SPECIALIZED TRAINING

There remain, however, valid objections to transurethral resection: it is difficult to do, difficult to learn, and difficult to teach. Hence it demands prolonged and specialized training, and at the moment there are too few trained urologists to meet the need. If the advantages of transurethral surgery are to be made more widely available, the first need is for more urologists. It is true that urologists need expensive equipment to do their work properly, but the capital costs of such equipment are negligible compared with the costs of hospital beds.

The need for more training facilities is equally important; the day has passed when general surgeons meddled with eyes, neurosurgery, or orthopaedics. Urological surgery should be left to those who have undergone special training. But additional training can only be provided by expanding the limited facilities available at present and by halting the trend of deliberately restricting the number of senior registrar training posts in urology. Another look should be taken at the dispersal of trainee surgeons away from teaching centres and into the periphery.

It is high time that we faced the truth that, as in other specialties, there is a difference between the results which can be obtained in urological surgery by those who specialize. The difference in results is not merely a difference in cost effectiveness, or of administrative convenience. As Ashley *et al.*⁷ showed, with cruel clarity, the price of prostatectomy at hospital B is a price which is not only paid in cash, but in lives. Nevertheless, as we have illustrated, the saving in money is by no means negligible—an argument which we trust may weigh more with those who clutch the purse strings on which the hospital service depends.

References

- ¹ Lytton, B., Emery, J. M., and Harvard, B. M. (1968), *Journal of Urology* 1968, 99, 639.
- ² O'Flynn, J. D., *British Journal of Hospital Medicine*, 1969, 2, 562.
- ³ Blandy, J. P., *Transurethral Resection*. London, Pitman Medical, 1971.
- ⁴ Singh, M., Tresidder, G. C., and Blandy, J. P., *British Journal of Urology*, 1973, 45, 93.
- ⁵ Gow, J. G., *Practitioner*, 1973, 210, 535.
- ⁶ *Hospital Inpatient Enquiry 1970*. London, H.M.S.O., 1972.
- ⁷ Ashley, J. S. A., Howlett, P. A., and Morris, J. N., *Lancet*, 1971, 2, 1308.

Aspects of Plastic Surgery

Maxillofacial Injuries

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Introduction

Civilian maxillofacial injuries result mainly from road-traffic and industrial accidents or from fights and it is unusual for general practitioners to see them at an early stage or to be involved in their treatment. But late management of any resulting disablement or disfigurement may require a fairly detailed understanding of all the associated clinical problems. Casualties of this kind were previously normally treated in the larger plastic and oral surgery centres, sometimes at a considerable distance from the patient's home, and this tended to separate him from his own doctor until he was finally discharged. The development throughout the country of accident centres with improved resources now reduces the need for transfer to the more specialized units. In most large towns the dental and oral surgery services are based on a general hospital and patients with maxillofacial injuries are treated nearer home. So there may often be a greater need for the general practitioner to be involved in aftercare until patients are fully recovered or sufficiently rehabilitated to return to their normal occupations or some more suitable employment.

The overall incidence of injuries of the face and facial skeleton, like the incidence of head injuries, is difficult to estimate but the number of patients who require continued care, after discharge from hospital, is a relatively small proportion of the total spectrum of trauma. The contribution which can be made by general medical and dental practitioners towards restoring self-confidence and morale is nevertheless important even though improved

standards of treatment have resulted in greatly reduced morbidity and residual deformity.

The injuries under discussion can range from quite trivial fractures to the most severe compound and complex fractures of several or all of the facial bones, extending into the orbits and anterior fossa of the skull. Sometimes there can be extensive penetrating wounds of the soft tissues of the face, nasal passages, tongue, and the orbital contents. In all these cases early assessment is most important in achieving a high overall standard of results, since time can be utilized at this stage in preparing splints. This applies even where there is little evidence of initial disability or alternatively where the actual treatment of the facial wounds may be necessarily delayed by the urgent need for resuscitation or perhaps by the treatment of more serious life-endangering head, chest, or abdominal injuries.

The only features which demand immediate action from the time of injury are the dangers from obstruction of the airway and continued bleeding from the nose, mouth, and pharynx. Great improvements in the first aid training of ambulance crews and others has, without doubt, improved the mortality rates from these two causes alone but there is still room for much more to be done to help those who are called upon to make the first assessment at the roadside or in the factory. The insertion of a simple oral airway is possible in the unconscious patient but better still is the passing of a nasopharyngeal or endotracheal tube in the first instance. This technique should be much more widely taught and applied in practice even if it is not the only vital action necessary for safe transportation.

