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Anesthesia for Minor Surgery in the Office or Outpatient Department

P. C. Lund

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SEVERAL DECADES AGO many minor surgical procedures now carried out in the hospital were performed in the surgeon's office. The age of specialization changed many aspects of the practice of medicine. Numerous new anesthetic agents were developed and complicated equipment for administering them were usually available only in the hospitals. The tendency shifted to have as many anesthetics as possible administered in the hospitals.

During the past few years, despite the opposition of anesthesiologists in general, the trend is again toward having minor surgical procedures performed in the surgeon's office or the hospital outpatient department.

Some of the reasons for this trend are the crowded conditions of the hospitals and the increase in hospital costs. Recent improvements in medical educational facilities make it possible for every intern or resident to learn at least the fundamentals of anesthesia. There is also now available an adequate supply of safe, simple, relatively inexpensive anesthesia and resuscitation equipment which is especially convenient for office and outpatient anesthesia. Many new anesthetic agents or technics have also been developed during the past ten years that are particularly suitable for ambulatory patients.

Vandam[1] states that most doctors can safely administer certain anesthetics in their offices if they are willing to acquaint themselves with the principles involved and have available the necessary equipment.

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[1] Vandam, Anesthesia for Office Procedures, Medical Science 819-837 (Dec. 10, 1961).

General Considerations

In most cases the technical aspect of administering anesthesia for a minor surgical procedure in an office or outpatient department to an ambulatory patient presents no particular difficulty or problem. The pharmacologic actions of the anesthetic agents employed are precise and predictable; thus the results are satisfactory in most instances.

However, it must be emphasized that all anesthetic agents are potentially hazardous and that it is impossible to completely eliminate all complications. It is imperative to realize that the old axiom that the skill and knowledge of the anesthetist is more important than the agent or method employed applies only if adequate equipment for administration as well as management of all possible complications is available.

Standard Equipment

This is probably the most important factor in the consideration of anesthesia for ambulatory patients. There is no doubt that the lack of even the most essential resuscitative equipment has been responsible for the general condemnation of office or out-patient anesthesia and for the resulting popular opinion that it is just bad medicine. Most doctors know of an instance or two in which a catastrophe occurred for this reason.

It must be understood that the minimal standard, resuscitative equipment is essentially the same *regardless* of the type of anesthesia employed. For example, vomiting with or without tracheo-bronchial aspiration can follow local, inhalation, or intravenous anesthesia. Cardiac asystole or respiratory arrest can also follow regional anesthesia. Therefore, the minimal resuscitative equipment required in an office or outpatient department approaches minimal hospital operating room requirements.

Minimal Resuscitative Equipment Requirements:

1. Adequate means for sterilizing needles, syringes, and the local anesthesia agents.
2. A recovery room (or at least a stretcher or couch) where the patient can recline.
3. Adequate trained help, such as an office nurse or aide.
4. Resuscitative equipment and facilities. The absolute minimal requirements are:

a. A self expanding rubber bag attached to a mask, such as the Ambu-resuscitator. A bag and mask, complete with a reducing needle valve attached to an oxygen tank with which it is possible to administer oxygen under pressure; or best of all a small portable anesthesia machine.

b. Airways of all types and sizes such as oral, nasal, and endotracheal tubes.

c. A suction apparatus (complete with tubes and metal tips) powerful enough to clear an airway of secretions or vomitus, or both.

d. Laryngoscopes of various sizes suitable for all age groups. It is of prime importance that the surgeon be proficient at utilizing this equipment because frequently the insertion of an endotracheal tube followed by aspiration with a catheter is the only method for removing aspirated material from the tracheo-bronchial tree.

e. Various intravenous vasoconstrictor agents and other stimulants, such as neo-synephrine, ephedrine epinephrine, vasoxyl, and barbiturates suitable for intravenous administration such as pentothal, surital or nembutal should be available for immediate injection. It is desirable to have other, milder agents such as "smelling salts" available for the treatment of syncope or primary hypotension.

These minimal requirements are not only necessary for the safety and welfare of the patients but are also important to the surgeon from a medico-legal standpoint. In the event of a complication followed by a catastrophe, the attending surgeon may be involved in a malpractice suit if any neglect can be shown.

