

Fundamental Techniques of Plastic Surgery

AND THEIR SURGICAL APPLICATIONS

Ian A. McGregor

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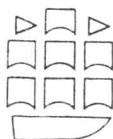
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Foreword

Like other surgical specialties, Plastic Surgery originated through the efforts of a small group of enthusiasts who, by utilising a particular refinement of technique, soon raised the standards of surgical craftsmanship within a narrow field to a high pitch of efficiency.

Then came the war, and the techniques primarily evolved for hiding facial blemishes and correcting visible deformities were applied with immense success to the treatment of wounds in general. Since then, as a natural sequel, plastic surgeons have widened still further their range of interests, notably in casualty work, in hand injuries and in burns. In doing so, they have implicitly ceased to regard themselves as a class apart, exclusive authorities in a chosen field, but rather as expert advisers and helpful collaborators in a wide range of surgery.

Mr McGregor is emphatically of this latter class, trained in the Glasgow School of Plastic Surgery, broadened in experience by the responsibility of a busy casualty department, and with a particular interest in the surgery of the hand. His book reflects these interests and this experience, being designed not for specialists but for all those who are concerned with the healing of wounds. Its approach is essentially practical, dealing as it does with the choice of incisions, with stitchcraft, avoidance of ugly scars, methods of skin grafting, and similar matters, and with their application to casualty surgery, orthopaedics and general surgery. It will assuredly receive a warm welcome.

Glasgow, 1960.

C. F. W. Illingworth

Preface to the Seventh Edition

The most striking change in this edition is the inclusion of a chapter on muscle and myocutaneous flaps. Muscle flaps did receive mention in the last edition but extension of the technique to include the overlying skin in the transfer, in the form of a myocutaneous flap, has greatly increased its scope and usage, to the extent that it now merits more detailed consideration. Inclusion of these techniques has also made it necessary to be more specific in nomenclature than in the past and refer to flaps which consist of skin and superficial fascia as skin flaps.

Attitudes to skin flaps themselves have also changed, with a much greater concern to exploit their axial vascular elements. This has resulted in a reduction in the popularity of random pattern flaps generally. These changes in emphasis have created problems of exposition. It was previously possible to discuss direct flaps and tube pedicles as the norm, taking the view that axial pattern flaps, which of course share many techniques established in random flap usage such as the tubing of bridge segments and use of the wrist carrier, were merely departures from the norm. But axial pattern flaps are now the norm and the tube pedicle has almost been relegated to 'dinosaur' status. It has been necessary as a result to recast the entire chapter.

The situation in muscle flaps is now relatively stable with those which combine the maximum therapeutic value with the minimum of disability from loss of use of the donor muscle firmly established.

New myocutaneous flaps on the other hand are still appearing in the journals. Selection has been needed to pick the likely winners, viewing the field as a realist rather than as an enthusiast.

These obvious changes apart, the entire book has been subjected to scrutiny with changes of detail and emphasis in several chapters. A considerable number of new illustrations have been required. The drawings are recognisably the work of Mr Robin Callander; the photographs were prepared by Mr Alan McIlroy and the staff of the photography unit at Canniesburn Hospital. The illustrations of the

soleus muscle transfer were provided by Mr Martyn H. C. Webster. My secretary, Mrs A. M. Allanach, converted a mixture of new manuscript and minor text changes into a state suitable for presentation to the publishers. To all of these I am most grateful.

Glasgow, 1980

Ian A. McGregor

Preface to the First Edition

Plastic surgical methods are being used increasingly often by surgeons who have received no formal training in plastic surgery and who are looking for guidance on the basic techniques. Advanced textbooks of plastic surgery are apt to pass over those elementary but nonetheless fundamental methods while the sections on plastic surgery in textbooks of surgery describe its scope and results without giving enough detail of actual technique to be of practical use. This book I hope may help to fill the gap.

The first part describes the basic techniques of plastic surgery in detail and the second considers their application to the situations which surgeons in other specialties are likely to encounter. A difficulty in the second part has been that of deciding what material to include and what to leave out. The deciding factor generally has been to include such topics and techniques as it was felt a surgeon in the particular field might reasonably wish to deal with himself without necessarily referring the patient to a plastic surgeon.

The book makes no attempt to describe all possible methods of repair and reconstruction. To include a multiplicity of methods in a book of this nature would merely confuse and I have preferred instead to describe those methods which I have found work best in practice.

In discussing the basic techniques I have tried to stress the difficulties of each and to describe the complications, how they can be avoided and how to cope with them when they do occur. I have endeavoured too, to bring out the principles of the various methods in the hope that an understanding of these principles may weld the technical details into a coherent, rational pattern and prevent them from being a mere jumble of empirical instructions.