Simple Fractures

Minor injuries involving the dislocation or avulsion of front teeth with or without facial lacerations, particularly in children, are a common feature of any accident and emergency department

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but not every department can have a dental surgeon readily available to deal with these injuries. As a result, through delay or lack of knowledge, many teeth are needlessly lost. As a general rule replantation of permanent teeth in children at the earliest possible moment after injury and under good conditions results in a sufficiently high success rate that it is always worth trying to achieve it for dentally-conscious patients. Treatment usually involves the use of some type of prefabricated splint or a fitted arch bar and may be best carried out under endotracheal anaesthesia but this should not debar any child from receiving this care and successful treatment is very rewarding.

Many of these minor injuries are associated with facial lacerations and it is worth remembering that this is the time at which there is always the best opportunity of obtaining the least disfiguring scars. It is not enough to accept that facial scars tend to heal well; time taken to clean the wounds very thoroughly and to suture with as much precision as possible, using the finest atraumatic needle and suture that is practicable, is well worthwhile. Most people are capable of doing this well if provided with the correct instruments and materials and the pressures of a busy casualty department should not encourage too much haste or an attitude that minor injuries require lesser standards of care—perfect repositioning of the wound edges should always be the aim.

Other common fractures are those of the mandibular condyles or the angles of the mandible resulting often from a blow with a fist or a fall on to the chin. Occasionally such fractures, if not displaced, go undiagnosed and therefore untreated, and only present at a later date when deformity and disability are only too obvious and may be difficult to treat. In particular, bilateral fractures of the mandibular condyles may result in a severe open bite deformity gradually developing due to the upward pull of the powerful masseter and temporalis muscles and the antagonistic action of the depressors. Such a deformity makes mastication quite impossible and it may then require quite extensive surgery involving refracture of the rami to correct this whereas very simple treatment by immobilization with eyelet wiring would have been possible in the first instance.

Conservative treatment of jaw fractures using various methods for splinting and immobilization has been practised for centuries. Recently there has been a trend towards more definitive surgical management wherever this approach could either shorten the period of immobilization of the jaws or lead to a better functional and cosmetic result. The principle underlying these conservative methods of treatment which have such universal application is simple and can be applied with varying success, depending upon what dental support remains. The upper and lower teeth occlude together in a precise relationship which can usually be easily determined for any particular patient. Moreover, the mandible itself has a stable rest position within its muscle sling which is relatively unaltered throughout life from the time that the teeth have erupted until old age. Thus it follows that if the teeth are immobilized in their correct occlusion or in the rest position then the fragments of the fractured jaws—that is, the mandible and maxilla themselves—will be reduced into their approximately correct relationship and, in the absence of sepsis, healing will take place. Bone union follows producing a satisfactory functional result. To this end methods of treatment have been developed using dental techniques and appliances which were greatly improved during the last war. These procedures included many variations of the standard eyelet wiring technique, the use of arch bars and cast silver cap splints cemented to the teeth which provide the ultimate in control where many teeth have been lost or damaged.

From the second world war, when it became obvious that antibiotics would control infection, conservative methods have been more frequently combined with open operation to allow more positive reduction and fixation of the fractures. In cases where there is gross displacement of the fractures and difficulty in reducing and stabilizing the fragments then this is desirable and allows precise apposition of the cancellous bone surfaces to be achieved. The fractures are then stabilized with trans-

osseous wires or vitallium plates which can, if necessary, be supplemented by further intraoral splinting or pinning.

In general terms a well reduced fracture of the mandible, in the absence of sepsis, will unite satisfactorily in four to five weeks during which time the intermaxillary fixation is retained and it is necessary to ensure an adequate liquidized or pureed diet. Patients vary greatly in their capacity to adapt themselves to this situation but there is no need for them to reduce their normal intake of food. Any deficiencies may be supplemented with high-protein concentrates such as Complan or Casilan and for many it is even unnecessary for them to be off work during this period.

“Middle-Third” Fractures

The middle-third of the face comprises the structures lying between the upper teeth and the frontal bone. Fractures of the middle-third of the facial skeleton may involve one or all of the bones such as the maxillae, the zygomatic bones, the nasal and frontal bones and ethmoids, and the bony structures of the orbits and anterior fossa of the skull. It is not always appreciated that these are relatively thin and fragile bones with little inherent strength, but for the fact that they form box-like structures of very complex shapes. Damage to them—for example, in high-speed impact—may result in over 50 fragments with comminution of such a degree that it becomes quite impossible to consider reducing them completely and restoring all the minute detail of contour. The fracture lines are complex and varied but in 1901 Le Fort in Paris described a simple classification which has been used ever since and is invaluable in practice as it broadly indicates, in a way which can be appreciated by all medical and nursing staff and technicians, the approximate sites of the main fracture lines. Le Fort subjected the heads of cadavers to varying degrees of trauma and later examined the resulting pattern of fracture lines (fig. 1).

