

THE ANESTHETIC MANAGEMENT OF PATIENTS WITH FRACTURE OF THE MANDIBLE*

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In discussing the development of an anesthetic technic, the adage "there's more than one way to skin a cat" could be used often. So-called variations, refinements and improvements stem from the requirements imposed in meeting the needs of patients, surgeons and anesthesiologists. Anesthetic procedures will and should differ in various clinics and the differences testify to the versatility inherent in proper anesthetic care. Adherence, however, to fundamental principles must be constant. This includes not only the principles concerning preoperative preparation and the selection of anesthetic agents but also complete familiarity with working conditions for the surgeon and the complications and sequelae peculiar to patients undergoing any specialized type of surgical procedure.

The anesthetic technic to be described for surgical procedures about the jaw has evolved over a ten-year period. Component parts of the method represent no radical innovation in current anesthetic practices, but the pattern of application of commonplace technics merits consideration in view of the relatively long period and manner of their evolution.

Throughout the period of development the questions that have inevitably arisen in relation to operations on the mandible have been considered as mutual problems for the Oral Surgery and Anesthesia Services. Their solution, jointly undertaken, has afforded a regimen safe for the patient, convenient for the surgeon and rewarding for the anesthesiologist.

Not all patients in this series were treated in identical fashion and there is little to be gained in enumerating, statistically or otherwise, the phases through which the anesthetic management has passed. At present the method is often modified in some detail to accommodate the individual patient's needs.

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SPECIFIC CONSIDERATIONS

Many of the patients * (36 per cent) were known alcoholic addicts and sustained fractured jaws in the course of their drinking. They were generally young and in good physical condition. Their faces were sore and often visibly bruised, swollen and lacerated. Excitement during induction (52 per cent) was common and was aggravated by holding the rubber face piece over a painful jaw. Emergence delirium could be expected often, and severe excitement did occur in 4 per cent of the cases.

The operative procedures were of fairly short duration and often entailed some bleeding into the mouth. A good working field for the surgeon called for his "possession" of the entire oral cavity, muscular relaxation of the jaw and the privilege of leaning on and turning the head as well as exerting traction on the mandible. A successful operation was easily undone if the patient became severely agitated or delirious postoperatively. Yet it was considered undesirable that these patients have a prolonged postoperative depression because of the hazards from the inevitable accumulation of secretions and blood characteristically following operations about the mouth.

It was observed that these chronic alcoholic patients, in spite of the local injury, evidence depressed pharyngeal and laryngeal sensitivity. They rarely vomited during induction and severe laryngospasm seldom developed. As with any inhalation anesthesia, however, a definite amount of postoperative nausea and emesis was anticipated and required special consideration in those procedures which called for fixation of the mandible to the maxilla.

Three specific oral operations (1) include the majority of the cases and serve best to illustrate the factors involved in the development of the anesthetic procedures: (1) circumferential wiring of the fractured mandible over an acrylic splint (204 cases); (2) Roger-Anderson external fixation of the fractured mandible (122 cases), and (3) resection of the mandible for prognathism, with fixation to the upper jaw (35 cases).

Fracture of the mandible is not treated as an emergency. The patients are allowed an adequate interval during which oral hygienic measures are started, splints are prepared and acute alcoholism, when present, is overcome. Operation is always delayed in instances of post-alcoholic agitation or impending delirium tremens. For the completion of the surgical procedure to-and-fro absorption nasotracheal anesthesia is utilized.

PREMEDICATION

Morphine sulfate, not exceeding 10 mg., and scopolamine hydrobromide, not exceeding 0.4 mg., ninety minutes before operation have

* Admitted by patients themselves—true figure considerably higher.

been found useful. Some patients also receive pentobarbital, 0.1 Gm. orally, forty-five minutes later.

INTUBATION

Ten minutes before scheduled operating time, with the patient on a carriage in the anteroom, a 4 per cent solution of cocaine is sprayed into each nostril, using an ordinary atomizer (fig. 1). The patient is instructed not to swallow but to allow the solution to remain "in the back of the throat" and then to expectorate into a gauze pad. The process is repeated in five minutes, the entire amount of cocaine used being less than 5 cc. It is remarkable that such cursory preparation provides entirely adequate topical anesthesia for intubation in the conscious patient. Spraying the nasal mucosa simplifies intubation by



FIG. 1. Spraying cocaine solution through nose prior to intubation.

providing local anesthesia and simultaneously by shrinking the nasal mucosa, making epistaxis from passage of the catheter less likely. Cocaine reactions have not occurred in any patient in this series. This is, perhaps, owing to the small dose of cocaine used, the previous administration of a barbiturate and the short time interval between cocainization and the induction of anesthesia.