It is extremely difficult to defend successfully a suit in malpractice if the prosecution can prove beyond a shadow of a doubt that the commonly accepted standard adequate means of resuscitation or treatment was not available, or, if it was available, was not in statisfactory working order.

Preparation of the Patient and Preoperative Considerations

There is much controversy regarding the preoperative medication of the ambulatory patient for minor surgery.[2] In some centers in England, for example, these patients are evaluated in and out-patient clinic by the anesthesiologists several days in advance of the scheduled surgery. Complete histories, physicals, and the usual laboratory studies are carried out by staff surgeons. The patients then arrive in the outpatient department several hours before surgery and receive preoperative medication, usually in smaller amounts than in-patients. They are anesthetized in the usual manner with minimal amounts of various anesthetic agents during the surgical intervention and are then kept in a recovery room until able to return to their homes with the aid of an escort. This is probably the ideal method of managing outpatient surgery.

Some authorities[3] feel that extensive preoperative workups and evaluations are in most instances unnecessary and have little effect on the choice of anesthesia for a minor office or outpatient surgical procedure.

In a majority of instances this may be true. However, the ambulatory surgical patient should be managed like the hospitalized surgical patient. This means that the following procedure should be carried out: the signing of a consent form; a complete history and physical with at least the most essential laboratory procedures; the withholding of all solid foods and fluids at least 6-8 hours before surgery; and pre-medication according to specific needs.

This routine also applies to local or regional anesthesia because a toxic reaction to the anesthetic agent may induce vomiting and inadequate analgesia may require supplementation with an inhalation or intravenous anesthetic agent.

Selecting the Preoperative Medication

It is generally accepted that ambulatory patients should receive less preoperative medication than in-patients to hasten recovery from anesthesia and decrease the incidence of post-

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[2] Adriani and Yarberry, Pre-anesthetic Medication 876-980 (Dec. 1959); Tesoriere, Uses and Abuses of Scopolamine, 38 Anesth. and Analg. 103 (1959); Cullen, Anesthesia—A Manual for Students and Physicians (Year Book Medical Publishers, Inc., 1961).

[3] Vandam, *op. cit. supra,* note 1.

anesthetic depression. Atropine is preferable to scopolamine because the latter produces a high incidence of amnesia that is frequently followed by confusion. Demerol is probably preferable to the organic opiates, such as morphine or pantopon, because of its shorter duration of action. Demerol also produces less depression of the central nervous system.

The short-acting barbiturates such as nembutal or seconal should generally be omitted except perhaps before local or regional anesthesia when large doses of local anesthetic agents are required.

An ataraxic agent such as phenergan is preferable to barbiturates before intravenous or inhalation anesthesia because of its mild sedative effect and antihistamine action with a minimum of side effects.

The choice of preoperative medication for the average ambulatory patient is phenergan 25-50 mgs. 1½-2 hours preoperatively, demerol 25-50 mgs. with atropine grs. 1/200-1/150 one hour preoperatively. If there is insufficient time for the intramuscular preoperative medications to be effective, one-half of the foregoing recommended dose is administered intravenously. In such instances the oral medication is omitted.

It is well known that most opiates cause pylorospasm. Therefore, to be effective, oral medication must be administered at least one hour before these drugs.

The amount of preoperative medication required varies with the anesthetic agent used. For example, before a potent agent such as fluothane, atropine is the only preoperative medication required. A weak agent such as nitrous oxide requires the maximum amounts of ataraxics, opiates, and belladonna derivatives compatible with the ambulatory status. In regional anesthesia for patients in whom it is important to illicit parasthesias, such as when performing a brachial plexus block, very little preoperative sedation should be given.

Because it is desirable to use only minimal amounts of preoperative medication for ambulatory patients, the timing of administration is important. To reach their maximum effective action, intravenously administered drugs require at least 15 minutes, intramuscularly administered agents at least 45 minutes, and subcutaneously administered agents at least 60 minutes.

It is apparent that office or out-patient surgical patients should, if possible, be scheduled and prepared in advance as is customarily done with the hospitalized patients.

