

# The role of the skin in Dupuytren's disease\*

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Previous lectures have presented McIndoe's contributions as a combination of reminiscences and technical details and some have gone on to develop those subjects in which he had an especial interest—the burn wound (1,2) and even more important, the burned patient (3), hypospadias (4), congenital absence of the vagina (5), hand surgery (6), maxillo-facial (7) and oro-pharyngeal surgery—with his even more profound contributions to the structuring of plastic surgical enterprise during and after the war (8) and in the training of young plastic surgeons—through the establishment of the British Association of Plastic Surgeons (9,10).

This lecture is presented as a philosophical and technical tribute to McIndoe in those two areas of hand surgery which he made his own. These are the technical expertise of fasciectomy—never before McIndoe so eloquently displayed—and the application of free skin grafting to the mobile regions of the hand, so classically enunciated in his wartime work on the burned hand.

## The role of the skin

Only in the past twenty years have we become increasingly aware of the controlling role which the skin and its hypodermis play in the pathogenesis of Dupuytren's disease and particularly of recurrent Dupuytren's disease (11).

I have no simple explanation as to why recurrence does not occur beneath a skin graft—but let us summarise what is known at present of the volar skin of the hand and its subcutaneous space in relation to the development, recurrence and control of Dupuytren's disease.

## Anatomical observations

*The Palmer Subcutaneous Space* This is bounded dorsally by the palmar aponeurosis and its distal digital extensions through which it is fixed to the margins of the phalanges (12,13) and to the overlying glabrous skin of the palm and digits (14). Relative to the rest of the hand in cross-section this is a remarkably narrow anatomical space enclosed between the skin and the palmar aponeurosis. This very thin palmar subcutaneous space contains less fat and more fibrous tissue with age (15) and is within the 'zone of influence' of the dermis and hypodermis of the overlying palmar skin.

Creaselines represent lines of transverse shortening induced by dorsal stretching of the digital integument in flexion. At the flexure creases the fat compartments are secondarily displaced distally and proximally, leaving the dermis and hypodermis directly in contact with the deep fascial plane. Flint has shown a regional preference for the fat to be replaced by fibrous in that very part close to the distal palm creaseline, where the earliest nodules of Dupuytren's disease are most commonly found.

The dermis appears to be specially capable of influencing fibroblast behaviour (16). To be more precise it is the cells in the hypodermis, so important in providing the active components for healing of any skin wound, which are most likely

controlling the fibroblastic behaviour within the subcutaneous space between the palmar aponeurosis and the palmar skin. Nodules do not occur at the creaselines themselves where no fat is present. The freedom of this fatless fibrous line indicates that the primary lesion of Dupuytren's disease is unlikely to lie solely within the fibrous structures of the palm.

Recent studies (14) have schematicized previous findings (12) but any 'adhesion' theory of pathogenesis ignores the role of the volar skin and the subcutaneous space—in particular the hypodermis acting as an inductor of new fibroblastic activity above entrophy. In 1962 Sir Peter MacCallum and the present author (17) proposed from microscopic observations the concept of metaplasia—namely that any connective tissue cell under appropriate environmental changes can change the product of its activity from one matrix to another. The production not only of the primary but also of recurrent Dupuytren's tissue is thus possible from virtually any connective tissue cell in the palm. This 1962 statement (17) has frequently been misinterpreted as attributing the origin of Dupuytren's disease solely from fat cells. However, it is relevant that recent work (18) suggests that changes in the fatty tissue in the region of the distal palmar crease may activate the cells on the surface of the palmar aponeurosis.

## Operative observations

A nodule is never found on the dorsal aspect of a palmar aponeurosis resected for Dupuytren's disease. This observation supports the role of the volar subcutaneous space in the initiation of the primary pathological process.

The skin incision—normally made directly over the most involved area of the contracting nodule-band unit—immediately enters this mass of fibroplastic tissue. The dermis is usually directly involved in this fibroplastic process and often retains some of this tissue despite the most careful elevation of flaps. The amorphous mass of mixed fat and fibrous tissue is seen to occupy the palmar subcutaneous space—arising from the volar aspect of the palmar aponeurosis and its distal and dermal extensions. The better organized glistening longitudinal bands lie between, and are secondary to a combination of slow cellular contraction within the less well defined nodules, and work hypertrophy induced in normally existing fibrous structures under the longitudinal stresses of the normal use of the hand (19). That these bands resolve and disappear after release by fasciotomy of this longitudinal stress confirms their secondary nature. The ultimate force generated in the process is capable of shortening the normal anatomical fibrous framework by up to half its length and, since force requires energy, and energy can only come from living cells, it is clear that the cellular areas are the fundamental source of the contracture in Dupuytren's disease.