A soft rubber endotracheal catheter is then introduced without the use of a laryngoscope (fig. 2) and the glottis and trachea are anesthetized by spraying a small amount of cocaine through the catheter during inspiration. Blind nasotracheal intubation may be performed in the conscious patient, so cocainized, with relative ease. This procedure is not associated with undue discomfort for the patient if it is explained to him beforehand. It is well to mention that when the catheter is in place, he will not be able to talk. The conservative dose of morphine and barbiturate as premedication allays apprehension, yet does not interfere with intubation by increasing the irritability of the larynx or depressing respiration. It has not been found necessary to

use an anesthetic ointment to lubricate the endotracheal catheter, since inhalation anesthesia is instituted before the effects of any anesthetic jelly would be manifest. Direct laryngoscopy is considered undesirable, either in the conscious or anesthetized patient with fractured mandible, because of the unavoidable manipulation of the bony fragments it entails. In the instances in which blind intubation was unsuccessful, intubation by direct vision was performed after the patient was anesthetized to avoid the pain it involved.



FIG. 2. Introduction of endotracheal catheter in conscious patient.

INDUCTION OF ANESTHESIA

These patients, already intubated, are given a 2 per cent solution of sodium pentothal by vein to induce unconsciousness. There are several advantages from such an induction. It is rapid without producing excitement. Placing the face piece over tender areas of the jaw need not be done with the patient awake. The small dose of barbiturate may provide protection against any latent sensitivity to cocaine and decrease, to some extent, the possibility of severe emergence delirium. It does not, however, result in the long postoperative sleep so often noted when larger doses of the thiobarbiturates are administered.

MAINTENANCE OF ANESTHESIA

When the patient is asleep, a moist gauze packing is placed in the pharynx. This serves the double function of improving the closed system and, more important, of absorbing any blood that may leak into

the posterior pharynx during the operation. Following induction, when there is no specific contraindication, cyclopropane anesthesia is instituted. Cyclopropane is advantageous in these short procedures on the jaw. With it, the patient recovers his reflexes and consciousness rapidly, thus affording a measure of self-protection from possible aspiration from postoperative emesis.

VARIATIONS IN TECHNIC

As already stated, not every patient is treated by this fixed routine. Certain patients are not suitable for intubation in the conscious state. These are individuals who have sustained sufficient injury of the nose to make passage of the catheter painful and difficult. A few patients are markedly uncooperative and will not allow intubation while awake. When "conscious" intubation is not contemplated, cocainization and pentothal induction, as described, is not included. The patients are put to sleep with cyclopropane and subsequently intubated. Infrequently, oral intubation is necessary when injury to the nose makes passage of the catheter unfeasible. Induction with pentothal occasionally is used in the nonintubated case but only after much more thorough cocainization than that described.

A unilateral or bilateral mandibular nerve block has been the selected anesthetic procedure for a few patients. The extra-oral approach is preferred since oral hygiene is usually bad. Although this method provides adequate pain relief, most patients become uncomfortable during the surgical manipulation and have little praise for it. The use of nerve block in these selected cases, however, is a valuable teaching exercise, but has been limited almost completely to oral operations other than those described here.

Ether, as a secondary agent, is still frequently utilized. It seems to be of value in reducing postoperative delirium. Ether, therefore, is used as the primary agent for those severe alcoholic addicts who have shown withdrawal symptoms preoperatively.

There have been other variations in technic which will not be described since, in review, they have little significance. In the current group of cases, not yet analyzed, some patients have received nitrous oxide, pentothal and curare in combination.

EQUIPMENT (fig. 3)

The actual set-up of equipment should be mentioned because it adds significantly to the convenience of the method. An elbow adapter is attached to the free end of the endotracheal catheter which is advanced into the nostril so that the elbow alone protrudes over the ala of the nose. A dental or mouth connecting piece is fixed to the elbow adapter and extends from the nose well onto the forehead to which it is fastened with adhesive tape. Three types of dental connections have been used.