Choice of Anesthesia

This is a controversial question that cannot be answered directly. The choice of anesthesia for ambulatory patients depends on such factors as the operative procedure, the anesthetic equipment available, the ability of the surgeon or anesthetist, the desires of the patient, the space available for recovery. The ordinary methods of anesthesia such as local, regional, intravenous, and inhalation are all suitable for office or outpatient anesthesia.

To insure simplicity and predictability of results, the number of anesthetic agents administered simultaneously should be kept at an absolute minimum. The selection of the anesthetic agents should be limited to those with a wide margin of safety and to those that are rapidly detoxified, or eliminated, or both.

The ideal anesthetic for office use would be one that produces analgesia (loss of pain perception) without loss of consciousness which may lead to problems involving the respiratory, circulatory, and nervous systems. Unfortunately, and paradoxically, analgesia alone is neither desirable nor suitable for all ambulatory patients.

Generally, when loss of consciousness is required, there is a tendency to favor inhalation rather than intravenous agents because the former usually require a shorter recovery period. As a general rule only those agents that can be administered with a minimum of equipment and have short induction, as well as recovery, periods are suitable for ambulatory patients.

Local and Regional Anesthesia

Local and regional anesthesia have numerous advantages that are particularly apparent in office anesthesia. It is the safest method of anesthetizing patients who have eaten recently because the incidence of vomiting with tracheo-bronchial aspiration is very low. The patient is conscious throughout the operation and is therefore able to cooperate with the surgeon. The patient should be able to leave the office unassisted after a short waiting period. A minimum of equipment and technical help is required.

Local or regional anesthesia does not produce amnesia, and the incidence of anesthetic emergencies is substantially lower than with other methods. Most regional block procedures can be performed safely in the office for minor surgical procedures.

It is not advisable in the very young, malingerers, hysterical patients, and septicemic cases. *Regional Anesthesia* by Moore is recommended reading for anyone who contemplates performing regional anesthesia.

Only antiseptics that do not stain clothing should be used. The patient should be recumbent during the injection of the local anesthetic agent to decrease the incidence of syncope and cardiovascular collapse.

Hyaluronidase, which allows anesthetic solution to spread in the tissue by inactivating the hyaluronic acid, is not a substitute for anatomical knowledge in regional anesthesia. It reduces the duration of analgesia and increases the incidence of toxic reactions.

There are excellent local anesthetic agents available today such as procaine, pontocaine, xylocaine, carbocaine, and chloroprocaine. These local agents are widely used, have predictable effects, and are for this reason ideal for office anesthesia for minor surgical procedures.

The following principles should be observed to render these anesthetic agents as safe as possible and to reduce the number of complications:

1. Employ the weakest effective solution that will accomplish the desired effect.
2. Terminate the injection at the slightest sign of an overdose.
3. Observe the patient carefully at all times and be properly prepared to treat complications.

The maximum dose of local anesthetic agent administered for a specific surgical procedure varies with agent, operation, age, and physical status of the patient. Table No. I sets forth the names, uses, concentrations, and dosages of the currently popular local anesthetic agents.

Vasoconstrictor agents, such as epinephrine, are added to most local anesthetic agents to decrease their rate of absorption and prolong the duration of effective analgesia. These agents, epinephrine in particular, may be responsible for many of the reactions such as dizziness, sweating, and pallor that are mistakenly blamed on the local anesthetic agent. For this reason, the concentration of epinephrine in the local anesthetic solution should not exceed 1:200,000. Some authorities recommend that epinephrine

be omitted from local anesthesia for office procedures, but this can only be justified when utilizing agents that have a very low toxicity due to rapid detoxification, such as chloroprocaine or agents that have an inherent vasoconstrictor action such as carbocaine.

