ANAESTHESIA FOR MAJOR ORAL AND MAXILLOFACIAL SURGERY

BY

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The aims of the anaesthetist working in maxillofacial surgery must be to provide: general anaesthesia for the patient; an uninterrupted airway during both surgery and the recovery period; an unobstructed field for the surgeon.

The range of major oral and maxillofacial surgery includes: all forms of exodontia; operations on tongue, lips, palate; elective operations on mandible and maxilla; repair of trauma to teeth, facial bones and facial soft tissues.

Certain anaesthetic principles have such wide-spread acceptance in this field of surgery that their use is almost mandatory. For instance, intubation of the trachea is essential in all elective procedures, to provide an airway which is sufficiently safe. The throat must be packed in order to protect the pharynx and airway from blood and debris shed during the operation. There is, however, such a wide range of variation in individual practice in this field that no single sequence of anaesthesia can be put forward as ideal.

EXODONTIA AND SURGERY OF TONGUE

All forms of exodontia and surgery on the tongue make the same demands—a perfect airway and a wide-open unobstructed mouth. This is the commonest situation, and our standard practice is as follows.

Pre-anaesthetic inspection of the patient is not only important as a medical assessment, but also as an opportunity to judge potential local hazards. The presence of a deflected nasal septum, loose teeth, crowns, bridges, prostheses and gold inlays may all add to the difficulty the anaesthetist may encounter.

For the fit patient our choice of premedication is a combination of an analgesic, a phenothiazine sedative and an antiallague, levophan 1.0–2.0 mg, promethazine 25 mg and atropine 0.6 mg or scopolamine 0.4 mg being our usual combination.

Upon arrival in the theatre the patient is identified, and a Gordh needle is put into a vein on the dorsum of the left hand. Through this is injected a dose of $2\frac{1}{2}$ per cent thiopentone, commonly of the order of 200–400 mg. When the patient is asleep 75 mg of suxamethonium are injected, and the patient's lungs are inflated with oxygen prior to intubation. A nasal endotracheal tube is passed; on the paralysed patient this can usually be performed "blind", although this is less certain in very young patients, the edentulous patient, and those with a very short neck or limited cervical movement. If blind intubation is not easily achieved, a laryngoscope is passed and the tube is guided into the trachea with Magill's forceps.

Anaesthesia is established with nitrous oxide, oxygen, and halothane. The period of relaxation provided by the suxamethonium is, however, usually sufficient to facilitate the packing of the oropharynx with a long strip of 2-inch ribbon gauze which has been moistened in liquid paraffin and sterilized before use. Before the patient's head is towelled his eyes are covered with paraffin eye-pads; when a circle system is used there is no danger of halothane accumulating in such eyepads (Jones, 1967). Anaesthesia is maintained throughout with nitrous oxide, oxygen and halothane, with spontaneous or assisted respiration.

MORE EXTENSIVE SURGERY

Surgery not confined to the oral cavity imposes different requirements. Surgery on the upper lip, the palate, and the body of the maxilla nearly always indicates passing an oral endotracheal tube. For surgery for cleft lip and cleft palate, we prefer to pass flexible tapered latex armoured tubes of the Enderby type, anaesthesia being induced and maintained with nitrous oxide, oxygen and halothane or ether, and intubation undertaken after the injection of an appropriate dose of suxamethonium. The EGART* gag (fig. 1) facilitates palatal surgery and protects the tube (Davies, 1954).

* EGART: East Grinstead Anaesthesia Research Trust.
Major maxillary and mandibular surgery, e.g. hemimandibulectomy, mandibular body osteotomy, hemiglossectomy and maxillary resection for malignant disease, with or without block dissection of the glands of the neck, are operations of considerable length and potentially high blood loss. These seem to us to be indications for the induction of deliberate hypotension (Larson, 1964; Eckenhoff, Enderby and Larson, 1963). This provides a relatively bloodless operating field, reduces blood loss and the size and number of transfusions. Also, induced hypotension facilitates surgical progress, and should bring about a reduction in operating time.

