CHAPTER 48

PLASTIC AND FACIO-MAXILLARY SURGERY

At the beginning of the war preliminary plans were made by Major-General R. M. Downes, the Director-General of Medical Services, Australian Military Forces, for the establishment of facilities for facio-maxillary and other branches of reconstructive surgery. Sir Thomas Dunhill, who was the Consultant Surgeon of the A.I.F. in London, and was active in supplying recent information to the Australian medical headquarters, gave great assistance in these developments by advice and by helping Australian surgeons to obtain the requisite training in England. The details of the development and organisation of plastic surgery in the Australian Army Medical Corps are told in another volume. It is sufficient here to touch on such aspects as outline the history of this special work in service hospitals and indicate its influence on war surgery.

The special hospital at Sidcup established in England during the 1914-1918 war, made it possible for Australian surgeons to attend their own casualties. In 1939, no special hospital existed in England, but arrangements for this highly important work were included in the Emergency Medical Service. Helped by the skilled advice of Sir Harold Gillies as Consultant-Adviser, special units were formed. The title "facio-maxillary" or "maxillo-facial" was soon outworn, as this covered only some 30 per cent of modern plastic repair work in war. At these special units several Australian surgeons, D. Officer Brown, B. K. Rank, and K. W. Starr were trained, and A. J. Arnott as dental surgeon. The work done by these and other Australian surgeons working in plastic units in the Australian Army Medical Corps as they became established thus reflected the principles and methods of British surgeons.

A special facio-maxillary and plastic unit was formed and incorporated in the surgical division of the 2/2nd Australian General Hospital centrally located at Kantara. This serviced the A.I.F. in the Middle East until the end of 1941, and by periodic attachment of medical officers and nurses, some familiarity with plastic procedures was diffused. When the 9th Division remained in the Middle East after the return of the 6th and 7th Divisions to Australia Major D. Officer Brown had charge of plastic surgery in respect of Australian troops and worked with the No. 1 British Plastic Surgery Unit for ten months. This unit, strategically placed at Alexandria, dealt with the considerable work arising out of the Alamein campaign. Later in Australia more units were formed, and ample provision made for the needs of the various Australian States during and after the war. Personal contact of general and dental surgeons with these units, and demonstrations of work and methods spread interest and understanding in the particular problems of plastic surgery through all the services. This ensured that a long range view was taken of the treatment of the many varieties of wounds which require application of the principles of repara-
PLASTIC AND FACIO-MAXILLARY SURGERY

Live surgery. At the end of the war almost the only men still requiring attention for facial mutilations were among the repatriated prisoners of war. This prompt meeting of demands was due to efficient increase of the organisation of plastic surgery in Australia, and also to the development and close study of the application of modern antiseptics and antibiotics to reparative surgery. This work has reflected on the outlook of other branches of surgery in numbers of ways. Its teaching function has been active and important, and hardly less has been the example of its necessarily meticulous and detailed records, by which the progress of the art and science of plastic surgery can be measured.

FACIO-MAXILLARY SURGERY

The initial technical instruction issued to medical officers in the Middle East laid down that coapting sutures should be inserted if necessary, to prevent retraction of soft parts, but that they should be very few. Fractures of the jaw were fixed by dentures or interdental wiring, with the help of a dental officer if available. Care was taken to leave enough room for the ejection of vomitus. This precaution was especially necessary when men with these injuries were sent from Tobruk to Alexandria on naval ships. Conservation in the trimming or excision of damaged tissue was emphasised.

Further detailed instructions were issued later, designed to give guidance along the most helpful lines of early treatment. In advanced operating units the anaesthetist, surgeon and dental surgeon could cooperate. In the later years of the war dental surgeons under the modified organisation of the newly-formed Dental Corps were not specially attached to field ambulances, but were available in other field units. The special points advised for the avoidance of delay in providing the necessary immobilisation, excision or débridement of the wound and drainage were stated in the Middle East Technical Instruction No. 24 (appendix).