An earlier obsession with the collagenous structure of the palmar tissues is at present being replaced by the more logical study of the cellular origins of this energy source needed for contraction (20). Further evidence of the tissue cell priority in the pathogenesis of Dupuytren's disease is that 'myofibroblasts'—probably only a transient phase of a

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normal fibroblast life-cycle—are found constantly in the primary nodule but rarely if at all in the secondary hypertrophic bands of the contracting mechanism (21,22). Growth studies suggest that the life cycle of myofibroblasts from a nodule differs from that of fibroblasts in bands (23).

Far less precise is the interpretation of vascular or neurovascular changes in the skin and subcutaneous space of patients with Dupuytren's disease. We have long been aware of the clubbed fingers of cardiopulmonary invalids and the 'liver palms' of alcoholics—but the possible association of neurovascular changes affecting the behaviour of palmar tissues to produce Dupuytren's disease dates a century back to Abbe (24) and has often been reviewed since (25–29).

The plastic surgical principle of primary wound closure was frontally flouted in 1964 by McCash who proposed leaving open the wide transverse palmar defect after extensive fasciectomy (30). This clinical experiment—which many surgeons still advocate—demonstrated that in Dupuytren's disease the volar skin in palm and fingers undergoes a contraction that is more apparent than real. The shortening of the subcutaneous 'contracting nodule-band unit' creates these skin folds.

The demonstration by Rudolph that myofibroblasts can be found beneath split skin grafts but never beneath Wolfe grafts (31) explains the clinical prevention of wound contraction by Wolfe grafts—and is probably crucial to the prevention of recurrent Dupuytren's disease by resurfacing with a Wolfe graft.

### Recurrent Dupuytren's disease

The same contracting fibroblastic tissue can be laid down and reproduce flexion deformity after excision of the original contracting elements of Dupuytren's disease from the same area. This indicates that the primary process producing this tissue cannot lie solely within the pre-existing anatomical fibrous structures of the palm and fingers. Surely a study of recurrent Dupuytren's disease must bring us closer to revealing the pathogenesis of this condition. The opposing 'intrinsic' and 'extrinsic' theories (32) will not be exposed again here, but the 'extrinsic' theory is strongly supported by the very fact of recurrence itself.

That recurrence is common in Anglo-Saxon communities has been supported in Edinburgh (33) with 41% and by two studies 15 years apart in Melbourne with 40% (34) and 35% (35) recurrence. A recent report from Derby of 46.5% recurrence (36) confirms this very real and often ignored sequel of fasciectomy in those races with a strong diathesis to Dupuytren's disease. It is the patient who determines the outcome of surgery on the evolution of the disease process (37). Recurrence is commonest in younger patients with ectopic deposits and usually occurs within 2 years of primary fasciectomy (38). Certainly some directly infiltrated dermis is often retained but, if the longitudinal stresses on this dermis are relieved by either Z-plasty or an interpolated graft, recurrence usually occurs in patients with a moderate to strong diathesis. A diathesis exists which often allows the prediction of recurrence in some young patients (39) particularly if supported by a strong family history, although it has shown (40) how unreliable a negative family history can be. By his recent computer studies of 1,000 patients with Dupuytren's disease, MacFarlane (41) has confirmed the existence of such a diathesis.

By far the most important, if still empirical, observation on recurrent Dupuytren's disease is that recurrence can be prevented by changing the skin over the area cleared by fasciectomy. Thus it appears that the removal of the skin of the palm or digit removes with it the mechanism responsible for the production of recurrent Dupuytren's disease. Berger (42) and Lexer (43) advocated radical skin excision in Dupuytren's disease on the analogy with burn scar contraction but the phenomenon of freedom from recurrence beneath the grafts, reported by Piulachs and Mir y Mir (44) has stimulated the reintroduction of free graft replacement of

the skin prophylactically in recurrent Dupuytren's disease (36,45–47). The term 'dermofasciectomy' indicates that the overlying skin is excised along with the underlying fascia at the time of operation. A full thickness (Wolfe) graft is preferred to a split skin graft to prevent wound bed contraction.

