ANESTHESIA FOR PLASTIC SURGERY OF THE FACE

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The principles of anesthesia in plastic surgery have been discussed by Gordon (1) and formulated by Apgar (2) to include the following: (a) no distortion of the operative field, (b) no increase in bleeding, (c) maintenance of normal muscle tone, (d) pleasant induction, (e) smooth recovery, and (f) no encroachment on the operative field. While several methods and agents satisfy these criteria, it is the concern of the anesthesiologist to choose the one best suited to the case. It is the purpose of this paper, based on experience with 630 elective plastic operations on the face,* to present some of the elements which may determine that choice.

From the surgeon's viewpoint, the induction and preliminary steps of the anesthetic procedure are of little concern. Once the surgical procedure is started, however, proper anesthesia can greatly facilitate operating conditions. The anesthesiologist must neither distort the operative field nor encroach upon it with cumbersome or unsterile apparatus. An oral endotracheal tube may cause facial asymmetry if it pulls the corner of the mouth laterally. A face mask is seldom convenient to use. Bleeding in the operative area must not be encouraged by the agent or method. Muscular tone should be preserved as much as possible, especially during plastic procedures on the cheeks and about the mouth, so that grafts which appeared perfect in the operating room are neither puckered nor taunt after normal muscle tone has returned. Slight movements by the patient are not objectionable unless frequent or occurring during a delicate maneuver. Finally, the surgeon requires a quiet patient until after dressings are applied. The proper placement of bandages, particularly if pressure dressings are used, is one of the most important steps, insuring a minimum of hemorrhage and exudate beneath the graft.

From the patient's viewpoint, a smooth induction and recovery are desirable. If the face is tender because of the deformity, a face mask may produce discomfort during induction. Local or regional anesthesia is usually well tolerated for short procedures when the injections are not too painful. Most patients, however, prefer general anesthesia for prolonged operations or for multiple stage operations.

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From the viewpoint of the anesthesiologist providing general anesthesia, the requirements of the surgeon and patient should, of course, be met as far as possible. In addition there are several problems which require elucidation. The most pressing of these are the provision and maintenance of an adequate airway. For intra-oral operations where local anesthesia is impracticable or for surgical procedures involving extreme flexion, extension or torsion of the neck, the endotracheal route guarantees a free airway and is the obvious choice. In other plastic surgery of the face and neck in which the airway is not encroached upon, there are several reasons for not employing an endotracheal technic. A deeper plane of anesthesia is required for the tolerance of the endotracheal tube than is necessary for the operation. This will produce relaxation of the facial muscles. If attempts are made to maintain anesthesia in lighter planes, the patient may cough in response to the endotracheal airway.

Bleeding of an oozing nature in the operative field is easily caused by any straining effort, such as coughing, retching, or obstructed respiration. This may be the result of a decreased venous return from the facial area accompanying increased intrathoracic pressure. One need only observe the distended external jugular veins for evidence of this. In respiratory obstruction, hypercapnia may contribute to peripheral vasodilatation.

When the electrocautery is used, as it commonly is, to secure hemostasis, a nonexplosive agent is indicated. The risk of ignition is considerable when sparks are produced within a few inches of the nose and mouth with inflammable agents in use, even with a closed, supposedly gas-tight system.

To control secretions during the course of lengthy operations additional quantities of atropine or scopolamine should be administered as the effects of the original dose wear off. In practice, the premedication dose is repeated hypodermically after two to three hours of surgery. In the event that mucous formation is obvious before then, neither of these drugs is given, since this will presumably cause the resorption of water from the secretions, leaving a thick tenacious mucus which the patient will have difficulty in expelling.

Patients coming to surgery have had little or no fluid intake since the previous night and their liquid intake by mouth is often limited during the first postoperative day. Accordingly, it is essential that adequate amounts of fluids are administered parenterally during the surgical procedure. Approximately 500 cc. of 5 per cent dextrose in saline, saline solution, or plasma as indicated is administered each hour. If patients are then encouraged to drink as soon as they are able, it is seldom necessary to institute postoperative parenteral fluid therapy. Patients undergoing local anesthesia are not given intravenous fluids unless the nature of the operation makes postoperative feeding difficult.

Adequate respiratory exchange immediately after operation must
be maintained. The large pressure dressings usually held in place by elastic bandages must be kept away from the anterior portion of the neck in order to avoid strangulation. These dressings, if they include the chin, tend to retract the lower jaw, thus producing respiratory obstruction. For these reasons an oral or nasal pharyngeal airway is left in place until the patient is fully roused or will no longer tolerate its presence.

Local Anesthesia

In the series of cases which form the basis for this paper, local anesthesia, including the various nerve blocks, was admirably suited to facial plastic operations. It answered the requirements of an anesthetic for such operations with the possible exception of causing some distortion of the operative field when large volumes were infiltrated.

