Forcible hyperextension of fingers	6
Burn	1
Infection	4

In 11 cases, injuries to the upper limb were followed within months by the onset or progress of Dupuytren's contracture. These injuries were as follows:

Forearm fracture	6
Forearm infection	1
Elbow dislocation	2
Shoulder dislocation	2

In 21 instances in the same series of 400 patients, an episode of acute invalidism was associated with the initial appearance or clinical progression of Dupuytren's contracture. The conditions causing these episodes were as follows:

Myocardial infarction	3
Lower limb injury	9
Eye surgery	4
Abdominal surgery	1
Pulmonary tuberculosis	3
Diabetic crisis	1

The presence of a foreign body in a Dupuytren's nodule has been an incidental finding at operation on four occasions. In two cases, this was a fragment of wood, and in two cases a metal fragment. In two of these cases the Dupuytren's contracture was localized to the digit, and the palm was not involved, suggesting even more strongly a causal relationship between local injury and the Dupuytren's contracture. Diffuse changes elsewhere in the same hand, and also in the other hand, were present in the other two cases, suggesting that, if there was any causal relationship, it was unlikely to be more than local aggravation of the fibroplasia.

Despite the irrefutable evidence of local injury that a foreign body presents, it is worthy of note that none of these four patients could remember the specific penetrating episode. This is another example of the fallibility of patient observation, which is a constant impediment in the collection of factual data relating to the aetiology of Dupuytren's contracture.

An operation for the correction of Dupuytren's contracture is the commonest major injury to the hand of these patients with Dupuytren's contracture, and it allows continuous observation of the state of the hand following this injury. The early onset of most clinical recurrences within two years of operation has already been noted (Hueston, 1963b), and it is not uncommon to see evidence of extension appearing in the unoperated areas of the same

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hand in the weeks after an operation. This is particularly so when there has been a period of clinical vasomotor disturbance, with swelling and stiffness of the fingers for a month or more, after the operation.

The age distribution of patients in whom an association appeared to exist between a specific episode of injury and the progression of Dupuytren's contracture (Table 1 and Figure 1), shows the same shift to the younger age groups, as that of patients with a recurrence after surgery (Hueston, 1963b).

TABLE 1
Age Distribution of Patients with Dupuytren's Contracture Causally Related to Injury, Compared with Patients Not Showing any such Relationship

Age Group (Years)	Number of Cases		Percentage of Age Group
	Association with Injury	No Association with Injury	
Under 29	3	5	37.5
30 to 39	13	32	28.8
40 to 49	17	81	17.3
50 to 59	19	108	14.9
60 to 69	6	104	5.5
Over 70	—	12	—

In patients of an advanced age, the operation of fasciotomy, involving as it does simple surgical transverse rupture of the deforming band in Dupuytren's contracture, is frequently followed by resolution and shrinkage of much of the separated segments of the mature fibrous band. The same sequence has been occasionally described in other elderly patients, namely, that an accident which produced forcible extension of the contracted finger, has caused at first a painful rupture of the deforming band,



FIGURE 1: The figures in Table 1, when drawn in graph form, clearly demonstrate the younger age distribution of patients in whom there is an association between injury and Dupuytren's contracture. This distribution is similar to that of patients with a recurrence after fasciotomy.

but the subsequent disappearance of most of the abnormal Dupuytren's tissue in the palm. This apparent paradox of an injury causing cure of the condition is virtually confined to the elderly age group for whom fasciotomy is usually reserved, and in whom spontaneous rupture is more likely to occur. It has been found that recurrence after surgery is rare in this older age group (Hueston, 1963a) and that the difference in the behaviour pattern of the local palmar tissues when injured may possibly be related to changes in the vascular or vasomotor status of elderly patients.

From our still very incomplete knowledge of the basic nature of the pathology of Dupuytren's contracture, it is, as yet, impossible to do more than speculate on the factors controlling the vascular and cellular changes associated with the initiation and progression of this condition.

The mechanism by which each of the three sets of circumstances classified in the three preceding tabulations could affect the tissues of the hand may be the same, or may be entirely different. A local injury of the hand is followed by a predictable sequence of inflammatory and reparative changes of a vascular and cellular nature. A regional injury to the arm causes swelling of the hand, and some vascular changes associated with disturbance of tissue fluid balance, but few local reparative processes of a distinctive cellular nature would be expected in the hand. Enforced rest, as in acute medical crises or during an illness, would not even produce a clinically detectable swelling of the hands, but it is very likely that the pattern of vascular flow through the different tissue planes of the hand may be altered under the circumstances. A great deal of further study is necessary on the normal physiology of the hand.

SUMMARY

Circumstantial evidence of an association between an episode of injury and the development of Dupuytren's contracture is presented. No conclusion is possible as to the mechanism by which a specific injury can so state of the palmar tissues that Dupuytren's contracture begins, or is made to progress, but it is suggested that elucidation of this mechanism may follow further studies of the pattern of blood flow in the hand, and of their changes under conditions of injury, disease, disuse and manual work of various types.

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What can I wish to the youth of my country who devote themselves to science?

Firstly, gradualness. About this most important condition of fruitful scientific work I can never speak without emotion. Gradualness, gradualness and gradualness. From the very beginning of your work, school yourselves to severe gradualness in the accumulation of knowledge.

Learn the ABC of science before you try to ascend to its summit. Never begin the subsequent without mastering the preceding. Never attempt to screen an insufficiency of knowledge even by the most audacious surmise and hypothesis. Howsoever this soap bubble will rejoice your eyes by its play, it inevitably will burst and you will have nothing but shame.

School yourselves by demureness and patience. Learn to inure yourselves to drudgery in science. Learn, compare, collect the facts.

Perfect as is the wing of a bird, it could never raise the bird up without resting on air. Facts are the air of a scientist. Without them you never can fly. Without them your "theories" are vain efforts.

But learning, experimenting, observing, try not to stay on the surface of the facts. Do not become an archivist of facts. Try to penetrate to the secret of their occurrence, persistently search for the laws which govern them.

Secondly, modesty. Never think that you already know all. However highly you are appraised, always have the courage to say to yourself—I am ignorant.

Do not allow haughtiness to take you in possession. Due to that you will be obstinate where it is necessary to agree, you will refuse useful advice and friendly help, you will lose the standard of objectiveness.

Thirdly, passion. Remember that science demands from a man all his life. If you had two lives that would not be enough for you. Be passionate in your work and your searchings.—Speech by Pavlov at the age of 87 years to Russian students, translated by Kupalov and quoted by Liljestrand, G. (1957), *Ann. Rev. Physiol.*, 19: 9.