A difficult decision has been whether or not to use the eponyms in which plastic surgery abounds. Eponyms are an essential part of everyday surgical shorthand and they recall men who have stood as signposts along the way of an advancing specialty. But often they lack precise meaning and they are liable to cause confusion, firstly

because they sometimes have different meanings in different countries, secondly because they are frequently used loosely so that in some instances a name has even come to be applied to a procedure different from that described by its owner. The Thiersch graft is an example of this latter category, being nowadays applied to a graft of quite different thickness from that originally described by Thiersch. For these reasons I have regretfully avoided eponyms altogether.

References have purposely not been introduced into the text. Instead I have listed a few papers and monographs at the end of each chapter under suitable subject headings to provide a starting point for anyone wishing to pursue a particular subject further.

I must acknowledge my debt to many who have helped me in preparing this book. To Professor C. F. W. Illingworth who encouraged me at the outset in its writing and Mr J. S. Tough who was responsible for my training in Plastic Surgery and gave me free access to the photographic records of the Unit I am deeply grateful. I am greatly in debt of Mr Douglas R. K. Reid for his constructive criticism of the text and for the pains he has taken to make it as lucid as possible without sacrificing brevity in the process. To Professor Roland Barnes and Dr J. C. J. Ives who read and criticised parts of the text I express my thanks.

The illustrations are all-important in a book largely concerned with surgical techniques. Mr Robin Callander made all the drawings and I find it difficult to convey fully the care and trouble he has taken to portray visually what I wished to express. Any usefulness which the book may have is due in no small way to his illustrations. The photographs are the work of Mr T. Meikle and Mr R. Macgregor of the Plastic Surgery Units at Ballochmyle Hospital and Glasgow Royal Infirmary; Mr R. McLean, Department of Medical Illustration, Western Infirmary; Mr P. Kelly, Photographic Department and Mr E. Towler, Department of Surgery, Glasgow Royal Infirmary. For the care and trouble which each has taken I am most grateful. I am also indebted to Messrs Chas. F. Thackray for permission to use illustrations of their instruments.

The typing and retyping of the manuscript was carried out with patience and good humour by Mrs A. M. Drummond.

I should like lastly to record my thanks to Mr Charles Macmillan and Mr James Parker of Messrs E. and S. Livingstone for the advice and help which they have given me throughout.

Glasgow, 1960.

Ian A. McGregor

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Basic techniques

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Wound care

Given accurate skin approximation and freedom from infection epidermal healing occurs extremely rapidly but the healing processes which go on in the dermis are much more prolonged and as far as the ultimate appearance of the resulting scar is concerned far more important. The transition from fibrin, formed between the two surfaces of the wound as the first stage of healing, to the quiescent relatively avascular scar takes place slowly over a period of months.

Early on, the scar tends to be red and the immediate surroundings are indurated, almost wooden, in consistency. Gradually the induration and redness diminish and disappear leaving a soft scar, paler than the surrounding skin. The degree of redness and induration is extremely variable as is the time taken for the reaction to subside; three months to almost a year are the extremes. The appearance of a scar can be expected to improve up to a year and at least the greater part of the reaction should be allowed to subside before secondary revision is considered.

This gradually diminishing induration constitutes normal progress to quiescence. Such a sequence is by no means invariable and instead the fibrous tissue of the dermis may become grossly hypertrophic giving rise clinically to a raised, red, *hypertrophic* scar or when the reaction is more florid to a *keloid* scar, but these conditions are sufficiently important to merit separate consideration.

During the healing phase the tensile strength of the wound gradually increases. The sutures take what little strain there is until they are removed and if a scar is going to stretch it does so gradually over the next few weeks. Support of the wound for as long as is feasible appears to have little effect. Naturally a scar is more likely to stretch badly when skin has been lost and there is obvious wound tension, but often stretching occurs when there is no apparent tension other than that deriving from the normal elasticity of the skin.

Nevertheless in many parts of the body the direction of the scar appears to influence the amount of stretching which takes place and

the directions which result in minimal stretching can be systematised into **lines of election for scars**.

In the face and neck the lines of election are at right angles to the direction of the resultant pull of the muscles of facial expression and with the loss of elasticity that goes with ageing they become set into a pattern of wrinkles (Fig. 1.1). In the vicinity of the flexures the lines of election are parallel to the skin creases which are clearly present in the region of the flexure.

In the skin surfaces between the flexures the evidence for a specific line of election is less clear cut and in any case the placing of an incision there is determined more often by considerations other than the eventual cosmetic result of the scar.

In general then an incision should be placed in a line of election where at all possible.