FIRST AID

When the middle-third is fractured the maxillary block is displaced backwards and may drop downward by as much as (2 in (5 cm)). The bony block carries the soft palate with it and this impinges on the dorsum of the tongue sometimes completely occluding the oral airway. As the mandible is usually already widely open there is no possibility of the patient being able to open the jaw further in order to breathe; if then the posterior nares become blocked with blood clot a serious situation immediately exists even in the conscious patient. It is usually a simple matter to elevate the whole mobile maxillary block with the fingers in the mouth and thus relieve obstruction and it is important at this time to clear the mouth of clot and any broken teeth and dentures. The conscious patient does not easily tolerate an oral airway but a nasopharyngeal tube can be passed so that its distal end lies behind and below the tongue rendering the patient safe until the fractures are reduced and a normal airway re-established, or until a tracheotomy is performed.

The only positive indications for immediate treatment on the day of injury are continued severe haemorrhage or the threat of obstruction which cannot be obviated by any other method; apart from these considerations operation is much better delayed for 24–48 hours while other injuries are being assessed and resuscitation instituted. Many of the methods used for immobilization involve intermaxillary fixation and so a delay of this sort also reduces the hazards of general anaesthesia.

CRANIOMAXILLARY FIXATION

Treatment of fractures of the facial bones is not essentially different to the treatment of all other fractures in that it simply entails adequate reduction followed by immobilization for sufficient time to achieve union—usually three to four weeks in

FIG. 1—Le Fort I (dotted line). The fracture lines separate the tooth-bearing part of the maxilla from the structures above.

Le Fort II (broken line). This fracture line results in a pyramidal fracture running from the nasal bridge downwards on each side through the infraorbital margins below the zygomata and posteriorly across the antral walls to end by fracturing the pterygoid plates.

Le Fort III (continuous line). This fracture complex is the most severe and extends bilaterally from the frontonasal suture line across the lachrymal bones and the floor of the orbit, past the optic foramen and inferior orbital fissure to the lateral orbital wall and frontozygomatic suture. The fracture lines are suprazygomatic and the entire middle third of the facial skeleton is thus sheared from the base of the skull and displaced backwards en bloc.

the case of middle-third injuries. The main difficulty lies in the fact that there are few adjacent structures available for fixation and, as variations of the Le Fort fracture lines occur, many different techniques of management become necessary to achieve the best results where no single approach could possibly bring about anything but mediocre results. While conservative measures alone can achieve excellent results as regards restoring the dental occlusion and masticatory function they have their limitations in some cases and then surgical exposure with transosseous wiring is used. Suitable techniques for any particular case are

chosen depending on the fractures themselves, the level of consciousness and the patient's ability to co-operate and also upon what other injuries may have been sustained.

The procedures can be involved and time consuming but it is essential to obtain accurate reduction of the main bony blocks first in order to avoid major deformity of the upper jaw, nasal passages, and orbits before proceeding to the more definitive repair of important smaller structures. Sufficient time and care spent at this stage usually obviates the need for much more elaborate and difficult reconstructive procedures at a later date.

Cast silver splints cemented to the teeth have been in common use for many years and by using precision screw plates, extraoral rods and universal joints can be attached to the skull. Previously the only means of skull fixation was a plaster-of-Paris headcap (and this had considerable limitations) whereas the use of various halo frames fitted directly to the calvarium or frontal pins drilled into the supraorbital ridges, provides vastly improved cranial fixation. Titanium rods, universal joints, and self-tapping screw pins are now used which are not only much lighter than steel but are biologically almost inert and therefore very comfortable to use (figs. 2 and 3).

Where it is desirable to avoid the encumbrance of extraoral craniomaxillary fixation, as in the unconscious patient or where cerebral irritation already poses difficulties for nursing staff, then some means of suspension wiring is employed, sometimes combined with acrylated arch bars fitted to the teeth. Circumzygomatic and frontal bone suspension wires are particularly useful in this situation though never quite so effective as extraoral methods. These suspension wires are passed, using an awl or cannula, from the mandibular teeth upwards close to the bony surfaces, around the zygomatic arches or threaded through holes drilled in the zygomatic processes of the frontal bones (fig. 4).

