SKIN-GRAFTING IN THE BUCCAL CAVITY.

By T. P. KILNER AND T. JACKSON, SIDCUP.

THE intention of this paper is to deal in full with one branch of technique which has been evolved at the Queen's Hospital, Sidcup, during the treatment of facial injuries in the last few years.

In March, 1917, Esser described in the *Annals of Surgery* a method of skin-grafting which he had employed in the treatment of distorted eye-sockets. This method was modified and its field of usefulness greatly extended by Waldron and Gillies, and its various modifications have been in almost daily use for some time now by surgeons operating upon those cases of facial injury which have formed such a pitiable harvest of the Great War.

Gillies' book, recently published, contains a brief description of the technique followed; but it is felt that a wider use of the method might be made than is at present the case by surgeons and dental surgeons who are unlikely to have that book in their possession.

The paper will be divided into two parts: (1) A brief outline of cases to which the method is applicable; and (2) A description of the technique.

I. CASES IN WHICH THE METHOD IS APPLICABLE.

A.—CASES IN WHICH THE EXTERNAL ALVEOLAR SULCUS IS ABSENT, OR DEFICIENT IN DEPTH.

War Injuries.—It is in this class of case that our experience has been greatest. Numerous cases of facial injury involving the mouth, and frequently associated with fracture of the maxilla or mandible, have been encountered, in which the most troublesome residual disability is entirely dependent upon distortion or complete obliteration of the sulcus between the lip or cheek and the alveolus.

Bulky masses or bands of scar tissue between the soft tissues and the bone render the fitting of an efficient functional denture impossible. Such a disability is seen at its worst when the jaws are edentulous, for every movement of the cheek or lip displaces the denture from its already insecure bed.

Parallel Cases met with in Civil Practice.—In ordinary civil practice quite a large number of cases analogous to these war cases is encountered from time to time. As our experience of these is extremely limited, we shall do little more than point them out.

The similarity is, however, so close that their treatment by the same procedure cannot but give similarly satisfactory results.

Excessive Absorption of the Alveolus.—Cases of this type are particularly common in dental practice. A recent visit, however, to the out-patient department of a general hospital revealed the fact that they are met with in surgical clinics also. Two cases presented themselves in as many days complaining of ulceration of the gums and constant trouble with dentures, in which the source of trouble was easily traceable to the deficiency of the external sulcus, due in turn to unusually marked alveolar absorption. No definite dental ridge remains in these cases; numerous attempts are made to fit a denture, but neither comfort nor utility can be obtained; every movement of the jaw, tending still further to reduce the depth of any sulcus remaining, displaces the denture, and the patient is reduced to a state of desperation. Such a condition is the bane alike of patient and dental surgeon.

Fræna.—Abnormally thick labial fræna are sufficiently common to find themselves illustrated in every book on dental surgery, as a cause, particularly, of central incisor displacements. Similar mucous-membrane-covered bands occur in other situations, and, though not as a rule interfering with dentition, and therefore not giving trouble in the first half of life, are very trying when the fitting of a denture is under consideration. The ordinary treatment of these bands—division or even excision—is frequently followed by recurrence or by the formation of a soft papillary mass of scar tissue which renders such treatment ineffective. Treatment by the method here advocated, though a little more troublesome, has all the advantages of being certain and radical in its results.

Scar Tissue.—Resulting from burns or scalds, or following ulceration produced by acids or caustics.

Scar-tissue Bands.—Following upon the rupture of an alveolar abscess in the region of the sulcus.

Deficiency of the Sulcus above and in front as the Result of Hare-lip.—Such a deficiency is almost always present in spite of every effort, at the time of original operation, to free the soft tissues well from the bone. It would be impracticable, in such young subjects and under the conditions of tension already present, to introduce anything capable of preventing the recurrence of these adhesions, and their treatment is therefore usually not considered until dentures are required. A great cosmetic improvement may be obtained by their treatment at an earlier date.

B.—CASES IN WHICH THE INTERNAL ALVEOLAR SULCUS IS DEFECTIVE.

War Injuries.—It is remarkable how few even of the severest types of facial wound involve the tongue, yet quite a number of cases has been encountered in which wounds of that organ itself or of the adjacent floor of the mouth have led to the obliteration of the sulcus on the inner aspect of the alveolus. In these cases even a carefully-fitted denture is constantly being pushed off the dental ridge by tongue movements during mastication or articulation.

Parallel Cases in Civil Practice.—Cases analogous to the above are few. Occasionally, however, an unusually short and thick lingual frænum gives trouble in the manner indicated, more especially when the lower jaw is edentulous. The rare cases of ordinary congenital tongue-tie are probably best treated by the simple operation of division at present practised.

We hesitate to recommend the use of grafts in potentially cancerous areas, but throw it out as a suggestion that, in cases which have been successfully treated for carcinoma linguæ, or in which a portion of the tongue has been removed for less dangerous disease or for injury, articulation might be considerably improved by freeing of the remaining portion to some extent and epithelialization of the raw surfaces by the technique here described.

C.—OTHER CONDITIONS IN WHICH THE METHOD IS APPLICABLE.