At the outset it must be said that there is great and uncontrollable individual variation in healing characteristics. Examples of factors beyond the surgeon's control are the age of the patient, the site and often the direction of the wound or incision. Scars in children generally remain harder and redder for longer than in the adult and the end result is poorer, this quite apart from the tendency of scars in childhood to develop hypertrophic change or even keloid. One of the compensations of age is the fact that the more wrinkled the skin the more rapidly a scar settles and the better is its final appearance.

Scars also behave very differently in different parts of the body. Outside the face and neck, scars are apt to stay conspicuous despite careful surgical technique and late stretching even of the most meticulously handled incision is frequent. In the face too, different sites and different skins vary greatly in behaviour. Coarse, oily skin tends to produce more than the usual reaction to suture materials and suture marks are the more common as a result. This problem arises most strikingly in the nose where the skin can be very thick with active sebaceous glands, most marked towards the tip. Hairless skin, on the contrary, such as the red margin of the lips and the palms and soles, usually gives less conspicuous scars.

Probably the best example of the influence of direction on scar behaviour is seen in the neck where the horizontal thyroidectomy scar does uniformly well while the vertical scar in the same area does uniformly badly. Equally the best example of the influence of site is the upper sternal area where scars almost invariably become keloid.

Despite these unavoidable factors which set a limit to what can be achieved by pure surgical technique it is nonetheless true that to produce the best result in a given set of circumstances a meticulous

technique is essential and it must be emphasised that failure in a single aspect is enough to give a poor result.

The factors concerned in wound care are:

1. Placing the scar
2. Preparing the wound
3. Stitchcraft
4. Postoperative care

An added factor which influences surgical method throughout is the all important need to prevent *haematoma* in wounds.

PLACING THE SCAR

When the onus of placing the scar lies with the surgeon the principles to be followed in selecting site and direction are:

Use of natural lines

The scar should be placed in the line of a wrinkle or at least parallel to it (Fig. 1.1) so that in course of time it will settle in to look like another wrinkle. Even if wrinkling is not actually present, the eventual site of the wrinkles which will develop in the future and, more important, their direction can often be found by getting the patient to simulate the appropriate facial expression, e.g. smiling, frowning, closing the eyelids tightly, etc. This brings the more obvious wrinkle lines into being.



Fig. 1.1 The lines of election for scars in the face and neck shown by the pattern of wrinkling and their relation to the direction of the underlying muscles.

The most generally useful wrinkles develop in relation to the eyes and the mouth—the naso-labial fold, the glabellar wrinkle pattern, the lateral canthal ‘crow’s foot’, the forehead wrinkles. As can be seen (Fig. 1.1) these sites overlie the main concentrations of facial muscle. Where there is less facial muscle, as over the masseter, the wrinkle pattern is less clear cut and in the ear and nasal tip where there is none it is completely lacking.

In the adult the presence of a submandibular ‘jowl’ associated with slackness of the adjoining skin often creates a superadded wrinkle pattern and this can also be made use of on occasion. Such wrinkling, arising from the effect of gravity on a background of skin slackness, occurs also to a varying degree elsewhere on the face. Indeed in many ageing faces the criss-cross of fine wrinkling is a mixture of gravity wrinkling and expression lines.

In the child with completely smooth skin it can be extremely difficult, especially away from the eyes and mouth, to select the best line for a scar.

In the ear the contour lines of the pinna are useful and they camouflage scars very effectively but for the nasal tip there are really no useful rules to help in selecting the best line.

Where there is a natural junction to distract the eye from a scar this may be used. Examples of these are the junction lines between nose and face especially around the base of the ala, the nostril rim, the margin between the red border of the lip and the skin, the junction line between the ear and the masseteric region, and in the lower eyelid just below the line of the eyelashes. All of these and others are used routinely to distract the eye and render the scar less conspicuous.

Placing the scar where it will not be visible

The obvious examples are inside the hair line or in the eyebrow, and these are the only sites where an incision which is not perpendicular to the skin surface is permissible. Instead the incision should be made parallel to the hair follicles to avoid the hairless scar which sectioning hair follicles would cause. The eyebrow incision is especially useful in approaching a dermoid cyst of the lateral canthal region and the invisible scar more than compensates for the added technical difficulty of such an indirect approach. One practical point to note is the possibility of subsequent baldness revealing a scar previously hidden in the scalp. Account should always be taken of the patient’s sex and any hereditary factors in assessing the desirability of using an incision inside the hair line and the precise details of siting.