Our practice in induced hypotension is to aim for a bloodless or almost bloodless field, with a minimum systolic blood pressure between 60 and 80 mm Hg, using ganglion blocking drugs, head-up tilt, intermittent positive pressure ventilation, and nitrous oxide, oxygen and halothane anaesthesia, with the possible addition of a β-receptor blocker (Hewitt, Lord and Thornton, 1967).

It is our practice, at the end of any operation in and around the mouth, to invite our surgical colleagues to remove the pharyngeal pack and to demonstrate the oropharynx. Thus both surgeon and anaesthetist can be satisfied that the pharynx is free of blood and debris. When the anaesthetist is satisfied, an oral airway is introduced and the anaesthetic is terminated by withdrawing the endotracheal tube. The patient is lifted into bed and returned to the recovery ward lying on his side in the “tonsillar” position.

The procedures described, with minor modifications, are suitable for almost every patient. Two circumstances merit special consideration: (1) the haemophiliac patient; (2) the acutely traumatized patient.

THE HAEMOPHILIAC PATIENT

Haemophiliac patients (Biggs and McFarlane, 1962) presenting for oral surgery are a problem to surgeon, anaesthetist and pathologist alike, and these three must co-ordinate their treatment of such patients with the utmost attention to detail. The special problems of the haemophiliac include pre-existing anaemia, poor general condition, considerable (and understandable) apprehension, and the possibility of difficulties in crossmatching blood as a result of previous transfusions. The surgeon and anaesthetist both have the task of handling the patient with studied gentleness, and they should avoid all manoeuvres that could possibly cause unnecessary haemorrhage (Lucas et al., 1963). The routine to be outlined below has been used recently with gratifying results.

Operations on haemophiliacs are best performed on Thursdays or Fridays, for the complications if they arise are either immediate or, more likely, on the fourth or fifth (postoperative) day. If these should coincide with a weekend, the pathological service may be strained unduly and avoidably. The patient is admitted for investigation 2 or 3 days prior to surgery. A plentiful supply of matched blood is available.

The day prior to operation the patient is given epsilon amino caproic acid (EACA) (Cooksey, Perry and Raper, 1966)—6 grammes 6-hourly—which is taken by mouth up to 6 a.m. on the morning of operation. The anaesthetist visits the patient at about 10 a.m., and under local anaesthesia inserts in a forearm vein a large polythene...
intravenous cannula. Through this are injected the contents of two packets of freshly thawed cryoglobulin, followed by any sedative or analgesic chosen as premedication. The end of the intravenous cannula is now closed with a rubber diaphragm, and the patient is taken to theatre forthwith. Anaesthesia is induced by injection of thiopentone through the indwelling cannula, and when the patient is asleep 75–100 mg suxamethonium is administered.

The anaesthetist must now proceed with particular care and attention to details. When the patient has been oxygenated sufficiently, an oral armoured latex cuffed endotracheal tube is passed carefully, and the cuff is inflated. No throat pack is inserted, in order to avoid the possibility of scratching the palate or oropharynx with fingers or Magill’s forceps. (It is our opinion that nasotracheal intubation is dangerous to the haemophiliac, since uncontrollable bleeding may result. The presence of an oral tube is usually only a slight inconvenience to the surgeon.) Anaesthesia is maintained as usual with nitrous oxide, oxygen and halothane.

The oral surgeons must be meticulous in achieving haemostasis, by stitching. Little reliance is placed in other local methods (McIntyre et al., 1959). At the commencement of the operation an infusion of 1 unit of newly thawed fresh-frozen plasma is begun through the indwelling cannula, and this is maintained throughout the operation and for an hour or more afterwards. The fresh-frozen plasma is followed by an infusion of 12 g of EACA in normal saline. Postoperative medication can be administered intravenously.

At the end of the operation the anaesthetist must aspirate the pharynx, and remove the endotracheal tube as gently as possible.