Trismus.—This condition, depending upon the presence of scar tissue in the mucosa lining the cheek, has been met with occasionally in military practice, and might conceivably be found in cases coming under one of the above headings.

In such cases, though the sulcus is not actually at fault, treatment follows the same lines, and consists essentially of the removal of all scar tissue and its replacement by sound healthy epithelium. We have treated two cases in this way, and have obtained a measure of success much greater than we had anticipated. In one of these, previous excision of the coronoid process, adhesions of which to the adjacent maxilla were thought to be responsible for the condition, had been carried out without giving any relief.

After Removal of the Maxilla.—The deformity which follows upon this operation can be rendered practically negligible if surgeon and dentist will combine forces. As a rule, at the end of the operation there is not a very great extent of raw surface remaining; but a mould, designed in the way advocated for grafting and carrying grafts when neces-

sary, inserted at the end of the operation—preferably by the dentist who is to have the after-care of the case—not only prevents the deformity of the face which commonly follows the delay in instituting prosthetic treatment, but is also very efficient in preventing post-operative hæmorrhage.

After Tonsillectomy.—It would appear that grafting of the raw surfaces shortens convalescence, diminishes post-operative hæmorrhage, and prevents cicatricial contraction. The pillars of the fauces are sewn together loosely over a skin-graft-covered mould of suitable size and shape.

2. DESCRIPTION OF TECHNIQUE.

The method consists essentially of: (a) Producing a sulcus wherever this is required by careful and free excision of offending tissue; (b) Epithelialization of this new sulcus by means of skin-grafts of the Thiersch variety applied to its surfaces upon a suitable mould. The operative treatment may be carried out under either local or general anaesthesia; but the latter, administered if practicable by the naso-intratracheal route, is preferred. If, however, the former is chosen, the inferior dental or infra-orbital branch

of the fifth is blocked, according as the sulcus under treatment is lower or upper; local infiltration of the actual area of operation is carried out; and the area from which the graft is to be removed is similarly treated. The latter procedure does not interfere at all with the vitality of the graft, and actually facilitates its removal.

Preliminary Dental Work.—This consists in the provision of suitable means for retaining the mould in position, and differs according to the type of case.

a. External or Internal Sulcus: Teeth present (Fig. 137).—A metal cap splint is made, carrying opposite the centre of the offending area an upright pillar, on to which is fitted a small tubular piece of metal provided with a screw, and having a flat per-

FIG. 137.—Dental splint for epithelial inlay to external alveolar sulcus.

forated malleable plate projecting from it at right angles, which is directed inwards or outwards in reference to the alveolus according as internal or external sulcus is under treatment. This plate is usually from $\frac{1}{2}$ to $\frac{3}{4}$ in. in width, and its edges are neatly rounded. When a gap in the teeth is present, as is usual in traumatic cases, a bar is placed between the caps fitted to those teeth bordering upon the gap, and a vertical metal plate is attached to this and made to fit snugly against the gum-margin along the gap. This effectively prevents the mould material from escaping laterally, and so helps much in obtaining a good, smooth, and easily-removed mould.

b. Edentulous Cases.—These cases are difficult to treat, and a considerable range of ingenious devices has been evolved in the dental department. Suture of the mould in position alone—a method tried in order to evade the necessity for fixation apparatus—is unsatisfactory, for even if successful as a

FIG. 138.—Chin-piece splint for lower sulcus in edentulous case.

means of retention, it produces an unsightly and troublesome ridge around the margins of the grafted area. In addition it renders the after-treatment difficult, there being no means of retention available once the sutures are out. The illustrations show the appliances now usually adopted for upper and lower alveolar regions. *Fig. 138* illustrates a chin-piece apparatus which has been found useful for some cases in which the lower sulcus was under treatment. *Figs. 139* and *140* represent an apparatus similar to Kingsley's splint, but provided with metal loops to carry the mould

FIG. 139.—Modified Kingsley's splint for inlay to upper sulcus in edentulous case.

FIG. 140.—Splint *in situ*.

material. *Fig. 141* shows a modified double Gunning splint which may be adapted for either the upper or lower sulcus.

FIG. 141.—Modified double Gunning splint, which may be used for either sulcus, prepared for lower sulcus in a case with edentulous mandible.

FIG. 142.—Type of apparatus used in trismus cases.

c. Trismus Cases.—The type of apparatus (*Fig. 142*) devised for these cases provides for adjustment to the maximum gape obtainable at the time of operation, and after excision of all scar tissue. It also carries a perforated metal plate, to the outer side of which is packed the mould material which is to bear the graft. The mould should be of sufficient size to produce bulging of the cheek. In this way an excess of epithelialized surface is obtained.

d. After Excision of the Maxilla.—In these cases the dental officer who is to have charge of the post-operative prosthetic treatment should be allowed access to the case for the purpose of obtaining an impression of those parts which are to be left behind on the unaffected side. He will then construct a partial upper plate carrying metal loops to support the mass of dental composition, which, at the end of the operation, is moulded into the large gap left by the maxillary excision.