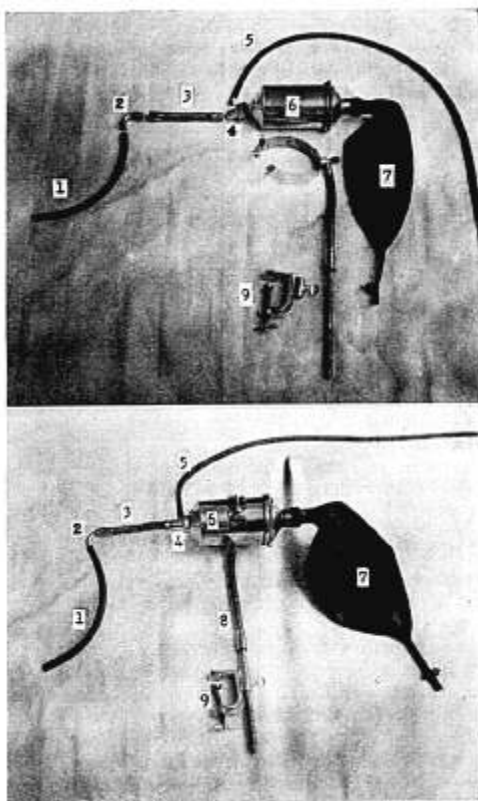


FIG. 3. Anesthesia equipment utilized for fracture of mandible: 1, endotracheal catheter; 2, elbow adapter; 3, dental connection; 4, canister adapter; 5, delivery tube (from gas machine); 6, canister for carbon dioxide absorption; 7, breathing bag; 8, adjustable filter bracket; 9, clamp (bracket to table).

Each has an over-all length of 5 inches and an inside diameter of $\frac{1}{2}$ inch. One kind (the original) is a length of ordinary brass pipe, the ends of which are machined to fit the adapters. The other two are flexible, one a latex-covered wire coil and the other an all metal coil (Foregger). The distal end of the connecting piece fits the orthodox canister adapter. By means of a standard adjustable filter bracket, the canister

and bag are fixed to the operating table and held in proper position behind the patient's head. The anesthetist's position is displaced slightly, but he has free access to the patient. This entire arrangement of the anesthesia equipment is flush with the patient's face (fig. 4), cannot be compressed and permits movement of the patient's head with little danger of twisting or disconnecting any part of the airway.



FIG. 4. Anesthesia equipment for fracture of mandible in use.

COMPLICATIONS

Two precautions merit particular mention. Emergence delirium, if not controlled immediately, can quickly defeat the entire purpose of the operation by disrupting the reduction and fixation of the fracture. Morphine, intravenously, except in prohibitive doses, does not overcome the excitement. Reanesthetizing the patient, using high concentrations of oxygen, is effective but unduly prolongs the patient's stay in the operating room and when discontinued often leads to recurrence of the delirium. For several years it has been observed here, from experience with premedicating acute alcoholic addicts, that subemetic doses of apomorphine are almost invariably effective in overcoming emergence delirium (2). The slow intravenous administration of 1.5 to 2.0 mg. of apomorphine in 10 cc. of saline solution provides excellent sedation without retching or emesis. When necessary it can be repeated.

The other precaution applies to those instances in which the jaws are to be wired to each other. Aspiration and suffocation resulting from postoperative vomiting, even after the resumption of active pharyngeal reflexes, are real hazards. For this reason, the Oral Surgery Service routinely maintains the jaws fixed to each other with rubber bands instead of wire for a sufficient period of time postoperatively so

that this accident may be avoided should vomiting occur. An intern or properly instructed nurse is with these patients during this time so that the rubber bands may be removed should the occasion demand. The low incidence of postoperative nausea and emesis is surprising and may, perhaps, be attributed to the diminished pharyngeal sensitivity observed in alcoholic patients.

ANALYSIS OF CASES (table 1)

In the total of 361 cases only the three oral operations listed are represented. Actually, almost twice this number of procedures were completed in the ten-year period, including a wide variety of oral operations. Although many of these patients were treated in the manner described here, they were purposely omitted from this analysis. These omitted cases support the purpose of this discussion but their tabulation detracts from simplicity of presentation of data.

TABLE 1
TABULATION OF DATA (1937-1947) FOR THREE TYPES OF MANDIBULAR OPERATIONS

Year	No. of Patients	Ex-ternal Fixa-tion	Circum. Wiring	Resect. Man-dible	Alcohol Addicts	Cyclo-propa-ne	Agents		Topical Cocaine	Pento. Induct.	Induct. Excite-ment	Emer-gence Delir-ium	Severe Emesis
							Ether	Other					
1937	18		18		4	14	4				1		
1938	24		24		13	17	7				9	2	4
1939	25		23	2	5	17	8				9	3	2
1940	11		9	2	4	6	5				4	2	2
1941	29		27	2	15	16	13				18	1	
1942	37		33	4	20	16	21				29	3	1
1943	56	43	6	7	15	37	18	1	10		33	1	4
1944	46	30	13	3	20	41	5		24	6	29	2	
1945	58	41	16	1	12	56	2		51	5	31		3
1946	43	8	24	11	16	41	1	1	37	22	21		2
1947	14		11	3	6	14			14	14	2		
(6 mos.)													
Totals	361	122	204	35	130	275	84	2	136	47	186	14	18
Per cent		33	57	10	36	76	23	1	38	13	52	4	5