Use of the Z-plasty

The Z-plasty plays an extremely important part as an adjunct to other methods designed to minimise scars. It is carried out during the excision of a scar by transposing the flaps resulting from two additional side cuts, each made at an angle which may vary but which tends to be in the vicinity of 60° . The effect of this is to alter the line of at least part of the scar and it can be designed so that the alteration brings the line into a wrinkle or line of election.

It is a precise procedure which must be fully understood if it is to be used properly; it is also used in contexts other than those relating to facial scars. In its several contexts it still retains a basic unity of theory and practice and because of this it is convenient to discuss it as a topic on its own in chapter 2.

At this stage it can nevertheless be stated that it should not be used in the primary treatment of wounds resulting from trauma unless the wound approximates in character to a surgical incision and the circumstances are otherwise ideal. Even then it is a procedure for the experienced surgeon. It is better reserved for use in any subsequent scar revision.

PREPARATION OF THE WOUND

When a wound is already present as a result for example of trauma it is important to consider how and to what extent it transgresses the principles of placing a scar and whether it can be modified to fit those principles. It often proves impossible or undesirable to make it conform as a primary manoeuvre because of potential infection, poor blood supply of wound margins, skin damage, etc. and the aim should be to prepare it for the time when, at a later date, it can be modified to conform.

Wounds can be regarded as **traumatised** when the wound edges have been appreciably damaged or **non-traumatised** when the wound edges contain minimal damaged tissue as in surgically created wounds.

It is the presence or absence of damaged tissue which determines whether or not a wound should be excised. Under all circumstances it is axiomatic that all dirt and other foreign material must be removed, by excision if necessary. In the face where the cosmetic result is of paramount importance the problem of excisional policy is more difficult than elsewhere and there are two approaches to the problem:

If damage is minimal the wound may be excised so converting it to

an atraumatic type in an attempt to get a final result primarily. This approach is satisfactory only under optimal conditions. If the result is not acceptable, however, the situation can always be retrieved by secondary scar excision provided too much skin has not been excised in the first instance.

In more extensive wounds (Fig. 1.2) the approach is more conservative and only dirt and obviously non-viable tissues are removed. In these circumstances one accepts the need for further surgery in the knowledge that a good scar cannot be expected from the healing of such a wound. This policy permits the salvage of tissue which might otherwise be excised, tissue which may be valuable later.



Fig. 1.2 The conservative treatment of severe soft tissue injuries of face involving eyelids, nose, and mouth where there is no skin loss, showing the results of accurate tissue replacement with careful matching.

A conservative policy is obligatory in the care of severe facial soft tissue trauma where it is seldom possible to achieve final reconstruction at the primary operation and where the over-riding object must be to replace structures in their normal position and suture them there. The secret in suturing an irregular wound is to look first for

landmarks on either side to match. With two points which definitely fit sutured together fresh parts of the jigsaw fall into place until enough key points have been matched to allow the intervening sutures to be placed readily. Time spent fitting a jigsaw of tissue accurately at the time of original suture is never wasted. The chance comes only once and if it is missed the results can be disastrous. Although it may be quite obvious that Z-plasties will be required later, these should seldom be used at the primary operation.

An added difficulty arises when there has been actual loss of tissue and the governing principle then is to replace surviving tissues in their correct anatomical position so that the defect can be properly displayed and assessed in terms of tissues lost.

While the experienced plastic surgeon may legitimately carry out a primary definitive repair in such circumstances the less experienced surgeon should be more modest and if the defect cannot be closed by direct suture he should apply a split-skin graft in most instances. A full-thickness defect opening into the mouth which cannot be closed without undue distortion calls for suture of skin to mucosa.

These temporary measures have at least the merit of allowing rapid healing with minimal scarring and leave conditions suitable for a definitive repair subsequently.

The common errors in treating wounds at this stage are:

1. Failure to remove all dirt from the wound leaving an area of tattooed scarring (Fig. 1.3) which is usually difficult and often impossible to eradicate later.
2. The production of a scar with gross suture marks (Fig. 1.4). Such a wound would often do better to heal by granulation for the resulting scar however ugly can always be excised. The presence of suture marks, however, makes excision infinitely more difficult.
3. Failure to suture the various wound edges in the precise position which they occupied relative to one another before the injury (Fig. 1.5). The resulting irregularities are especially obvious when the lip margin, eyelid, eyebrow or nostril have been imperfectly matched.

It is often important to know when a piece of traumatised tissue can safely be conserved or whether it must be excised. In deciding this the important factor is vascularity. Blanching on pressure and the presence of dermal bleeding are both evidence of an active circulation. When there is some doubt the anatomy of the region together with the size and content of the pedicle help in making a decision (Fig. 1.6). The problem arises most acutely in the face and scalp and there the vascular abundance is on the side of survival, and