

## PROBLEMS OF ANAESTHESIA IN PLASTIC SURGERY •

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THE practice of Anaesthesia for Plastic Surgery presents problems which are as special to this field as are the problems of plastic surgery itself. Some of these are obvious to any trained anaesthetist. Others become apparent only on a closer acquaintance with the procedures of plastic surgery. Not all of them have yet achieved entirely satisfactory solution. It is my purpose to point out the general principles which determine these problems, and to discuss some of the more important considerations.

### CONSIDERATIONS CONTROLLING THE CHOICE OF TECHNIQUE

The primary factor which determines the choice of technique is the site of operation. The majority of plastic procedures involve surgical manipulations covering the whole or a part of the face. A significant number involve procedures within the mouth, nose, or antra. Others involve the neck. For all of these an endotracheal technique is the one of choice. For those involving the mouth, antra or nose it becomes imperative.

Plastic procedures in other regions may be accomplished with almost any adequate technique, provided due consideration is given certain aspects to be discussed below. We find that those procedures which require the patient to be in the prone position for the whole or part of the operation are more easily accomplished by intubation or the use of an intravenous technique.

In addition to the operative site there are other considerations which make endotracheal anaesthesia the technique of choice for procedures about the head and neck. The control of bleeding is one of the great problems confronting the plastic surgeon. The life of free grafts, and often of flaps, depends on the control of bleeding from the beds on which they are placed. Any obstruction to the airway of the patient, even though it be so slight as to cause a scarcely noticeable increase in the respiratory effort, will result in congestion of the venous system of the head and neck, extending to the venules of the skin. This congestion causes bleeding, which in some cases defeats the whole purpose of the operation. Proper intubation of the patient will ensure a patent airway and respiration as free as possible from impediment. At the

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same time it might be pointed out that a tube which is obstructed by a kink or by compression is worse than no intubation at all.

It is desirable, as a rule, that the lightest possible plane of surgical anaesthesia should be used for patients requiring plastic surgery. Muscular tone should be preserved as far as possible to facilitate the cutting of grafts, to keep the contours of the body and face in their normal relationship, and to prevent unnecessary distortion of deep tissues during surgical manipulation of the skin.

#### TECHNIQUE FOR ENDOTRACHEAL ANAESTHESIA

1. *Induction.*—It is my practice to induce all patients with a small intravenous dose of pentothal sodium. This practice is adopted chiefly because we find that this induction is the most pleasant for the patient of the procedures yet available to us. We are concerned with using an induction which is pleasant for the patient because the great majority of patients who are receiving plastic surgical treatment are faced with the prospect of several operations. Any technique, therefore, which abolishes fear of the operating room is well worth while. This technique also simplifies the anaesthetic procedure in patients who have defects of the face, and in those patients where the face is covered with dressings or some external splint fixation of the facial bones, or tied to a tube pedicle.

2. *Intubation.*—Following the induction with pentothal the ordinary practice is to carry on with nitrous oxide-oxygen and ether, or with cyclopropane, using a closed system with CO<sub>2</sub> absorption, until the patient is in the upper part of the third plane of third stage anaesthesia—that is, until he has automatic respiration and is moderately relaxed. Intubation is then done by the oral or nasal route, and the tube is connected to the closed circuit. If the pharynx is still relaxed, it is packed with fine mesh gauze, which is saturated with paraffin oil or vaseline. The pharynx should be relaxed before the packing is inserted, otherwise it may be forced by the pharyngeal muscles upward into the mouth, and the system will no longer be airtight.

The pharyngeal pack is recommended in preference to any type of pneumatic cuff on the endotracheal tube. It has been noted that the anaesthesia for plastic procedures should be maintained in a very light plane. The pressure of an inflated cuff on the wall of the trachea in the lightly anaesthetized patient sets up a gasping reflex which reduces the respiratory exchange of the patient, produces suffusion of the skin of the head and neck, and introduces movements which make the surgical procedure difficult. The use of cocaine spray and tube lubricants containing topical anaesthetic agents has not eliminated this reflex.