When arranged in chronological order the data indicate several factors of clinical importance. The use of "conscious" intubation with the aid of topical anesthesia in 1943 led to a decrease in the use of ether and to a relative increase in the incidence of excitement during induction of anesthesia. Emergence delirium, although more likely to occur after cyclopropone than after ether, was decreased as a result of the better airway from the very onset of anesthesia. This implies the obvious and important role of transient and subclinical hypoxia during anesthesia in the occurrence of emergence delirium. The introduction of pentothal induction into the technic in 1944 decreased this induction excitement and, later, virtually eliminated emergence delirium. Surprisingly, the frequency of significant postoperative emesis was very

small in the entire series and was noted even less as the use of ether decreased. Such infrequency of vomiting in the alcoholic patients is noteworthy as well as fortuitous for them following oral surgery. However minimal, it should not be overlooked in anesthetic care for oral procedures.

DISCUSSION

The anesthetic problems inherent in oral and facial surgical procedures have received considerable attention recently (3, 4, 5). This interest was created by the tremendous increase in reconstructive surgery resulting from military injuries. Thornton and Rowbotham (6) reported a group of patients treated in the acute stage of their injuries. Papper and one of us (E. A. R.) (7), in a recent report, discussed the anesthetic treatment of maxillofacial injuries undertaken in the late stage.

Although the anesthetic technics others have recommended for plastic and reconstructive operations include some of the considerations emphasized in this report, they do not cover many of the significant features relative to operations specifically limited to the fractured mandible without the serious involvement of soft tissues.

Although, as the method evolved, the anesthetic procedure became more detailed, it has never become complicated or difficult. Proof for this is the fact that all these patients were managed by a changing group of resident anesthetists of graded experience. While the surgical results are not included here (1), they have steadily improved and permitted the oral surgeons at this hospital to plan a definite approach to a difficult problem with a degree of confidence not previously permitted. No patient has been refused operation; there were no deaths and no serious sequelae relative to respiratory obstruction and aspiration.

The evolution of the present management has been particularly instructive to the Anesthesia Service. Like most technics, incentive for its development grew out of the inadequacies of the preexisting method. In one sense it is the product of the application of the broader aspects of anesthesia care during a period when such applications were indicative of the rapid growth of the specialty. There is little doubt, therefore, that the described technic will remain unvaried for long.

The observations peculiar to the chronic alcoholic patient have been noted. Other lessons were of significant value, particularly in the guidance of residents who were able to share in the process of integrating anesthetic with surgical management as part of a protracted clinical study. There developed an appreciation of the value of interdependence between surgeon and anesthetist. Of most benefit, perhaps, has been the attitude that the method was still tentative and in need of revision. This produced a variety of solutions for each aspect of the problem and helped to create a technical versatility in managing the individual patient. As one resident commented "there's a lot of anesthesia in those cases."

SUMMARY AND CONCLUSIONS

The anesthetic management of patients requiring surgical procedures on the mandible demands meticulous care. The method described, evolved over a ten-year period, has provided safety for the patient and satisfaction for the surgeon and anesthetist. It has been particularly instructive in guiding residents in some of the broader aspects that must be part of good clinical practice.

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3. Analeptics, Robert D. Dripps, M.D.
4. Anesthesia for Ophthalmic Surgery, Thomas Stone, M.D.
- 4:00 p.m. to 5:00 p.m. Combined meeting with the Philadelphia Anesthesia Study Commission—Henry S. Ruth, M.D., presiding.
- 5:15 p.m. to 7:00 p.m. Cocktails.
- 7:00 p.m. Dinner—Charles F. McCuskey, M.D., speaker.

SATURDAY, OCTOBER 9, 1948

9:30 a.m. to 12:00 p.m. Panel Discussions.

1. Pediatric Anesthesia, Curtiss B. Hiekoex, Moderator.
Participants: Charles H. Robeson, M.D.
Margery V. Deming, M.D.
C. Everitt Koop, M.D.
Robert M. Smith, M.D.
2. Teaching Methods in Anesthesia.
Participants:
 - (a) Undergraduate—Henry S. Ruth, M.D.
 - (b) Postgraduate—Stevens J. Martin, M.D.
 - (c) Clinical Research—R. Charles Adams, M.D.
 - (d) Laboratory Research, Paul Dunphy, M.D.