When the EACA has run in, the infusion is stopped, and the cannula is closed with a diaphragm as before. The patient is kept in the recovery ward until the infusions have been completed, and is taking antibiotics, analgesics, and EACA by mouth.

On the fifth day after operation a second bottle of fresh-frozen plasma is given, and unless secondary haemorrhage has occurred the cannula is removed. We aim to leave the same intravenous cannula in the patient throughout the whole period of surgical treatment since this ensures that a transfusion of blood or further fresh-frozen plasma can be started at very short notice should it be required. Furthermore, it should mean that only one puncture is made in the patient’s skin throughout the whole procedure.

THE ACUTELY TRAUMATIZED PATIENT

Maxillofacial injuries (Kelsey Fry and Ward, 1956) produce a wide variety of problems for the anaesthetist, in such a way that no single technique can be uniformly adopted. The problems produced by the injury must be solved with three points in mind:

1. the limitations and difficulties imposed by the injury itself;
2. the requirements of the patient, and especially of the airway, before, during and after surgery;
3. the requirements of the surgical procedure and the surgeon.

FIG. 2
Common sites of facial fractures.
Anatomy of the injury.

Figure 2 shows some of the sites at which the facial bones may be broken. Any one, or any combination, of these fractures may be found in any patient, together with soft tissue damage and/or mandibular fracture(s). Beyond these, the disruption caused by, for example, a gunshot wound may produce additional and varying problems.

As a result of an accident any combination of these types of injuries will, by definition, occur instantaneously, at which time the patient may be rendered unconscious, and may receive concomitant injuries—for example, head injuries, thoracic cage injuries, or long bone injuries. If the patient is rendered unconscious, death may supervene from an obstructed airway, unless immediate treatment is instituted. In fact, it is the care of the airway, before and during anaesthesia, and during the recovery period, which must be made the keystone of all treatment. While the anaesthetic technique used may vary, the care of the airway at all times allows no variation—it must be impeccable. These points may well have to be considered against a background of the treatment of the concomitant injuries.

Emergency position and treatment.

In any injury to the facial bones—in particular the mandible—obstruction of the airway is frequently present, either from the presence of loose bodies (bone fragments, teeth) or by blood, in the pharynx, or by direct obstruction by displaced bones or the tongue. If the patient is placed in the prone position, with the head resting on the crooked arm, debris and blood will tend to drain out of the mouth. Clearance of this debris with the guarded finger should be carried out before, or preferably after, the patient is placed in this position. No opiate should be given, as the concomitant respiratory depression may well be sufficient to remove an adequate respiratory drive, and this, together with the impaired airway, may lead to asphyxia. The patient must be transported to hospital in the prone position.

On arrival in hospital the airway must be secured, if the patient is unconscious, with an airway, by endotracheal intubation, or by a suture placed transversely on the posterior third of the tongue; or, if conscious, by maintaining the prone position—if the patient cannot maintain his own airway. The usual restorative measures must be instituted, if blood loss is known to have been great, or if the patient shows signs of hypovolaemia. Bleeding points are clamped or ligated.

During this resuscitative phase, the oral surgeon will order X-rays; impressions will be taken and intra-oral splints prepared (if these are required as a part of the future treatment of the injuries). At all times the anaesthetist will be on hand to discuss these plans with both the surgeon and radiologist.

When the time for surgery arrives, premedication will be with atropine alone, no opiates being given. Induction of anaesthesia, of which endotracheal intubation will form an essential part, will be carried out with the following points in mind:

1. the stomach must be assumed to contain swallowed blood;
2. the airway must be assumed to be actually or potentially obstructed;
3. bleeding must be assumed to be active in the mouth and pharynx during induction (the pressure of a face mask on a fractured nose can restart a brisk haemorrhage).

Blood in the stomach needs either the preoperative passage of a large-bore stomach tube and drainage and lavage, or, alternatively, induction of anaesthesia in the head-up position with cricothyroid pressure. If the former, the stomach tube must be left unclamped during induction.