TABLE I
LOCAL ANESTHETIC AGENTS

	Regional		Infiltration		Topical	
Agents*	Concentration Per Cent	Maximum Dose Mgs.	Concentration Per Cent	Maximum Dose Mgs.	Concentration Per Cent	Maximum Dose Mgs.
Procaine	2	1000	0.5-1	500		
Pontocaine	0.15	200	0.5-0.1	100	1-2	80
Xylocaine	1-2	1000	0.5-1	500	2-4	200
Cocaine					2-4	200
Carbocaine	1-2	1000	0.5-1	500		
Metycaine	1-15	1000	0.5-1	500	2-3	200
Chloroprocaine	2-3	1000	1-2	1000		

*Popular Nomenclature

Serious hazards such as convulsions or severe central nervous system depression, likely to be encountered in local or regional anesthesia, are due to the production of excessively high blood levels of the local anesthetic agent. This high blood level is caused by one or more of the following:

1. Intravascular injection of the local anesthetic agent.
2. Injection into very vasular regions.
3. Defects in the detoxification mechanism of the patient.
4. The administration of excessive doses or too rapid administration of the anesthetic agent.

It is also possible to encounter a toxic reaction secondary to sensitivity to the drug employed, but this occurs in less than two per cent of the toxic reactions.[4]

There is probably no indication for spinal anesthesia in ambulatory patients. Caudal anesthesia similarly would very rarely be indicated, but epidural analgesia has a few indications particularly in outpatient anesthesia rather than office anesthesia.[5]

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[4] Moore, Regional Block (1953).

[5] Lund, Cwik and Quinn, Experiences with Epidural Anesthesia—7730 Cases, 40 Anesth. and Analg. 153, 164 (1961); Foldes, Colavincenzo and Birch, Epidural Anesthesia: Reappraisal, 35 Anesth. and Analg. 33, 89 (1956).

It is possible to limit the duration of epidural analgesia to 45 or 50 minutes when it is induced with chloroprocaine. Recovery from epidural anesthesia is usually free of any afteraffects or side reactions; thus this form of anesthesia is excellent for diagnostic procedures such as cystoscopies and other minor genitourinary operations. It is possible to produce segmental analgesia with small amounts of local anesthetic agents, which is ideal for outpatient surgery or therapeutic and diagnostic nerve blocks.

Topical Anesthesia

Various endoscopic procedures such as laryngoscopy and cystoscopy can be carried out satisfactorily on ambulatory patients by topical anesthetization of the mucous membranes with such agents as cocaine, pontocaine and xylocaine, as shown in Table I.

The incidence of reactions following topical anesthesia is rather high because blood levels may be reached that equal those following intravascular injection of the same agent. Primary myocardial depression therefore is probably the most common cause of the sudden collapse during this procedure.

Atropine should be administered to decrease salivary secretions which interfere with topical anesthesia. The barbiturates are also indicated because they tend to decrease the incidence of toxic reactions due to the rapid absorption of the local anesthetic agent.

Topical anesthesia is induced by spraying or atomizing the anesthetic solution, applying soaked cotton pledgets, applying anesthetic ointments, or gargling with anesthetic solutions. There is danger of overdosage with each of these methods except possibly with anesthetic ointments. The sprayer or atomizer should have a calibrated reservoir to determine accurately the quantity of drug administered. An efficient atomizer should supply droplets ranging from 30 to 100 microns in diameter.[6]

Inhalation Anesthesia

The popular inhalation anesthesia agents are gases, such as nitrous oxide, or vapors of volatile liquid agents such as vinethene, ethyl chloride, ether, chloroform, or fluothane. The inherent safety in inhalation anesthesia is based on the fact that

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[6] Vandam, *op. cit. supra*, note 1.

the induction and depth of anesthesia is determined by more or less normal respiratory activity.

Nitrous oxide is a pleasant, nonexplosive, low potency anesthetic agent with a short recovery period that has practically no side effects and is therefore an ideal agent for many minor outpatient surgical procedures. But it requires an anesthetic machine, which precludes extensive use in the surgeon's office. Nitrous oxide is, however, an excellent induction agent for the various volatile anesthetic agents.

The volatile anesthetic liquids are more practical for office anesthesia because no special equipment other than a gauze-covered wire mesh mask is required. Anesthesia is induced and maintained by an open drop technique which is not very difficult to perfect. The induction period is however rather unpleasant for the patient and recovery is, in most instances, followed by at least minimal nausea and vomiting, or both. Fluothane is probably the agent in this group that causes the least discomfort. The duration of the recovery period varies directly with the depth or duration of the anesthesia or both.