The pharyngeal pack must be inserted carefully and evenly on the two sides of the tube. The mouth is held open by a mouth gag. With a good light coming over his shoulder the anaesthetist draws forward the tongue, using an ordinary right angled tongue spatula. If the

patient is relaxed the epiglottis should be easily exposed. The pack is then inserted, using a pair of long dressing forceps (without teeth) or Magill's forceps. It should be placed well down into the piriform fossa on either side of the tube, and, making sure that the amount of packing is kept equal on each side of the tube, it is continued up to the dorsum of the tongue. If there is to be no operative procedure in the mouth it is well to lead the end forward to the front of the mouth to assist in its recovery after operation.

The decision for nasal or oral intubation will often be dictated by the site and nature of the operation. It will be obvious that nasal intubation is out of the question if the operation involves the nose, and oral intubation may be awkward if the operative site includes the chin and neck. In cases where choice is not dictated in this way, nasal intubation is always to be preferred, because it materially reduces the changes of having the tube obstructed by subsequent movements of the head, or compressed by the surgeon or his assistant. Furthermore, the nasal tube may be passed in most cases without the use of direct vision, thus preventing the small abrasions of the pharynx which are readily produced at times with the laryngoscope.

3. *Special Problems of Intubation.*—We frequently meet patients with surgical conditions which make the procedure described above either difficult or impossible. These are patients who have large defects of the face, recent facial injuries, bulky dressings over raw areas or recent grafts, or external splints of one type or another supporting fractures of the mandible, malar or maxillae. Following the induction with pentothal these patients may be approached in either one of two ways.

The anaesthesia up to the point of intubation may be carried on with a mask and an ordinary ether drop bottle. Owing to the difficulty of getting the mask anywhere near the face this may be a long and trying procedure, but can usually be brought to a successful conclusion with a little patience on the part of the anaesthetist and some tolerance on the part of the waiting surgeon.

Alternatively, these patients are anaesthetized to the point of complete relaxation with pentothal, and the endotracheal tube is passed immediately by direct vision, the anaesthesia being continued from that point through the tube. The use of direct vision is recommended for nasal intubation in these patients because, should the first attempt at blind intubation fail, the patient may have a troublesome spasm of both larynx and pharynx at the next attempt. A proportion of these patients may be intubated blindly by waiting for a cough, when the pharyngeal muscles will direct the tube into the larynx, but it is my experience that this procedure is not always effective, and the personal discomfort of events following such failure in these cases has led me to abandon the practise for the more certain procedure outlined above.

In a large number of operations we find that, no matter how placed, the catheter connector and the connecting tube of the anaesthetic system intrude themselves into the operative field. This is an unnecessary source of anxiety to many anaesthetists and surgeons. These pieces of equipment should be sterilized before use by soaking in some germicidal solution. We use 1:1000 biniodide of mercury solution. Provided, then, that the anaesthetist's hands are clean when he commences his procedure, surely the exposed bits of equipment will be as clean as, or cleaner than the patient's skin. They are then "prepared" with the rest of the field before operation, and need give no more concern than the exposed skin.

The drag of the tube on the patient's nose becomes an important problem when the site of the plastic procedure is the upper lip. If a satisfactory result is to be obtained here, it is necessary that the normal relations of the alae of the nose and the upper lip should not be disturbed. For that reason, it is wise to intubate these patients through the mouth. If that is impossible under the circumstances, the connecting tube should be supported in a manner which prevents the coupling from dragging on the nose. This may be done by the use of adhesive strapping, but the most satisfactory method is to use a Goldman's Ring with a rubber band or head harness about the head. The Goldman Ring is a flat metal ring which fits tightly about the connecting tube, and has a hook on either side for the attachment of a head harness or rubber band.

I think it is accepted practice to lubricate the distal portions of endotracheal catheters with vaseline or some soluble jelly preparation. If these simple lubricants are employed in light endotracheal anaesthesia the patient is likely to cough when the head is moved. The use of 5 per cent decicaine (pontocaine) ointment as a lubricant has been very useful in minimizing this feature, and has been, I think, a little more effective than 10 per cent percaïne ointment, which we used previously.