All medical officers did not find the barrel bandage a success, and some preferred to use a rubber sheet under the jaw, moored to a head-cap. Major D. Leslie found that a broad rubber or linen bandage was very effective when attached on each side to the framework removed from a steel helmet. This framework made a good close fitting cap, and variation of the point of attachment controlled the amount of pull on the mandible. At base hospitals these injuries were often treated successfully with pins inserted in the bones and controlled by adjustable metal connections. Dental surgeons played a leading part in the various mechanical manoeuvres by which a patient with fractured mandible or maxilla could gain comfort and keep his injury immobilised while still able to take food and maintain nutrition.

The care of eye sockets after excision for wounds and other reasons concerned not only ophthalmologists and plastic surgeons, but also all medical officers in surgical wards. Where the retention of a temporary prosthesis required special mechanism the problem was one for a plastic unit.
The technical procedures necessary for extensive reconstructive surgery of the face and jaws cannot be described here as they are highly specialised and not only involve the various methods of transfer of tissues from often distant parts, but also accurate study of anatomical detail.

There are however some basic considerations relating particularly to facial injuries. One of these is the dual need for restoration of a facial mask with its underlying bony structure that will be functional, and at the time aesthetically acceptable. On the fulfilling of these requirements depends to a great extent the ability of a man or woman to face the world and follow a normal life. Without this power there is a certainty that temperament will be altered. Cases occur such as that described by B. K. Rank and H. R. Cash in which a soldier who had suffered a destructive gunshot wound of the face and as a consequence had a severe psychiatric disturbance. His paranoid outlook was so abnormal that he was judged to be psychotic, but once reconstruction of the face and jaw were begun his condition improved, and with attainment of a normal appearance his mental state likewise became normal. In attempting such restorations the plastic surgeon and the dental surgeon approached the problem jointly, and the plans thus made together were followed or modified with complete mutual understanding of the difficulties ahead. In face and jaw injuries immobilisation was an important end, either in control of fractures or of inlay grafts or in maintenance in position of special splints. Unnecessary manipulation must be avoided, and the responsibility for this attainment and control of movable parts was often that of the dental surgeon. Fixation had to be unequivocal in this work, and by the use of metal splints with attachments for firm locking of the jaws this could be attained. His help was also invaluable in ensuring simplicity of design in prosthetic appliances, particularly if removable. Though a certain degree of standardisation was desirable this was never sacrificed to the individual requirements of a particular case, and no trouble was spared in order to serve efficiency. Saving of time, though not a necessary end of plastic work, was desirable also if it could be achieved without loss. In jaw injuries the plastic surgeon had sometimes to disregard the claims of individual teeth or even the line of teeth in relation to the line of fracture, having in mind the hazard of the general surgical condition present. The degree of separation of fragments also had to be decided by the surgeon, who if necessary could supply epithelial inlays and transplant soft tissue from the neck so as to provide for a future bone graft. The dental surgeon modified the technique of taking impressions to suit the conditions, generally using small amounts of plaster and thus avoiding discomfort to the patient.

Most fixation procedures could be done without an anaesthetic, or with local injection or block, but “Pentothal” could be used if the necessary precaution of intratracheal intubation was taken.

For fixation of fragments of a fractured edentulous mandible, extraoral methods were sometimes used when intra-oral methods were unsatisfactory. This was apt to occur with displacements of the posterior fragment against the tuberosity of the maxilla. This method gave very good results
in chosen cases. Pins divergently drilled into the fragments through stab incisions were connected to T-pieces with universal joints and thus to traction bars which could be tightened to produce the desired tension. In order to avoid the necessity for such methods the desirability of leaving at least one sound tooth in mandibular fragments was advised. Similar devices were employed for maxillary fractures, supported by a head cap of plaster. One of the minor instances of useful devices provided by dental surgeons might be more widely used in civil practice, that is, prostheses for facial paralysis to maintain the lip muscles in normal position.