As an illustration of airway problems, the following example may be quoted.

The patient (fig. 3) was driving a tractor, when a shotgun which was being carried went off. In addition to the massive soft tissue damage, the central portion of the mandible was blown out. Because of the bleeding, alternatives for the induction of anaesthesia and intubation in the above patient would appear to be:

(a) Intubation with topical anaesthesia. This is of doubtful efficacy, as the active bleeding over the pharyngeal wall will prevent the adequate placing of the topical anaesthetic. It will also be time-consuming.

(b) Induction of anaesthesia wholly by inhalation is difficult to achieve. A face mask cannot be readily applied, induction will be prolonged, and control of bleeding will be a problem throughout.
If such a technique is employed, the patient should be placed in the Trendelenburg position and adequate suction must be available, and frequently employed during induction, to remove the pool of blood which will continually re-form in the nasopharynx.

(c) Preliminary tracheostomy may be carried out, followed by induction and maintenance of anaesthesia, by this route.

(d) Where no emergency tracheostomy has been performed prior to admission, our preference is almost always for the “crash induction” with or without cricothyroid pressure (Sellick, 1961) at the time of intubation.

The patient is pre-oxygenated, the pharynx cleared of blood by suction, obvious loose bodies removed, and induction rapidly completed with the aid of thiopentone and suxamethonium. Once the patient is paralyzed, intubation is more important than clearing the pharynx of debris. This latter can be performed after intubation—both around and, if necessary, via the endotracheal tube. Anaesthesia is then maintained by any method which will allow an extremely rapid post-operative return of the reflexes.

The siting of the endotracheal tube.

This is frequently a compromise between the limitations imposed by the injury and the needs of the surgeon; for example, the patient in figure 3 would be intubated only by the nasal route.

The patient in figure 4 suffered from a fractured mandible, a fractured maxilla, fractured nose and the central pyramidal fracture of the facial bones, together with multiple facial lacerations. The central pyramidal fracture had involved (and usually does) the cribiform plate. Cerebrospinal fluid was leaking from the nose, and the patient was thus in fact technically suffering from a compound skull fracture. The surgeon wished (1) to reduce the facial fractures, and to wire the mandible to the maxilla; (2) to reduce the nasal complex; (3) to fix the vertical dimensions of the reduced fractured facial bones with the aid of a plaster head cap and anterior bar fixed below to the now solid maxillary/mandibular block; (4) repair the facial lacerations. Thus for part of the surgery a nasal endotracheal tube would be ideal; for part, an oral endotracheal tube. In our opinion, the cerebrospinal rhinorrhoea precluded the passage of a nasal endotracheal tube. Therefore, an oral endotracheal tube was inserted, and when the maxilla and the mandible were to be locked together, this was performed with the oral endotracheal tube in place. On recovery of consciousness and return of the cough reflex, this tube was removed, the jaws finally locked up, and the final adjustments made to this anterior bar. The surgeon may ask for removal of the endotracheal tube at the end of surgery, to complete the inter-maxillary fixation on the unconscious patient. This should never be permitted, since under these conditions the patency of the airway is by no means certain. Such an action is indeed contrary to the cardinal rule of protection of the airway (see above).

Close co-operation and understanding between surgeon and anaesthetist is essential in order to solve the airway (and hence the intubation) problems of these patients. If necessary, an agreed compromise must be evolved between the two.
Postoperatively.

At the end of surgery, if the jaws are not locked together, the normal protection of the airway with, for example, a Guedel's airway or, where appropriate, a nasopharyngeal tube, is satisfactory. If the jaws are locked together, or any other airway obstruction is anticipated, the endotracheal tube should be left in situ, until the patient is fully conscious. When the tube is finally removed by the anaesthetist, suction and facilities for reintubation must be at hand.

Tracheostomy.