4. *Care of Patient at Conclusion of Operation.*—It is wise to remove the packing and the endotracheal tube at the conclusion of the operation, before the head is moved about in the application of dressings and bandage. In cases where this is not practicable, or where it is neglected, patients frequently have a sore throat on recovery. This results from the movement of the tube in the larynx, and the friction of the packing in the pharynx.

Following the removal of the packing, the pharynx should be inspected for small abrasions and those found may with benefit be painted with a 20 per cent solution of mercurochrome. It will be found that this simple treatment usually prevents a complaint of sore throat.

Before dismissing the patient aspiration of the pharynx should be efficiently performed, removing all blood and mucus. This not only reduces the possibility of aspiration of foreign material into the lower respiratory tract, but prevents a great deal of postanaesthetic gagging

and coughing. In cases where the agent has been ether, it has a definite influence on the incidence of postanaesthetic vomiting.

*Inhalation Agents.*—The majority of cases may be done satisfactorily with nitrous oxide and oxygen, using a minimum of ether for maintenance. There is a group of patients, however, in whom a considerable depth of anaesthesia may be required, and the presence of blood or pus in the mouth or pharynx makes it advisable to make the recovery period as short as possible. These patients are much safer when cyclopropane is used.

Cyclopropane has other advantages over nitrous-oxide and ether anaesthesia. Postoperative bleeding from a graft bed may be determined by postoperative straining. We rarely see postanaesthetic retching and vomiting in patients who have been anaesthetised with cyclopropane following an induction with pentothal. There is much value in eliminating this potential factor in the development of haematoma. The consideration of the patient's comfort should also recommend this agent.

Many surgeons profess to dislike cyclopropane anaesthesia on the ground that it is responsible for greater oozing in the operative field. In a recent series of cases we found that it was impossible for the surgeons to distinguish between nitrous oxide-ether and cyclopropane on this basis. It is probable that cyclopropane earned this reputation because it was the first anaesthetic agent to be administered over considerable lengths of time in completely closed systems, at a time when ether was usually administered by open or continuous flow methods. Accumulation of  $\text{CO}_2$  in a closed system will certainly produce more bleeding when compared to an open system, and greater attention should be directed to this factor, which is neglected by many anaesthetists. The importance of adequate absorption of  $\text{CO}_2$  in closed circuits must be emphasized. Increased bleeding will be produced by the accumulation of  $\text{CO}_2$ , whether the agent be ether or cyclopropane.

*Epinephrine with Inhalation Agents.*—It is the common practice of plastic surgeons to inject a solution containing epinephrine about the operative field to produce haemostasis. The amount used varies between 4 minims and 8 minims of 1:1000 epinephrine per fluid ounce of saline or local anaesthetic solution, representing concentrations of epinephrine varying between 1:120,000 and 1:60,000. Rarely is more than 6 to 8 cc. of this solution injected. In no case have I seen any ill effects from this practice with any agent, including cyclopropane. Reference to some of the reports of fatalities following the injection of epinephrine during cyclopropane or ether anaesthesia shows (1) in most cases the solution used was epinephrine 1:1,000; (2) the quantities used will certainly produce shock and cardiac irregularities in many normal individuals without the presence of any anaesthetic agent.

*Spinal Anaesthesia.*—Spinal anaesthesia may be useful in some cases of plastic surgery. It has two definite disadvantages. (1) It dilates

the vascular bed of the anaesthetized area, with resulting ooze of blood from small vessels. (2) It abolishes muscle tone. Both of these considerations have been discussed above. The only indication for spinal anaesthesia in plastic surgery would seem to be the necessity of immediate operation in a patient who is, for some reason, unsuited at the time for other techniques.