Surgeons responsible for dealing with injuries received by pilots of aircraft were specially concerned with facial trauma as this was unfortunately often the result of air accidents. Though improved protection was given to pilots in this regard by altered design of the cockpits of aircraft, injuries involving facial bones were not uncommon and called for prompt corrective treatment. The principles adopted in Australian service hospitals were those laid down by British plastic surgeons, under whom the Australian surgeons were chiefly trained. B. K. Rank in a lecture to air force medical officers in September 1942 emphasised the importance of the early adoption of special measures based on the teaching of A. H. McIndoe, Consulting Plastic Surgeon to the Royal Air Force.

One of the most important points was to remove any lingering idea that plastic surgery of the face was a remote repair which could be deferred till later. The facial skeleton, though strong and well reinforced in its upper parts, has components in its middle section which are more fragile and which may readily be impacted into the deeper bony structures. The excellent blood supply of the face, though a powerful and trustworthy ally in repair of the soft parts, here could introduce a disconcerting factor, as organisation of effused blood and compressed soft tissues could so fix skeletal elements as to make subsequent reduction difficult or impossible. Functional derangements such as nasal blocking, orbital distortion with ocular disturbances like diplopia, and dental malocclusion are likewise serious matters, causing both physical and mental trials and demand early recognition. This is not as simple as might appear, as swelling and haematoma formation complicate early diagnosis unless careful palpation and other examination are carried out. McIndoe's classification of fractures of facial bones was found valuable, and shed light on treatment. This recognises (a) fractures due to frontal violence, which may be subdivided into three degrees according to the severity of the lesion, (b) fractures due to lateral violence to the malar and maxillary regions, and (c) combinations of both. Frontal fractures may involve the nasal bony structures, or in addition the maxilla, extending into the orbit, or, with deeper trauma, added fracture of the base of the skull or its anterior fossa. Careful clinical examination could reveal both the simpler and severer grades of frontal and lateral fractures even without the undoubted aid of X-rays. The ideal time for first treatment was fixed at two weeks, after this if contraindications had existed for earlier treatment, such as head injuries, treatment could be undertaken up to three months. After three months mal-unions
could not be reduced, and plastic substitution or camouflage alone were available.

Anaesthesia was often a difficulty, especially during the early stages of swelling, but oedema was not a contraindication either to bony reduction or to the administration of a general anaesthetic. For short procedures, like reducing malar fractures, “Pentothal” was appropriate, provided care was taken to maintain a clear airway. For other injuries it was necessary to pack off the pharynx and give an endotracheal anaesthetic, either by machine if available, or if not, by the simple Flagg’s can.

The details of bony splinting and control where these were necessary need not be recounted here. The usual principle of supplying support to structures needing it and applying it from the correct aspect were followed. In the majority of these injuries early cooperation of a dental officer was essential. Even repair of soft parts could not be properly carried out until the question of special appliances and the taking of impressions had been discussed. As in fractures of the mandible full advantage had to be taken of parts or structures which afforded support and anchorage, whether by wiring or splinting teeth, by using external pinning, or by providing a fixed point such as a plaster cap on the head.

These injuries provided facio-maxillary surgeons with opportunities of altering not only an injured man’s face but his life to an appreciable extent, and the early cooperation of all medical officers in securing treatment at the right stage was sought and freely given.

Other plastic procedures which were of great importance but belonged to the category of delayed surgery were those carried out on soft tissues scarred or destroyed by extensive injuries and those involving peripheral nerves.

SOFT TISSUE REPAIRS

The earlier stages of treatment of soft tissue wounds have been described elsewhere, together with the improvements made, especially after the introduction of penicillin. The importance of a reparative outlook by all surgeons carrying out war surgery was more and more recognised as time went on. Plastic surgeons in particular emphasised that their specialty was only a delimited specialty where it concerned the more difficult problems requiring equipment and experience of particular kind. The ideal was a diffusion of the principles of plastic surgery; this was well attained among surgeons in the services partly through their opportunities for working over widely scattered fields, but chiefly through their own interest and resource.