Table 1

<table>
<thead>
<tr>
<th>Facial area</th>
<th>Local anesthesia</th>
<th>Intravenous anesthesia alone</th>
<th>Intravenous plus inhalation anesthesia</th>
<th>Inhalation endotracheal anesthesia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neck</td>
<td>13</td>
<td>1</td>
<td>38</td>
<td>1</td>
</tr>
<tr>
<td>Ears</td>
<td>47</td>
<td>13</td>
<td>38</td>
<td>8</td>
</tr>
<tr>
<td>Eyebrows, lids and orbit</td>
<td>50</td>
<td>26</td>
<td>52</td>
<td>10</td>
</tr>
<tr>
<td>Excision of powder stains of face</td>
<td>21</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Checks, forehead and chin</td>
<td>70</td>
<td>12</td>
<td>27</td>
<td>8</td>
</tr>
<tr>
<td>Nose</td>
<td>90</td>
<td>3</td>
<td>12</td>
<td>4</td>
</tr>
<tr>
<td>Lips</td>
<td>64</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Jaw</td>
<td>3</td>
<td></td>
<td>1</td>
<td>15</td>
</tr>
<tr>
<td>Intra-oral</td>
<td>36</td>
<td></td>
<td>21</td>
<td>48</td>
</tr>
<tr>
<td>Total</td>
<td>394</td>
<td>57</td>
<td>131</td>
<td>48</td>
</tr>
<tr>
<td>Per cent of total</td>
<td>63</td>
<td>9</td>
<td>21</td>
<td>7</td>
</tr>
</tbody>
</table>

Since local anesthesia was least disturbing to the patient’s physiology, it was the method of choice for comparatively minor operations, such as excision of scars or procedures to be carried out in areas easily subjected to topical, infiltration, regional, or conduction anesthesia. Local anesthetic agents, incorporating vasoconstrictors, helped reduce bleeding during operation and this fact often prompted the plastic surgeon to inject such an agent even in the presence of general anesthesia. As will be seen from Table 1, local anesthesia was used in 394 cases. Intra-oral procedures as well as most operations on the lips and nose were usually performed with a combination of topical cocaine and infiltration of procaine. The other operations performed under local anesthesia
were, for the most part, removal of scars, setting of tube grafts, or revision of previous grafts. The most useful nerve blocks were the mandibular and supraorbital.

The choice between local and general anesthesia was most often left to the surgeon. There were several reasons, however, why general anesthesia was frequently preferred. Protracted surgical procedures under local anesthesia were often uncomfortable for the patient even if complete pain relief was afforded. The position of the head could not be changed, the face was usually covered by drapes so that breathing was muffled, and the patient was aware of the operative manipulations. Adequate and sensible premedication helped allay these discomforts. Even so, many patients became restive after one or two hours. For these reasons extensive plastic procedures on the face were usually performed during general anesthesia. The deformities seen were often extensive scars, including the results of facial burns, and the size and fibrosis of these areas made local anesthesia impracticable. Then, too, multiple stage procedures were sometimes necessary and the patients preferred to be “asleep” rather than conscious. When skin grafts had to be taken from several donor areas, general anesthesia was almost mandatory.

**Inhalation Anesthesia**

In those cases in which the airway was encroached upon or in which the operation was expected to take longer than three hours, the endotracheal route was used. Thus, in 48 cases, or 20 per cent of those patients receiving general anesthesia, the operation was performed with this method, including most extensive reconstructions. Cyclopropane was not available but it would have been a valuable agent if the surgeons had abstained from using epinephrine as a vasoconstrictor. There is some question as to whether cyclopropane predisposes to capillary oozing.

Ethyl ether was used as the primary anesthetic agent with endotracheal technics. Induction could often be accomplished with nitrous oxide and oxygen by mask, but when dressings, friable tissues, or tenderness of the face made this impractical, intravenous pentothal sodium was used. When it was not specifically indicated there were several reasons for not employing ether. Ether was more potent than necessary since muscular relaxation was not required. There was a rather high incidence of postoperative nausea and vomiting after ether anesthesia. Since this type of patient was almost always bandaged with massive pressure dressings, vomitus was likely to contaminate the nearby dressings and clearing the mouth and pharynx of vomitus was difficult both for the patient and ward personnel. In addition, it was thought by some plastic surgeons that the straining incident to retching and emesis might produce bleeding beneath the skin grafts with consequent separation of the graft from the recipient site.
Intravenous Anesthesia