Dermofasciectomy is firmly recommended for recurrent Dupuytren's disease either as a total resurfacing of the volar aspect of the affected digit or as a transverse ellipse to act as a 'firebreak' (48), a technique used for many years both for primary and recurrent Dupuytren's disease by Gonzales (49). Dermofasciectomy is considered to be the primary

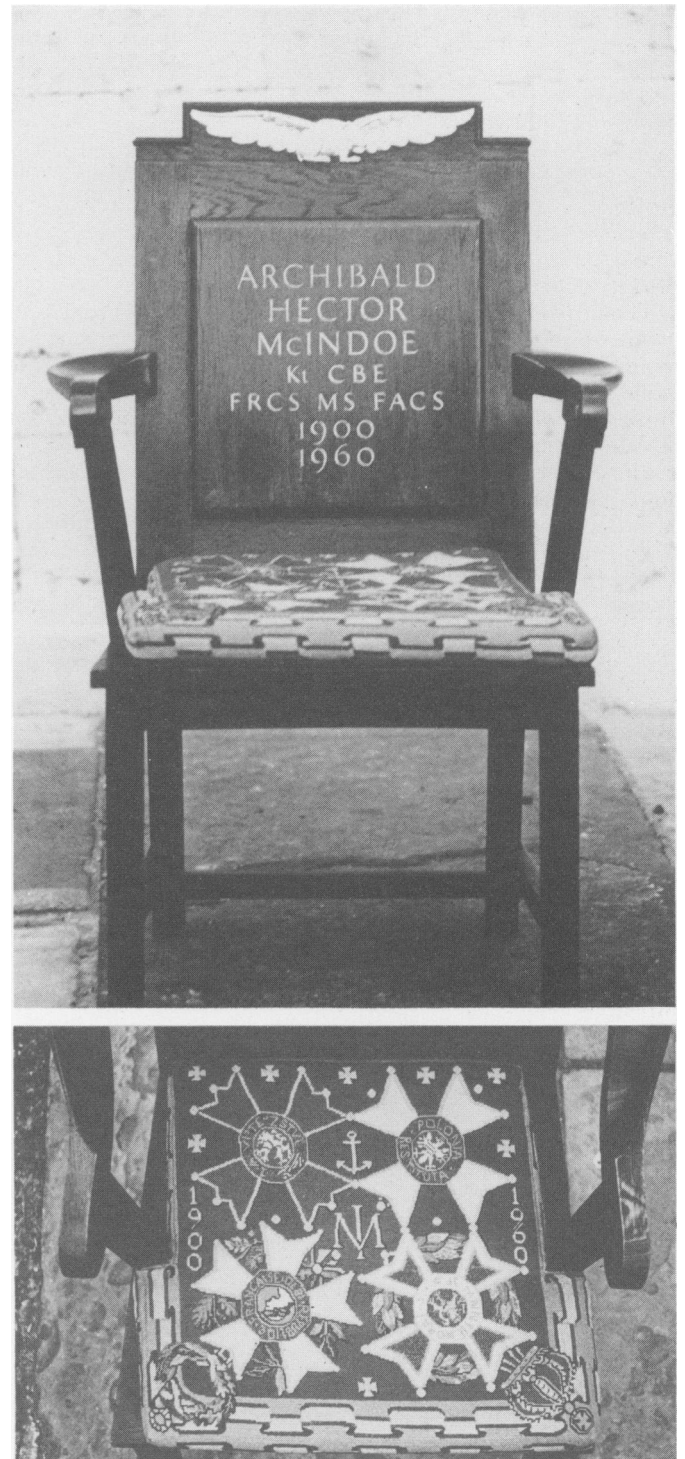


FIG. 1A and B. The McIndoe Memorial Chair in the parish church of the College and the church of the R.A.F. Note that the Guinea Pig replaces the Eagle of the R.A.F., see the text for the four foreign orders.

procedure of choice in young people with a strong diathesis particularly when digital skin infiltration is extensive. The immunity of the 'firebreak' grafted zone from recurrence relieves the patient of the risk of confluence of any adjacent areas of local recurrence beneath replaced skin flaps. A high rate of recurrence after the rarely indicated removal of a knuckle pad has led to the use of split skin graft replacement in this area (50). The practical aim of dermofasciectomy has been to minimize the need for amputation in even severe cases of recurrence. Cross-finger flaps are positively contraindicated for these would then be used in the very young patients likely to develop an extension of Dupuytren's disease in the adjacent finger.