B. K. Rank in an article on this subject traversed applications of the simpler principles, such as atraumatic technique, the repair of skin loss without tension, and the grafting of wounds with skin. Primary grafting can be undertaken under conditions in which primary suture is indicated. The indications are the existence of a wound actually or potentially surgically clean, trauma such as that due to deep electrical or chemical burns suited to primary excision, and the various procedures designed to repair loss of skin. Secondary grafting finds an important indication in wounds
which otherwise would heal by slow granulation and epithelialisation, with its inevitable sequel of scarring. Preparation for this procedure include the attainment of good physical form, and the provision of a clean healthy flat surface, with no residual focus of chronic infection. The selection of the method of skin grafting to be employed is important. The dependence of "taking" of grafts on the nutriment, tension and pressure in their new environment is concerned largely too with the thickness of the graft, and as with all plastic procedures attention to detail is essential. The various techniques are dealt with later.

**Tissue Loss**

The replacement of lost tissue has been in the past endangered by lack of capillary haemostasis and the incidence of infection. Plastic surgical procedures have helped to overcome difficulties of haemostasis by the clinical application of fibrin. The first applications of this method were to skin grafting, and the use of group plasma as a source of fibrinogen which can be precipitated by thrombin or thrombokinase has been found valuable. In other surgical fields fibrin mesh has been used widely, and the certainty of "take" in reconstructive operations has thereby been increased. Reinforced by chemotherapy this method has helped to remove some of the delays and disappointments of plastic procedures. The details of reparative manoeuvres cannot be dealt with here, but their scope as applied to the work of plastic surgical units during the war years may be noted.

Grafts of deep structures need protection which can be afforded by covering them by healthy skin and subcutaneous tissue. The greater possibilities opened up in such work has renewed interest in the local and remote methods of combined skin and fat replacement. If anatomical considerations permit, this may be done by local rotation or transposition flaps; if not, remote flaps may often be brought directly to the site required by apposition of a mobile donor site on a limb. If neither of these manoeuvres is practicable a tube pedicle graft may be brought from a remote site; this requires care and patience on the part of the surgeon and considerable fortitude on the part of the patient. D. Officer Brown emphasised the importance of an appreciation of the value of the cross leg flap in repair of deep leg injuries, and described a new technique in plaster fixation and general procedure, which greatly increased the scope and value of this method of repair. The use of open abdominal flaps in the repair of forearm and hand injuries has also been discussed in detail. The cross leg principle was later applied extensively not only in battle wounds and injuries, but in the definite repair of the serious conditions arising from tropical ulcers in the legs of men who had been prisoners of war in Japanese hands.

Defects of contour may now be filled by cartilage or bone grafts. Cadaveric cartilage grafts cut into small quarter-inch or half-inch blocks may be preserved in "Merthiolate", or autogenous grafts may be used. Both have given excellent results in the restitution and modelling of small defects. Larger defects may be filled by cancellous bone grafts from the
ilium, though the risk of infection always needs careful assessment. If sepsis has been only recently controlled a safer method is the use of cancellous chips to repair bone defects, of course combined with chemotherapy. The resultant restoration will not have the same rigidity as that provided by compact grafting, and the relative risks and advantages must be carefully weighed. Resistance to infection may be locally enhanced by drilling a compact graft so as to increase its content of cellular and vascular tissue, which will actively help in assimilation of the graft and repelling infection. Even in battle wounds with extensive destruction of tissue the success attending reconstruction has been most encouraging with the use of modern chemotherapeutic measures. Plastic operations on tendons may now be more widely practised, but the difficulties are still great, particularly in extensive wounds of the hand. Special atraumatic methods are imperative, and results have been encouraging. One important advance has been the greater success attending early operations on combined lesions of nerve, tendon and skin. Once the original wound has healed chemotherapy may permit the surgeon to effect a useful repair without having to face the later difficulties of contracture, fibrosis and scar formation.