These volatile inhalation drugs are all potent anesthetic agents capable of producing deep surgical anesthesia which may be accompanied by various respiratory or circulatory complications as well as prolonged recovery. Therefore, these agents must be administered with great care to the ambulatory patient.

Trichlorethylene or trilene is a pleasant, sweet-smelling, nonexplosive volatile anesthetic agent of low potency which can be self-administered with simple inexpensive equipment that is easy to operate.

Trilene is an excellent analgesia agent that produces only light surgical planes of anesthesia. Therefore, it is particularly useful for office or outpatient surgical procedures such as changing painful dressings, lancing of boils, and for diagnostic procedures such as cystoscopy.

A minimum of preoperative medication is required for trilene anesthesia and the incidence of postoperative nausea is low. During trilene anesthesia a patient may respond in a sluggish manner to commands but still have no recollection of the actual surgery, such as an abscess being incised. Various cardiac irregularities may appear when trilene anesthesia enters the surgical planes. Trilene forms phosgene and other toxic gases in the presence of soda-lime; therefore the carbon dioxide absorber

must be shut off or removed whenever this agent is administered with an ordinary anesthesia machine.

Fluothane (Halothane)

Fluothane is a potent, nonexplosive, volatile anesthetic agent possessing many properties that are ideal for ambulatory patients.[7] Some of these properties are a smooth, pleasant, rapid induction without an excitement period; suppression of the laryngotracheal reflexes; absence of secretions; readily controllable depth of anesthesia; and a rapid return to normalcy with rational behavior accompanied by a very low incidence of nausea or vomiting; particularly if the light planes of anesthesia are maintained. Fluothane may well obviate many of the problems and complications encountered in outpatient or office anesthesia. However, it has some serious drawbacks.

It is an extremely potent agent that requires great care and skill on the part of the anesthesiologist if complications such as hypotension and cardiac irregularities are to be avoided. It is very expensive. And although it can be administered by an open drop technic, fluothane must be vaporized by high flows of oxygen and nitrous oxide thorough a special vaporizer such as the fluotec to obtain the foregoing results.

Since most office surgical procedures are completed in a few minutes and little if any relaxation is required, the surgical procedure may be started as soon as the eyelash reflex has disappeared. Following such procedures the patient is in most instances able to walk normally a few minutes after surgery is completed.

Intravenous Anesthesia

Numerous intravenous anesthetic agents are available but only two are used extensively: pentothal sodium and surital sodium. Intravenous injection of an anesthetic agent is the most direct and therefore the fastest method of inducing anesthesia. The intravenous route is also the most hazardous because once a drug has been injected it cannot be withdrawn, but must be detoxified or eliminated by one of the organs of the body such as the kidney or reticuloendothelial system.

Pentothal sodium is a thiobarbiturate that is commonly considered ultra-short acting. This agent which has a very rapid

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[7] Stephen and Little, Halothane (1961).

and pleasant induction phase is usually administered in a 2½ per cent solution by the intermittent injection technique. Pentothal induces little analgesia because it does not block afferent pain stimuli nor does it produce any appreciable muscular relaxation except in excessive doses.

It is the most popular anesthetic agent with patients. It is a useful agent for short procedures particularly if the surgical intervention is timed to coincide with the maximum blood concentration of the drug in the brain. Its most serious shortcomings are a tendency to produce laryngospasm or adduction of the vocal cords; movements of the patient caused by painful stimuli, except in very deep anesthesia; and the recovery rate is unpredictable and frequently accompanied by amnesia, somnolence, and a "hangover."

Pentothal is detoxified at a rate of 15 per cent of the blood content per hour while the remainder of the drug is stored in various adipose tissues which accounts for the prolonged recovery period that is frequently encountered following anesthesia induced with the thiobarbiturates.

Pentothal sodium is not advisable in ambulatory patients with full stomachs or in those with chronic chest conditions that produce excessive tracheobronchial secretions. Premedication with large doses of atropine is essential before intravenous anesthesia.

There is no doubt that the most pleasant method to be anesthetized is with an agent such as pentothal. But it is also extremely hazardous unless administered by an anesthesiologist who is prepared to deal successfully with a severe laryngospasm, respiratory depression, and tracheobronchial obstruction or both. Many patients have died in outpatient departments and in doctors' offices following the administration of a "little" pentothal anesthesia for minor surgical procedures. Most of hese deaths were of course due to inadequate resuscitation or various errors in technique.

