

The authors set out to investigate the reports of Ivy and Graham of possible citrate poisoning when using large volumes of blood and plasma. They point out that the work of Ivy and Graham was done on dogs with no correlation in human cases. They studied fifty-three patients undergoing radical surgical operations, in whom large transfusions were necessary. All patients in this series received 1,500 cc. or more of blood and/or plasma in a short period of time. The red blood count and hemoglobin determinations were made two to three days before surgery and repeated twenty-four hours after surgery. The time period for receiving blood and/or plasma was from two to six hours. For blood transfusions 2.5 Gm. for sodium citrate was present for each 500 cc. of blood and the plasma contained about 4 Gm. of citrate for each 500 cc.

In dogs the authors have found that 0.30 Gm. of sodium citrate per kilogram of body weight was the lethal dose when given in fifteen minutes or less. "When the time of administration is prolonged to two hours, as much as 1 Gm. of citrate per kilogram has been given with survival of the animal. Most all our patients received from 0.10 to 0.30 Gm. of citrate per kilogram of body weight in from two to three hours." The patients in this series did not receive a dose of citrate equal to the lethal dose in dogs, due to the slowness of administration of blood and plasma. Five patients of this series were found to lose from 2,100 to 3,100 cc. of blood during surgery, which again confirms the impression many surgeons have that there is more blood loss than is appreciated at the time of surgery.

In this series receiving massive transfusions the urine output was satisfactory during the first two post-operative days, the hemoglobin and erythrocyte count had not changed

from the preoperative level and the patients did not go into postoperative shock. In this series the authors attempted always to give the same type blood as the recipient, and cross-matched each donors' blood with pre-operative samples taken of the recipient's blood.

The authors feel definitely that the work of Ivy and Graham in dogs cannot be applied to human beings since blood and plasma therapy in humans is given under longer periods of time. Their conclusions are:

1. "It is obvious from the data presented that the risk of citrate poisoning associated with the administration of large transfusions is negligible as currently practiced. Whatever the toxic properties of citrate may be, it is apparently detoxified rapidly enough so that it does not present a problem in the use of massive transfusions in man."

2. "Not only did our patients tolerate their massive transfusions well, but we believe that without the liberal use of blood or plasma most of these radical operative procedures could not have been carried to a successful conclusion."

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SELDON, T. H.; LUNDY, J. S., AND ADAMS, R. C.: *Nursing Care as Related to Anesthesia*. Am. J. Nursing **44**: 747-750 (Aug.) 1944.

"It is of particular importance that sedatives be given to the patient as ordered the night preceding operation. A patient who has had a restless night before operation is not in as good a mental condition as one who has had adequate sleep. The sedative which is ordered to be given immediately prior to the operation should be administered sufficiently far in advance to allow it to take its full effect before the patient is anesthetized. To administer a hypodermic injection of morphine and atropine as the patient is

getting on the elevator to go to surgery is poor treatment. . . . If the hypodermic injection cannot be administered some length of time before the patient goes to surgery, then the syringe of morphine and atropine should be carried by the nurse to the operating room. The attending physician then can administer the medication intravenously and thus get the full effect of the medication before the general anesthetic procedure is started. . . . Severe respiratory depression during general anesthesia as a result of the too late administration of the preoperative sedative is extremely disturbing. . . . Another point to remember is the fact that the ingestion of fluids or food just previous to operation is contraindicated. If for any reason food or fluid has been ingested, it is important to pass this information along to the physician in charge of the case. Often patients have removable bridges or partial or full plates in their mouths when they are brought to the operating room. Frequently patients will not tell the nurses on the floor about them because they feel self-conscious with these dentures removed. For safety's sake it is essential that they be taken out, for they may become dislodged during the anesthetic procedure and swallowed or aspirated into the thorax. An artificial eyeball also should be removed. . . . Because pentothal sodium gives such smooth induction, and maintenance is usually relatively easy with administration of small additional doses, changes in the patient's condition may occur relatively rapidly. A perfectly unobstructed airway needs to be maintained at all times. . . .