It is convenient here to consider some of the aspects of chronic wounds of soft tissues. In early phases of the war, a large number of wounds, even those of a more trivial nature, took a time to heal out of all proportion to their size. Delayed, arrested or failed wound healing caused an undue amount of hospitalisation and were often responsible, by virtue of the fibrosis accompanying them, for poor functional results, again out of all proportion to the nature or severity of the wound. Such wounds presented a characteristic indolent appearance, their abrupt edges devoid of epithelial activity, and their surface granulations becoming more and more atrophic as they were replaced by more and more fibrosis. Their surface infections usually included infection by haemolytic streptococci. The prevalence of wounds in this state was, at that time, due to three factors:

(a) There was a rigid and widespread application of the closed plaster technique of wound treatment. This treatment was often continued far beyond the useful period of its early indication and advantages. Even large wounds were often allowed to continue to heal by failing secondary intention with all its stigma of scar formation and contracture.

(b) The secondary infection of war wounds by the haemolytic streptococcus and the adverse significance of this was not duly appreciated. In the mass handling and management of such infected wounds, wound cross-infection and re-infection were rife. Methods of preventing and treating such infections were not so freely or widely applied.

(c) The place of active methods of wound healing as the natural corollary to the modern primary treatment of wounds by excision, was not generally appreciated.
Results of treatment of extensive tissue loss.

(a) External loss of skin and calf muscles after excision for gas gangrene infection of a gunshot wound.
(b) Early healing effected by palliative pinch grafts applied 3 weeks later.
(c) Final healing after replacement of the scarred area by a soft tissue flap migrated from abdomen.
(d) and (e) Indicate a functional result. There is no scar embarrassment super-added to the initial muscle loss.
To illustrate the method of radical cure applied to many chronic wounds of bone.

(A) and (D) A typical chronic wound of bone.
(B) After opening and preparation of the cavity.
(C) and (E) The final healed result of the soft tissue flap and cancellous bone chip grafts.
The plastic surgery unit at the 2/2nd Australian General Hospital emphatically demonstrated the place of secondary wound closure by skin grafting or other methods for all wounds with skin loss; the earlier this was effected, the better the ensuing result. By a rigid application of aseptic methods of handling wounds, and the use of modern antiseptics and bacteriological control of treatment, surface wound infection could be eradicated or controlled to permit of successful early healing by active secondary procedures. In this regard the use of the sulphonamide drugs was fully applied. Full details of the regime used in this plastic unit in the Middle East will be found in the literature.

In the treatment of established “chronic wounds”, after appropriate control of sepsis, re-excision was performed, including removal of underlying fibrotic tissue. The wounds were then closed by suture or graft, with or without a local plastic flap as indicated. The disappearance of the “chronic wounds” as a problem occurred long before penicillin was introduced, but with the use of penicillin and primary or early secondary wound closure, lesions common in 1941 would be regarded as a stigma to the war surgery of 1945.