The indications for elective tracheostomy are:

1. Other general conditions requiring tracheostomy—
   a. certain head injuries;
   b. massive chest injuries;
   c. incidental pre-existing disease.
2. Lack of adequate postoperative nursing care.
3. The known or anticipated presence of an obstructed airway after extubation.

As both nursing and medical skills become more experienced, the indications for tracheostomy become fewer. When in doubt, tracheostomy should always be performed as a planned procedure at the end of surgery.

Sedation.

No sedation must be administered until the patient complains of pain. There is no other reason for administering an opiate to these patients. The combination of opiate, depressed respiratory drive, and actual or potential impaired airway can be—and has to the authors' certain knowledge been—fatal. The custodians of the patient will learn of his pain only if he complains of it. Restlessness is no indication for the administration of an opiate. Restlessness is more frequently caused by airway obstruction than by
pain, which is in any event minimal postoperatively in these patients.

ACKNOWLEDGEMENTS

We wish to acknowledge the help of Mr. C. R. McLaughlin in the preparation of this article; and of Mr. Broadberry and staff of the Photographic Department, who were responsible for producing the illustrations.

REFERENCES


BOOK REVIEW


Enthusiasm for vigorous hyperventilation during anaesthesia and IPPV has waned in parallel with awareness of its limitations and possible dangers. However, acute or chronic hyperventilation may be a feature of a variety of psychiatric disturbances. In addition, patients undergoing e.g. examination may be asked to hyperventilate to provoke abnormal rhythms and the subject is therefore one that is of neuro-psychiatric interest. This book is the result of collaboration between psychiatrists, psychologists and a physiologist. It is intended to explain the physiological and psychological background to what is apparently a common problem in the United States. In the book it is stated that the hyperventilation syndrome probably accounts for 10 per cent of all diagnostic problems referred to internists. It is not such a common problem here, but since a large section of the book concerns the recognition of the signs of hyperventilation in military recruits, the fact that we no longer have a National Service liability may account for part of this difference.

The first chapter is a rather abbreviated historical review of hyperventilation which is followed by 70 pages which cover the physiological basis of the condition. The emphasis laid on physiology in a book for psychiatrists of only 192 pages is encouraging and in general this section is done very well. The explanation of acid base balance is particularly good, the pH notion being abandoned, which greatly clarifies the description of the Henderson (sic) equation. However, there are sections with which many people would disagree, which include the use of a fixed value for physiological deadspace, irrespective of tidal volume. The self-perpetuation of hyperventilation is attributed to an alteration in the sensitivity of the respiratory centre, and insufficient emphasis is laid upon the effect of habitual over-distension of the chest. The author recommends that a diagnosis of hyperventilation should be confirmed by blood gas analysis, but states that “arterialised” versus blood may be used for both oxygen and carbon dioxide estimation. The truism that “The English and Americans are two nations divided by a common language” is recalled in many sections of this chapter and the use of verbal shorthand such as “the metabolic acidosis which accompanies hyperventilation” will probably not make understanding any easier.

Next there are four chapters concerned with psychiatric aspects of hyperventilation, one of which is a reprint of an article which first appeared in 1964. Finally there is a chapter on the electroencephalographic effects of hyperventilation. This is a good review presented in simple terms and would be a suitable introduction to the subject, but the writer clearly does not fully understand the factors which control carbon dioxide excretion. He states that “widely varying hypocapnic levels were reached by healthy young men” during a hyperventilation investigation. Before attempting to determine the cause of abnormal e.g. rhythms in hyperventilation it is essential to control the rate of fall of alveolar carbon dioxide tension. It is misleading to imply that the hypocapnic response to hyperventilation varies between subjects since this is so only if the level of alveolar ventilation is not well controlled. This and other misconceptions suggest that there has been insufficient consultation between the authors of the different sections.

However, these are relatively minor points and I feel that the book will satisfy its aim and be a reasonable introduction to a subject for psychiatrists. It is well produced and contains many useful references, although its price may prove a deterrent to individual purchasers.

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