In the past thirty years, 383 Wolfe grafts have been used in over 3,000 fasciectomy. It is unlikely that this greater than 10% use of dermofasciectomy is required in populations diluted by non-Celtic races such as in the United States. In the past decade the use of Wolfe grafts in the author's personal practice has risen above 20% because of the high rate of referral of patients with recurrent disease. The more confident use of Wolfe grafts—often of necessity multiple and extensive—has, by preventing crippling recurrence, virtually eliminated amputation in Dupuytren's disease.

### Epilogue

McIndoe's enquiring, direct and pragmatic approach to surgical problems would have led to the logical shift in the treatment of Dupuytren's disease from the deeper to the more superficial plane. His constant pressing for the use of free grafts wherever possible has led directly to this present prospect of the control of a still most mysterious disease.

Finally, let us not forget the elegant ceremonial chair donated to his memory by Lady McIndoe in the parish church of this College—St Clement Danes (Fig. 1). Here the RAF eagle is supplanted by a heterograft of a guinea pig! The embroidered seat shows his four foreign orders—the French Legion d'Honneur; Order of the White Lion of Czechoslovakia; Order of the White Eagle of Poland (Polonia Restituta); Order of the Golden Lion of the Netherlands.

This final 'Je maintiendrai' (I will stick to my guns), set amongst these most appropriate emblems of power and leadership—the lions and the eagle—provides the most appropriate epitaph to the teacher and friend we honour here today.

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## Notes on books

**An Atlas of the Surgical Techniques of Oliver H Beahrs** by Oliver H Beahrs, Paul D Kiernan and John P Hubert Jr. 332 pages, illustrated. W B Saunders, Philadelphia. £55.00.

Many readers of this Journal will have visited the Mayo Clinic during the past thirty years and watched the masterly technical skills of Oliver Beahrs. This volume describes and illustrates his techniques and will be of fascination to all those who value the craft of surgery. Over and above a mere recording of the techniques involved the authors have tried to define and develop an operative philosophy in which surgical principles are elucidated and the principles which are basic to the understanding of every procedure are described.

The book endeavours to expand on Dr Beahrs' motto "Operative surgery is the art and science of defining and separating structures along anatomic planes of cleavage. . . ." Eighteen operations are described, five in the head and neck and the rest mainly abdominal. The frontispiece is a magic wand. Need this reviewer say more?

**Surgery of the Larynx** edited by Byron J Bailey and Hugh F Biller. 471 pages, illustrated. W B Saunders, Philadelphia. £74.00.

This book is written for laryngeal surgeons by laryngeal surgeons. It emphasises new information and techniques and is extensively illustrated and referenced.

The preface states that between the two covers will be found all that you ever wanted to know about laryngeal surgery and more.

**A Colour Atlas of Surgery for Hirschsprung's Disease** by H Homewood Nixon. 64 pages, illustrated. Wolfe Medical, London. £14.00.

This is Volume 21 of a series which is now well established. High quality colour photographs illustrate the various techniques used in the surgery of Hirschsprung's Disease. Although of particular interest to paediatric surgeons, all colo-rectal surgeons will find this book of value.

**Diagnostic Imaging Methods in Hepatology** edited by H Lutz and L Demling. 167 pages, illustrated. M.T.P. Press Ltd, Lancaster. £45.00.

Endoscopy, ultrasonography, radiology, nuclear medicine and nuclear magnetic resonance are covered in twenty-seven chapters in this comprehensive volume which describes the methods available for the assessment of hepato-biliary disease. The volume is well referenced and illustrated.

A review volume such as this is timely in a field that has undergone so much change in the past decade.

**Pulmonary Embolism and Deep Venous Thrombosis** by Samuel Z Goldhaber. 295 pages, illustrated. W B Saunders, Philadelphia. £55.0.

This well-written and extensively referenced monograph is in four parts. Part 1 covers pathology, epidemiology, haematology and radiologic diagnosis.

Part 2 is the core of the book and covers clinical considerations with special emphasis on management and prophylaxis. Part 3 covers the hypercoagulable state, massive pulmonary embolism, non-thrombotic pulmonary embolism and venous embolism in children. Part 4 is headed 'Future Prospects'.

Many surgeons will find this volume of great interest.

**Gastrointestinal Endoscopy for Surgeons** edited and illustrated by Russell K Pearl. 190 pages, illustrated. Paperback. Little, Brown, Boston. \$29.95.

This monograph covers all aspects of gastrointestinal endoscopy both flexible and rigid. The emphasis throughout is "how to do it" rather than the indications and a theoretical discussion. It is voluminously illustrated with line drawings by the editor. It will interest all surgical registrars—physicians too could read it with benefit!