Fractured Malar

The commonest fracture of the middle-third is the depressed malar. Frequently this is sustained in a fight or a fall without any serious head injury. If it causes very obvious flattening of the face or results in diplopia, because of disruption of the extraocular muscles, it clearly justifies treatment though these signs are often masked initially by the gross oedema which may be present. Reduction is usually possible through a temporal approach. In other cases, however, it may be associated with Le Fort II or Le Fort III fractures and these injuries inevitably involve fractures extending into the floor of the orbit to a varying degree, ranging from simple cracks to gross disruption and comminution of the entire floor with herniation of the orbital contents into the antral cavity. Transosseous wiring of separate

FIG. 2—Craniomandibular fixation (a) and extraoral connexion to sectional splints (b). Le Fort II and III fractures combined with midline split of the maxilla and bilateral fractures of the mandible. The right optic nerve was irreparably damaged and there was a profuse C.S.F. rhinorrhoea. The fractures were reduced and immobilized using frontal pins and sectional cast silver cap splints.

small fragments then becomes necessary. Disruption of the orbital floor also happens in "blow-out" fractures after a blow on the globe of the eye with an object larger than the orbital rim which causes sudden compression of the orbital contents and rupture of the very thin plate of bone constituting the orbital floor. In this situation there is no fracture of the orbital rim itself but there may be diplopia and diagnosis is confirmed by the so-called "hanging drop" appearance of the herniated orbital contents seen on an occipitomental x-ray film. If left undiagnosed and untreated the loss of periorbital fat leads to enophthalmos and subsequent scarring may result in incarceration of the inferior rectus or inferior oblique muscles causing diplopia on looking upwards. This is difficult to treat at a later stage whereas the orbital floor may be repositioned and supported with an antral pack or reconstructed using an iliac crest bone graft or Teflon implant at the time of injury.

FIG. 3—Le Fort II fracture reduced and immobilized using a Royal Berkshire halo and cast silver cap splints.

Complications

CEREBROSPINAL FLUID RHINORRHOEA

Le Fort II and Le Fort III fractures almost invariably involve the ethmoids and in about 25 per cent. of cases the cribriform plate is disrupted resulting in a tear of the dura and C.S.F. rhinorrhoea. Wherever this is confirmed or suspected it is important to institute suitable prophylactic measures such as 1 g sulphadiazine six-hourly, combined with penicillin. Continued movement of the mobile middle-third is likely to favour an ascending infection and consequent meningitis and this is therefore a further indication for relatively early fixation of the facial fractures.

Where C.S.F. rhinorrhoea has been present there is then a 25 per cent. risk of meningitis developing in these severe injuries yet this may not occur at the time of initial treatment but up to months and even several years later. Some neurosurgeons favour a formal dural repair but this is not commonly practised and so it behoves the general practitioner to be watchful for any suspicion of such a complication.

TRISMUS

Trismus is simply a limitation of jaw opening due to muscle spasm. This is invariably present for a short time after any period

FIG. 4—Le Fort II fracture immobilized with suspension wiring from the zygomatic processes of the frontal bone to a mandibular arch bar.

of intermaxillary fixation but usually disappears rapidly as the patient is allowed to function again and to masticate. No limitation should be put on the type of food he eats at this stage. Persisting trismus is more commonly seen after relatively minor injuries, particularly in the elderly, where there may have been trauma to the mandibular joints. Frequently this trismus is secondary to pre-existing dysfunction, degenerative changes in the joints, or maybe the overlong use of ill-fitting dentures with an overclosed bite. Such cases obtain relief from a period of rest, restoration of the occlusion, and sometimes supportive treatment with the use of diazepam in small dosage of say 5 mg twice daily.

Scarring or a failure to treat a depression of the zygomatic arch may give rise to the appearance of trismus and if this limitation persists it is often advisable to arrange for examination under a general anaesthetic to determine the cause. If it is found to be not simply due to muscle spasm then surgical treatment or vigorous use of jaw exercises is necessary.

DIPLOPIA

Diplopia sometimes persists in spite of apparently adequate reduction of orbital and malar fractures and may be due to damage to the suspensory ligament or to trapping of the extraocular muscles in fracture lines. Patients with such a complication must be seen as soon as possible by an ophthalmic surgeon.

SENSORY NERVE ANAESTHESIA

Crushing of the infraorbital or mandibular nerves may result in neurotmesis or neuropraxia with consequent long delayed recovery of normal sensation over the distribution of the mental and infraorbital nerves for up to two years after injury. Failure of complete recovery, however, is the exception rather than the rule and in any event little or no benefit is achieved by exploration of the main nerve trunks.

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