**SKIN GRAFTING**

Skin grafting has rightly come to occupy a more dominant position in traumatic surgery. A wound covered with skin is enabled to follow the natural processes of consolidating its repair; the procedures necessary to effect this are not considered as final, and more elaborate techniques may be confidently undertaken later to restore function. This is particularly true of burns and some war wounds. Sepsis is no longer so serious a menace, and preliminary Thiersch or pinch grafting may now be undertaken much earlier with good prospect of success. Exposure to sunlight was found useful in controlling infection on surfaces about to be grafted. In planning a skin graft the choice of method was subordinated as far as possible to the needs of the wounded part. Basil W. B. Riley (Consulting Plastic Surgeon to the R.A.A.F.) described the ideal graft as being thin enough to transplant, and thick enough to give adequate protection with minimum contraction, being of such colour and texture as to match its new environment, and leaving the donor site in such a condition that it will spontaneously regenerate. Not all grafts can do this. In a discussion in London in 1944 it was pointed out that pinch grafts though useful had the drawback of leaving scarred areas on the donor site. They also have a limited cosmetic value, but have been found most useful for early application in injuries like extensive burns in weakened patients with little available donor skin. The Thiersch graft is better from the cosmetic aspect, but the technical difficulties of cutting an even graft are considerable, and useful expanses of skin are sometimes inaccessible to the razor. As Riley points out these drawbacks have been overcome by the dermatome. Its perfection in 1938 has permitted grafts to be cut possessing some of the good qualities of both thick and thin grafts. It is very useful in cutting deep epithelial grafts or split skin grafts. By a special adhesive rubber solution the selected area of the skin is stuck to the drum of the dermatome, and a knife moved
with a sawing motion cuts a continuous graft at a predetermined depth. A very careful technique must be followed to secure exact apposition and suture of the graft to the previously prepared site. Both in civilian and service practice this method has given excellent results. In injuries received in aircraft accidents and from burns the cutting of grafts appropriate in thickness to varied sites such as the trunk, limbs, fingers and face has improved both cosmetic and functional results. An important adjunct to skin grafting is the use of moulds, usually made of acrylic synthetics, by which desired coaptation and pressure can be maintained without irritation.

Whole skin grafts have been found of particular value for their freedom from secondary contracture, a most essential characteristic for use on the face. Of course they require careful dissection. The use of fibrin has allowed more accurate fixation and coaptation of whole skin grafts. It is also valuable in treating the donor site, which often gives rise to discomfort that cannot be disregarded. Bitter complaints are often made by patients of pain in the denuded areas, even though the subject may be sustained by the offered reward of a functional and cosmetic repair his ordeal is none the less. The donor sites left after taking split skin grafts may be treated with fibrin and an analgesic ointment such as 2 per cent deicaine or benzocaine, to the considerable relief of discomfort. Whole grafts also present problems on the donor site; it is not always possible to cover the bare area completely, or to avoid tension on sutures.

Even more elaborate than the whole skin free graft is the attached flap and the tube pedicle graft, which can be long and trying procedures for all concerned. Where large tissue defects have seriously impaired the function of parts migratory flaps have given excellent results. These and other of the more complicated manoeuvres of plastic surgery are best exemplified by illustrations.

In skin grafting we have an old method, now widened in application by improved techniques, more reliable control of sepsis, and the more liberal insight of modern surgery.

**SCAR DISABILITIES**

Wounds healed with unsatisfactory scars have not been accepted as end results if by treatment that scar can be relieved, improved or transferred to a less vulnerable situation. Apart from the disfigurement itself, scars can be unsatisfactory by reason of instability, their situation on vulnerable areas, or their adherence to muscle with embarrassment of function: they may involve nerves and be painful or tender; they may even become malignant. To these considerations the size and situation of the scar bear a special relationship.

The work of the plastic surgery units has contributed to the diminution of scar disabilities in three ways—

1. By teaching and emphasis that scar is a monument to secondary intention healing to be avoided whenever possible, and that it can be avoided by earliest possible application of the available methods of wound closure, whether as primary or secondary procedures. In latter years, scar disabilities arising from treatment in the early phases of this war have
largely disappeared, and such scar disabilities as arise now require, in
general, less radical or tedious and time-consuming procedures. The value
of free skin grafts on large surface wounds is clearly demonstrated where
grafts are applied on wounds which have already partly healed by second-
ary intention, or where grafts have been inadequate or incomplete, so that
there arise areas for secondary intention healing. The unstable nature of
scar, a makeshift integument, as opposed to skin, is always obvious in the
behaviour of these wounds. They often break down, not in the grafted
areas, but in these areas of secondary intention healing. The sooner a
graft is applied to the large surface defect the more satisfactory the result,
and the nearer the result approaches the excellence attained by well applied
primary grafts.