*Nerve Blocks.*—Peripheral nerve blocks and epidural blocks share the disadvantages of spinal anaesthesia, but are extremely useful in patients who are too ill to withstand spinal, inhalation or intravenous techniques, particularly when the block technique is applied to an extremity. In patients where the only anaesthesia required is for the cutting of a skin graft, block of the lateral femoral cutaneous nerve of the thigh to be used is a very satisfactory procedure.

*Pentothal.*—Intravenous pentothal anaesthesia has become one of our most useful techniques in anaesthetizing patients for plastic procedures. Its use in induction has been discussed above. It is extremely useful for minor operations and manipulations of short duration, but its usefulness is by no means limited to these. It has much to recommend it in any plastic procedure which does not involve interference with the airway. The chief advantages are: (1) The induction and maintenance may be accomplished with one drug and with the least disturbance of the patient. (2) Light anaesthesia may be readily maintained without significant loss of muscle tone. (3) Patients sleep quietly after operation and awaken without coughing, vomiting and straining. (4) The necessity of sedation in the postoperative hours is reduced or eliminated.

It will be found most satisfactory for the longer procedures to induce anaesthesia rapidly with a 5 per cent solution of pentothal, and to maintain it with a 1 per cent solution. Satisfactory anaesthesia is maintained with a surprisingly small amount of drug by this technique. The whole procedure may be carried out with a syringe, although I personally prefer a drip technique. If a syringe is used it will be found useful to connect the syringe to the needle by a short length of fine rubber tubing. When the syringe requires refilling the tubing is clamped by ordinary artery forceps or a spring clamp, and the syringe may be detached and refilled without removing the needle from the vein.

*Basal Anaesthesia.*—When local anaesthesia or nerve block is to be used, it is often desirable to have the patient asleep before he comes to the operating theatre. This may be accomplished by heavy premedication with opium derivatives and barbiturates, hypodermically and by mouth, or it may be accomplished by the administration of some anaesthetic drug by rectum, to produce a state of "basal anaesthesia" before the time of operation. Avertin fluid may be used, but I personally prefer to administer pentothal by rectum for this purpose. The average dose is 0.5 Gm. for each 25 lbs. of body weight. This should be made up in about 100 cc. of distilled water, and instilled into the rectum about

one hour before the patient is to go to the operating theatre. This technique is especially useful with children, and the dosage is the same. It may also be used as an induction before general anaesthesia in those patients where no vein is available for intravenous administration of the drug.

*The Burned Patient.*—I think that it should be stated as a rule that the severely burned patient should never be given a general anaesthetic if that can be avoided. If an anaesthetic agent is necessary for treatment, it should be as short and as light as possible, and the anaesthetist must take whatever steps he can to remedy the grosser biological disturbances before anaesthesia is administered. His chief concern should be with the question of shock. Patients with extensive burns show early and frequently profound shock. This is associated with haemoconcentration, which may be particularly marked in these people. Haemoconcentration, if present, may easily be demonstrated by ordinary determinations of haemoglobin and red blood cell count. Haematocrit readings are valuable if this method is available. Since the haemoconcentration is due to the escape of the blood protein and fluid into the tissues, it may most satisfactorily be remedied by replacement of serum proteins. We feel that this is best achieved by the administration of concentrated blood serum. Blood transfusion in the acute phase is not recommended, as it does not relieve the haemoconcentration.

At a later stage burned patients have a tendency to develop a profound anaemia. This is particularly true of patients treated by the modern saline bath technique. At this stage these patients should be given blood transfusion before they are subjected to any anaesthetic procedure.

The choice of agent for the burned patient is probably open to question. I have found pentothal to be most satisfactory, but there are no greater contraindications to the use of other agents. It should be remembered that renal damage frequently follows severe burning, and the anaesthetist would be wise to determine the renal function before choosing an anaesthetic agent for a burned patient.

#### SUMMARY

1. Considerations controlling the choice of technique for anaesthesia in plastic surgery are discussed.
2. Technique of intubation and special problems of intubation are considered.
3. Individual agents are discussed in their application to anaesthesia in plastic surgery.
4. Some special problems arising in burned patients are considered.