Anesthetic Complications and Their Management

This is probably the most important aspect of anesthesia for the ambulatory patient. Regardless of how easy it may seem to anesthetize patients, nearly all anesthetic agents are potent substances following the administration of which various complications or untoward reactions may occur regardless of who administers the anesthetic. It is therefore essential for the surgeon

or anesthetist to know what untoward reaction may occur with each agent or method, and he must be capable of managing it successfully. The complications that occur most frequently may be classified as follows:

1. Respiratory—Depression to failure.
2. Circulatory—Depression to failure or arrest. This may be peripheral vascular or central cardiac in origin.
3. Central nervous system—Stimulation, depression to failure.
4. Various allergic manifestations.

Any, or all, or any combination of the foregoing complications may produce nausea, or vomiting and general malaise. In addition, unusual complications may occur that in most instances are primarily related to the general medical condition of the patient and secondarily to the anesthetic agent. Examples are coronary occlusion following hypotension in a patient with arteriosclerotic heart disease; a cerebrovascular accident in a hypertensive patient; and cardiac arrest in a patient with auricular fibrillation or in an extremely apprehensive patient who has been inadequately medicated. The treatment or management of these various complications is practically identical regardless of the anesthetic agent or method utilized.

Respiratory System

Respiratory depression is managed by increasing the oxygen tension in the inhaled atmosphere, decreasing the concentration of the anesthetic agent if possible, and assisting the respiratory activity if necessary.

Respiratory obstruction is managed as above with the addition of the establishment of a clear airway that will necessitate elevation of the mandible or the insertion of an oropharyngeal or nasopharyngeal airway if the obstruction is caused by the soft tissues of the mouth or pharynx. Any foreign material or secretions must be removed by suctioning.

After a clear airway has been established, artificial respiration is applied if necessary. This is generally carried out by one of the following methods:

(a) Mouth-to-mouth breathing. The physician expands the patient's lungs by exhaling into his mouth and nose while hold-

ing the head extended and the jaw forward. A breathing tube such as a resuscitube may also be used for this purpose.

(b) Manual pressure on the breathing bag of an anesthesia machine.

(c) Manual pressure on the bag of a resuscitator such as the "Ambu," or by utilizing the face mask and bag attached to an oxygen cylinder by means of a reducing valve, etc. The latter methods are of course much more efficient than the mouth-to-mouth method.

In the presence of laryngospasm an attempt is made to force oxygen past the vocal cords by one of the foregoing methods. If unsuccessful, an endotracheal tube must be inserted immediately with or without the previous administration of succinylcholine, the short-acting muscle relaxant that is capable of relaxing the muscles of the larynx in 60-90 seconds. Endotracheal intubation must be followed by controlled respirations with oxygen until the patient has resumed spontaneous respiratory activity.

If the respiratory obstruction is present at the level of the glottis, immediate tracheotomy is indicated or a large bore needle must be inserted in the cricothyroid ligament through which air can be injected and removed with a large syringe.

Respiratory failure is managed with one of the respirators, manual pressure on the breathing bag of an anesthesia machine, or mouth-to-mouth breathing as soon as a clear airway has been established.

The administration of various analeptics such as coramine or picrotoxin is not advisable in most instances because they increase the metabolism and consequent oxygen demand of the body but do not hasten the detoxification of the offending drug nor do they improve the airway.

A respiratory stimulant, such as coramine, in 5-10 c.c. doses may be administered intravenously after adequate oxygenation of the patient has been assured.

Circulatory System

Circulatory depression may be managed by posture (such as elevation of the legs or lowering of the head), the administration of a small dose of a vasopressor agent such as neo-synephrine, ephedrine or aramine. Table II sets forth the common sympathomimetic amines, suggested doses, and routes of ad-

ministration. The oxygen tension in the inhaled atmosphere should also be increased immediately. Syncope or primary hypotension is managed with lowering of the head, administration of oxygen, and also mild stimulants occasionally.

Circulatory Failure

Peripheral vascular failure is managed as above with adequate doses of vasopressors, oxygen and posture. Surgery is interrupted and an intravenous infusion started, if available.