2. Relief of scar disabilities—In the treatment of unsatisfactory scars in
their various manifestation, reliance has not been placed on any fixed or
routine method; but all principles have been applied according to the
indications of the case. Many are amenable to simple excision and free
graft replacement; but a local flap is required where deep scar or structures
are involved, and in vulnerable situations. This may be obtained from a
local area with or without a free graft on the secondary defect. A direct
flap may be indicated, or a migrated flap from other regions. In these
cases, tube pedicle flaps have been most extensively used, and applied
to all body regions. By these means, a large amount of elective plastic
repair has been carried out accepting only the highest standard of end
result. Repercussions of this in future invalidity and pensionable disability
must be realised.

3. Adequate relief of scar defects have had an important bearing on
the application of elective surgical operations for defects of tendon, bone,
joints and nerves. By flap replacement of surface defects, many previous
difficulties of contraindications to the reparative surgery of these divers
structures have been removed.

Large numbers of men with scar disabilities following lesions prior to
enlistment were referred to plastic units because of their aggravation or
unsatisfactory behaviour under war conditions. Many of these proved ver-
very uneconomic to the service, in view of which the paragraphs inserted in
recruiting instructions in this regard should be noted. Men with extensive
scarred areas, especially on the vulnerable areas of the legs, axilla, hands
and neck should not be enlisted for service.

APPENDIX

Technical Instruction No. 24, Middle East.

Treatment of face and jaw wounds in advanced operating units.

These notes are intended to act as a guide to the early treatment of facial wounds
on lines most helpful to subsequent management in a special unit. This must gener-
ally be done by an advanced operating unit, anaesthetist, surgeon, and dental surgeon
(if available) cooperating.

Immobilisation, wound débridement and adequate provision of drainage are the
aims of primary treatment. Unnecessary delay increases misery and deterioration of
general condition—it aggravates sepsis. The following points are advised:—
Soft Tissue Injury.—(1) Wound débridement should be thorough but conservative, i.e. only foreign substances and devitalised tissue should be removed. Any small tissue flap may prove valuable to subsequent repair (be extremely careful of antiseptic about the eyes, saline is a good routine lavage agent).

(2) These wounds are all potentially septic. Misguided attempts at primary repair under tension usually fail. This only causes more tissue loss, and displacements which must later be corrected with loss of time. Any established defect with tissue loss should be left.

Retraction is prevented by anchoring loose and displaced tissue flaps with a few catgut sutures in their normal positions. To the same end, suturing skin to mucous membrane about the periphery of defects about the mouth and nasal cavities is a good practice.

(3) Provision for drainage must be made under any pocket or skin flap. Haematoma accumulation must be similarly prevented.

(4) Wounds should not be tightly packed but lightly covered with a few layers of vaseline gauze (plenty of vaseline).

(5) Dirt ingrained in wounds and abrasions as from blast injuries can be adequately removed at this stage by simple measures—using gauze swabs and a stiff brush. If left it can only be removed later by radical treatment or must remain as unnecessary permanent disfigurement.

Bone Injuries.—(6) Conservation of bone fragments. Bone fragments should not be removed from the site of fracture. Their preservation frequently obviates problems of non-union, shortening and bone grafting. Declared sequestra can easily be removed later.

(7) Conservation of teeth. Apart from removing broken particles of teeth as foreign bodies, the dental surgeon should be very conservative. Teeth, whose later removal is indicated, may be of extreme temporary value for jaw fixation or preventing displacement of fragments.

(8) Immobilisation of bone fragments as absolute and in as good position as possible is the prime consideration of early treatment.

Mandible.—Except for a few simple fractures without displacement any form of external bandage does not provide adequate temporary immobilisation for comfort. Any bandage used must have an upward and forward pull, e.g. the "Barrel" bandage. The four tailed bandage is to be condemned. If sufficient teeth are present interdental wiring between three pairs of teeth, using the "eyelet" method is the routine advised, this gives immobilisation in good position against the opposing teeth. With unsuitable disposition of teeth, "arch bars" wired one each to upper and lower teeth and fixed one to the other by wire or rubber bands may be more suited to some cases.