Intravenous anesthesia alone carried none of these objections but did entail other hazards, such as laryngospasm when airways were inserted or when mucus or the base of the tongue initiated the laryngeal reflex; large doses necessary to maintain anesthesia over long periods, and prolonged recovery periods after such large doses. When intravenous anesthesia had been initiated for facial surgery it was difficult to change to an inhalation method of anesthesia once the operation had been begun. This meant that no matter how long the operation and no matter how much pentothal was required, administration of the drug had to be continued even in excess of what might be considered safe dosage (3). After 55 patients had been operated on under intravenous anesthesia alone, it was thought that these drawbacks were of such magnitude that some method of administering nitrous oxide and oxygen as complementary anesthesia to pentothal sodium should be used. It has been shown repeatedly (3, 4) that this decreases the amount of pentothal needed, insures an adequate supply of oxygen, and makes for smoother anesthesia. Since the surgeon was working in the area normally used in applying a face mask, however, the administration of nitrous oxide presented some difficulties. Mixtures of nitrous oxide and oxygen have been administered by the endotracheal route to complement pentothal anesthesia (3) and this can be done when maintenance of the airway is a problem. An oropharyngeal airway fitted with an adapter can also be used. The Connell or Buchanan airways are satisfactory or an adapter such as the one used in this series (fig. 1) can be constructed. This utilized an ordinary Guedel rubber airway. To prevent laryngospasm or coughing when the airway was inserted during light pentothal anesthesia, the pharynx and larynx were first thoroughly anesthetized with a topical anesthetic agent, such as 5 per cent butyn sulfate. "Intravenous anesthesia was then instituted
with a 2.5 per cent solution of pentothal sodium, using a three-way stopcock to allow the administration of parenteral fluids. Before the patient was draped, the special airway was inserted by the anesthetist or surgeon. If the airway was to be close to the operative area, it was first sterilized by soaking overnight in 70 per cent alcohol, rinsed in sterile water and shaken dry by the scrub nurse.

The airway was connected to the anesthesia machine and a mixture of 66 per cent nitrous oxide and 34 per cent oxygen was administered.

![Fig. 2. The airway in use. After applying some of the drapes the surgeon has inserted the airway. Note the three-way stopcock for administration of fluids or pentothal sodium.](image)

No attempts were made to pack the throat or obstruct the nostrils and the anesthetic was conducted by the semiclosed circle carbon dioxide absorption technic, excess amounts of the gaseous mixture escaping around the oral airway, through the nostrils, or through the safety valve on the machine (fig. 2.). Hypoxia had to be avoided in any event (5). It was not sufficient merely to provide enough oxygen to satisfy basal requirements. The total volume flow of gases had to be great enough to avoid building up a high concentration of nitrous oxide in the rebreathing bag as the oxygen was utilized by the patient. In practice this amounted to a minute flow of at least 3 liters of the mixture, including at least 1 liter of oxygen.
If, during the course of anesthesia, it became necessary to change agents because of bronchiolar constriction, hypotension, rapid destruction of pentothal, or for any other reason, the change-over could be easily accomplished if the ether vaporizer was gradually introduced into the system. In this event the surgeon was warned of the dangers of using the cautery.

![Graph showing the duration of anesthesia with and without nitrous oxide.](image)

**Fig. 3.** Pentothal sodium expressed in grams per hour required with and without nitrous oxide. The number of cases averaged for each time interval is indicated on the bar.

In order to compare the quantities of pentothal required with and without complementary nitrous oxide, the amount used in consecutive cases was determined in terms of grams per hour. Then, since relatively more pentothal is used during shorter cases, the two groups were compared according to the duration of anesthesia. The results are summarized in figure 3. It will be seen that 17 per cent to 55 per cent more pentothal was required when nitrous oxide was not administered. This meant increased recovery time and increased danger of postoperative pulmonary complications.

This nitrous oxide, oxygen, pentothal, and butyn combination utilizing an oral airway was used in 131 cases of facial plastic surgery.
Usually it was necessary for the anesthetist to support the patient’s chin, but in no case was there any interference with a free respiratory exchange. Patients were usually awake when they left the operating room and postoperative vomiting was not a serious problem.

SUMMARY

Anesthesia for facial plastic surgery is discussed from the viewpoint of the surgeon, patient, and anesthesiologist.

In a series of 630 cases, local anesthesia was the choice for relatively minor procedures and was used in 63 per cent of cases.

Endotracheal anesthesia was required in long procedures encroaching on the airway. It was used in 7 per cent of cases.

Intravenous anesthesia alone carries many disadvantages and was used in 9 per cent of cases.

Intravenous anesthesia complemented by nitrous oxide and oxygen was suitable for most facial surgical procedures in which general anesthesia was required, and was used in 21 per cent of cases.

REFERENCES


MEETING OF THE MASSACHUSETTS MEDICAL SOCIETY

At the 167th Annual Meeting of this Society, to be held May 25, 26 and 27, 1948, at the Hotel Statler in Boston, Massachusetts, two papers will be presented before the General Session and one luncheon discussion on subjects of general interest to anesthesiologists.

Doctor Meyer Saklad, Director of the Department of Anesthesiology, Rhode Island Hospital, Providence, R. I., will present a paper before the General Session on “Operative Morbidity—Whose Responsibility?” at 9:50 to 10:10 a.m. on Thursday, May 27, 1948.

Doctor E. A. Rovenstine, Professor of Anesthesiology, New York University Medical School and Director of the Department of Anesthesiology, Bellevue Hospital, New York City, will be the main speaker at the luncheon meeting held by the Section on Anesthesia of the Massachusetts Medical Society 12:00 o’clock noon to 2:00 p.m. Thursday, May 27, 1948, at the Hotel Statler, when he will discuss “The Present and Future Status of Cyclopropane.” Doctor Rovenstine will also present a paper before the General Session on “The Management of Pain,” Thursday afternoon, May 27, 3:40 to 4:00 p.m.