TABLE II
VASOPRESSOR DRUGS

Drug	Dosage (mgs.) Intravenous	Intramuscular	Continuous Infusion mgs./1000 ccs.
Epinephrine*			
Ephedrine	15	20-50	
Neo-synephrine	0.2-0.5	2-5	20 mgs.
Methedrine	5-10	10-20	
Wyamine	15-30	20-80	300 mgs.
Aramine	0.5-1	2-10	50-200
Levophed			4 cc (ampule)
Vasoxyl	5-10	10-20	120 mgs.

*Should not be employed as a vasopressor but given intra-cardiac for cardiac arrest.

Cardiac asystole or ventricular fibrillation should be managed by the closed chest method of manual systole. Intermittent pressure is applied over the lower portion of the sternum utilizing both hands in such a manner that the heart is compressed between the vertebral column and the sternum. This maneuver produces artificial systole and when correctly applied a peripheral pulse should become detectable.

Artificial ventilation is carried on simultaneously in the same manner as for respiratory failure. The general consensus is that the closed chest is more effective and less hazardous than the previously recommended open chest cardiac massage. Epinephrine should be injected intracardiac or intravenously or both and other vasopressor agents such as neo-synephrine and ephedrine may also be effective.

Following successful cardiac resuscitation the circulatory system will probably require further support such as rapid digitalization, vasopressors, and increased fluid volume. The patient should be transferred to a hospital for further therapy.

Central Nervous System

Cerebral stimulation, secondary to local anesthetic agents that produces twitching or generalized convulsions, is managed with oxygen and if necessary an intravenous thiobarbiturate such as pentothal or surital in an amount sufficient to stop the convulsion.

Intravenous nembutal or seconal may actually be preferable to pentothal or surital because of the decreased incidence of laryngospasm. If respiratory failure, circulatory failure, or both ensue, these conditions are managed as mentioned previously.

Cerebral depression which may be caused by local anesthetic agents is manifested by drowsiness, incoherent speech, dullness, or coma. These conditions require no special therapy other than oxygen. But the surgeon should prepare for a more severe reaction.

Central Nervous System Failure

This may occur following or during any type of anesthesia. It is manifested by a sudden severe collapse of circulation and respiration. The patient exhibits pallor, clamminess, dilated pupils, severe hypotension, a pulse of poor quality if perceptible, shallow respirations or apnoea. If untreated, this condition progresses to cardiac arrest.[8]

The treatment involves improving oxygenation, stopping the administration of the anesthetic agent, and supporting or controlling the circulatory and respiratory systems in the manner indicated previously.

It is possible to develop an immediate type of reaction to an excessively high blood level of local anesthetic agent which is manifested by a sudden severe collapse of the circulation and respiration which rapidly progresses to cardiac arrest.

Treatment is of course the same as outlined above, but it is usually unsuccessful. Fortunately this reaction happens very rarely.

Various Allergic Manifestations

These occur chiefly following local anesthetic agents, but they may also be caused by inhalation agents. The usual manifestations of an allergy or sensitivity to a drug are wheals, itching, angioneurotic edema, hypotension, or asthmatic breathing.

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[8] Moore, *op. cit. supra,* note 5.

The treatment, which depends on the symptoms, consists of oxygen as needed, antipruritic drugs, vasopressors, intravenous antihistaminic drugs such as benadryl or intravenous aminophylline for asthmatic breathing.

In summary one must always be prepared for a complication. If one does occur it must be correctly diagnosed and managed *immediately.*

It is important not to overtreat a complication particularly in ambulatory patients. Stimulants such as epinephrine may be detrimental and should be avoided except as indicated above. A barbiturate should be used only for convulsions or severe hypertension or both and only enough should be administered to control the convulsion in order to prevent the development of apnoea.

Conclusion

The various current methods of anesthesia utilized for surgery in the office or outpatient department have been described. The hazards and various complications that may be encountered when dealing with these ambulatory patients have been discussed in detail. Suggested methods of treatment and management of these complications have also been outlined.

It is pointed out that the availability of adequate equipment for resuscitation is essential for the over-all safety and welfare of the ambulatory patient.