FIG. 143.—Prosthesis built up to replace excised maxillæ. A, Anterior view ; B, Posterior view.

Fig. 143 shows a prosthesis built up, according to the suggestions put forward above, from a mould inserted at an operation undertaken for the removal of almost the whole of both maxillæ, which had been completely separated from their bony attachments as the result of a severe wound of the face. It is included because it indicates clearly how the same procedure may with advantage be adopted in civil cases.

Preparation of the New Sulcus.—In order to render the description of operation more concise, an outline of the procedure followed in dealing with a typical case of loss of lower sulcus will alone be considered. It will be easily seen how this is modified for other positions. Fig. 144 shows the state of affairs encountered.

FIG. 144.—Drawing to show total obliteration of lower sulcus. Dotted lines indicate excision of scar tissue.

The dotted lines indicate the incisions made for excision of the scar tissue. It is to be noted that the inner incision is made to follow accurately the surface of the bone. This is a point of great importance, for otherwise a spongy mass of tissue is left behind on that aspect of the alveolus which the operation aims at making free for the dentist's use. Such a mass is very troublesome and renders accurate impression-taking impossible. Again, it will be noticed that the new sulcus is produced by *excision*. Mere incision into the scar tissue will, when its sides are grafted, produce a sulcus, but such a sulcus invariably tends to become obliterated by the continued growth of scar tissue stimulated by operation. The tissue included within the dotted lines is completely removed, and any hæmorrhage is arrested by sponge pressure. Ligatures are seldom required.

Making of the Mould.—An impression of the new sulcus is now made in ordinary dental-impression composition, rendered soft by sterile water at the required temperature. The detachable portion of the retention apparatus is placed in position until the material

cools and hardens. It is essential that a smooth, well-rounded impression should be obtained, and the lip or cheek should be manipulated with this end in view while the composition is setting.

Cutting the Graft.—The graft is taken from a non-hairy portion of the skin—the anterior aspect of the forearm or the antero-internal aspect of the upper arm being usually employed. At one time the skin, sterilized by ether only and moistened with saline, was held on the stretch between two pieces of wood applied transversely to the limb, and the graft was cut by a sharp razor similarly moistened with saline. This method of fixing the skin is clumsy, requires an assistant well versed in the technique, and, owing to ‘bellying’ of the area between the pieces of wood, often results in a poor graft of uneven thickness.

Lately we have been using the apparatus shown in *Fig. 145*, and have found it simple and reliable. The small teeth on the cross-bars get a firm grip of the skin on either side of the area to be used; gentle pressure from above, pressing these bars apart, produces even stretching with a minimum of ‘bellying’; and the ratchet locks the apparatus at the desired degree of tension.

A mere touch on the upper part of the instrument with one hand steadies it, and the other hand is free for cutting. We feel that some similar instrument should be of considerable help to surgeons who wish to render their graft-cutting more certain and uniform.

FIG. 145.—Skin fixation apparatus used in cutting grafts.

FIG. 146.—Plaster model showing splint and mould in final position.

Applying the Graft to the Mould.—The mould, removed from the mouth, is dried, and the graft or grafts are applied to it so that the raw surface is outermost. If several grafts are required they are arranged so that their adjacent margins just overlap one another. The thinner the graft, the easier it is to manipulate at this stage, and the better, in our opinion, is the final result. Any redundant graft is removed by sharp scissors, for loose tags in the mouth become septic and are liable to be pulled upon by tongue movements and so displace the remainder. The graft-covered mould is now returned to its bed, and the fixation apparatus is finally adjusted. *Fig. 146* shows a plaster model illustrating splint and mould in their final position.

After-treatment.—The arm is dressed with ambrine, and rapidly epithelializes again—never giving any trouble after the first dressing. The mould is not disturbed for ten days. At the end of this period, during which antiseptic mouth-washes are used at frequent intervals, more particularly after meals, the retention plate is removed and the mould taken out with care. The newly-epithelialized sulcus is gently irrigated with a mild antiseptic lotion, and a new mould of guttapercha is fixed in position.

At this stage it often appears that the graft has not 'taken', for the surface may appear still raw and tend to bleed slightly, even in cases which prove to be perfectly satisfactory later on. After two days more the same procedure is repeated, with the exception that the mould is not renewed. After this the sulcus is irrigated daily, usually by the patient himself. The mould is kept in position until the dentist is ready to replace it by his denture. It is surprising how rapidly the newly-formed sulcus will become obliterated in the early stages of its existence unless some mould is retained. Later on this tendency disappears entirely, and patients are returning to us now for further treatment who were operated on twelve to eighteen months ago, and who exhibit perfectly epithelialized sulci with no tendency whatever to diminution of their depth.

In conclusion, it may be remarked that success is only to be obtained by close co-operation between surgeon and dentist—a co-operation which has been found absolutely indispensable at Sidcup.

SUMMARY.

Numerous cases of war wounds have been encountered in which the alveolar sulcus has been obliterated.

Efficient functional dentures cannot be provided.

Many analogous cases appear from time to time in civil practice.

All can be effectively treated by the method of skin-grafting here advocated, the field of usefulness of which remains still incompletely explored.