Edentulous patients may present difficulties. Use should be made of any unbroken dentures—otherwise a carefully made mould of dental "compo", or gutta percha (or a vulcanite Gunning type splint), if facilities and time are available. All must be supplemented by external bandage of barrel type, with suitable head gear—rubber dam bandage attached to a head cap is satisfactory. No elaborate forms of treatment should be carried out, which in any way hinders early evacuation to the special unit.

Maxilla.—The same principle applies. Gross sagging displacement of the maxillae is controlled by an inverted tray splint with external arms fixed to a head cap by traction as indicated.

Fractures of Nasal and Upper Facial Bones (often impacted).—Disimpaction with early manipulation into correct positions is indicated. If left this becomes more and more difficult. Retention apparatus is not usually required.

Exit of nasal discharge, blood or C.S.F. should not be impeded by plugging. No form of intranasal splinting should be used, other than a rubber tube with a free lumen.
Post-Anaesthetic Care must be constantly maintained. A tongue stitch should be inserted before the teeth are fixed. Posture with face down and head low. If inadequate exit exists for any vomitus, the wires can be inserted but final fixation delayed until patient is well round.

Nursing Care.—(1) Feeding. Early immobilisation is the best aid to feeding. A cup and tube used with encouragement is nearly always quite satisfactory. Nasal feeding is rarely indicated. Prior to immobilisation these people have had little if anything to drink, etc. As much fluid and liquid food as often as possible is indicated.

(2) Mouth washes and toilet as often as possible. Use Sod. bicarb., antiseptic and astringent mouth washes. Supply requisites to self-help.

(3) Salivation is usually profuse, dressings may need frequent changing. A waterproof "bib bag" increases comfort and saves work. It is of great value during evacuation of these cases.

Evacuation.—No advance treatment should unnecessarily delay evacuation to a special hospital.

Cases should be specifically directed to the maxillo-facial and plastic unit where ancillary aids to treatment are available. Send with patients any dentures (whole or partial) and any previous X-rays.

First Aid Treatment—Face and Jaw Wounds.

Correct first aid treatment of war injuries of the face and jaw is often life saving. Death from suffocation or haemorrhage may often be prevented if stretcher bearers and first aid personnel are correctly instructed.

How to Ensure and Maintain an Airway

1. Clear the mouth and throat of blood clot, broken dentures, etc.
2. Posture on stretcher with head over the end, and face down.
3. Control the tongue by posture and tongue stitch with suitable attachment.
4. No bandage should be applied which causes backward traction and increases the difficulties of respiration. Personnel should be familiar with the "Barrel" type bandage. (See below.)

How to Control Haemorrhage

1. When sub-asphyxiation is corrected by control of the tongue and airway, gross degrees of bleeding often cease spontaneously.
2. Plugging of wound cavities, and local pressure on accessible bleeding points, may be indicated.

Patients with severe wounds of this type should never be left unattended. All nursing and transport should be with the patient lying face down or, if condition permits, in the sitting posture leaning forward.

The "Barrel" Bandage—Any bandage used in the first aid treatment of these injuries should have maximum pull in an upward and forward direction and on no account any pull backwards. The four tail bandage, as illustrated in most first aid books, in many cases is dangerous and contrary to the principles of first aid of these injuries. From experience in the last war, and in this, it has been condemned by all surgeons familiar with this type of injury. The "Barrel" bandage is advised.

About six feet of 2" or 3" bandage are required. The middle of the bandage is placed under the jaw, well back, and a simple reef knot tied across the vertex of the skull. This knot is then opened so that the front loop passes around the forehead, and the back loop below the occiput. To exert upward tension, two running hitches are formed just in front and above the ear: the free ends are tied in a reef knot above the head.

REFERENCES