“If laryngospasm occurs postoperatively after the patient is returned to his bed, he should be turned on his side, the foot of the bed elevated, the throat cleared, the jaw supported to ensure a better airway, and a physician

called immediately. The throat is cleared in laryngospasm by means of aspiration either by a suction apparatus attached to a water tap or by one of the commercial motor aspirators. At all times a nurse must remain with a patient who is asleep under a general anesthetic agent until the patient is awake. . . . Patients to whom ether has been administered frequently are returned to their room in a sound sleep. Unless there are special contraindications, it is well to have that patient lying on his side with the foot of the bed slightly elevated during the period of recovery from anesthesia. In this position any collection of mucus or vomitus will tend to run out of the mouth instead of being aspirated. . . . Postoperative sedatives should not be given until the patient has recovered from the anesthesia to the extent that his reflexes are active. When the cough reflex, swallowing reflex, and so forth, have returned before morphine or another sedative is administered, the patient is not unduly exposed to possible postoperative complications such as aspiration of vomitus or mucus, poor ventilation of lungs with mucous plugs causing collapse of parts of lungs, and so forth. Frequently the patient is returned to his room with an intratracheal tube in place. Many nurses do not know when this tube should be removed. The intratracheal tube originally was inserted to ensure a perfect airway during the operation. It must not be removed from that patient until the reflexes in his throat have returned or are returning. If the intratracheal tube is removed too soon and no other airway is inserted, the muscles of the throat may relax completely, obstructing the airway. If removal of the intratracheal tube is delayed until the reflexes are returning, the natural airway usually will be maintained. The tube occasionally may be removed relatively early and

its place taken by a simple wire or hard rubber oral airway. The latter airways may be left in place until the patient expels them. . . . The preanesthetic treatment and medication is much the same for spinal as for general anesthesia. . . .

"When the patient who is under spinal anesthesia is returned to his room he should be left flat or the foot of the bed should be elevated for twenty-four hours unless this position is specifically contraindicated. It has been found that following a spinal anesthetic, the patient is less apt to get a severe headache or a severe drop in blood pressure if he remains in a flat position with the feet elevated for the first twenty-four hours. After twenty-four hours he may be moved to suit his particular condition. One of the complications of spinal anesthesia is a persistent headache. Various fluids have been administered intravenously and sedatives, spinal taps, and so forth, have been tried as treatment. To date, there is no specific treatment. Treatment is symptomatic. A spinal headache is not necessarily a contraindication to getting the patient out of bed, for it does not seem to prolong the headache. Under spinal anesthesia, muscular relaxation is so complete that when the patient lies in a poor position on the operating table, postoperatively his muscles and joints are extremely sore. It is important to see that the joints, such as knees, toes, and back, of patients under spinal anesthesia do not become hyperextended. Legs should never be left crossed because of danger of pressure on the peroneal nerves. Temporary or even permanent danger may be done by continuous pressure on this nerve. The same may occur to the ulnar nerve in the arm if the arm is left hanging over the side of a poorly padded table. When the patient is returned to his room, the bedclothes must not be drawn

too tightly at the foot of the bed lest the tarsal, metatarsal, and phalangeal joints be extended unduly. When patients are returned to their beds after any form of anesthesia frequently hot water bottles are placed in the bed. If the patient has received a general anesthetic agent, most nurses are particularly careful not to have those which are placed next to the patient's body too hot. However, because the patient usually is awake with spinal anesthesia, nurses sometimes forget that he is not able to determine the hotness of the water bottle and his legs may be burned without his knowing it. Special care must be taken to prevent this accident. . . .

"The operative and postoperative care of patients in association with continuous spinal anesthesia is similar to that for any spinal anesthesia. . . . Patients under continuous caudal anesthesia should lie in one position for only short intervals; since the patient is not warned by pain, owing to loss of sensation, pressure trauma to the tissues may result. We have encountered one case in which this happened. . . . These patients may be burned with hot water bottles. Sensation in the legs may be entirely absent and a burn from a hot water bottle may occur before anyone realizes that damage has been done. It is not unusual for patients to drink and have regular meals during the continuance of the caudal anesthesia in their beds. Care must be taken that the natural vaginal discharges during this time do not contaminate the dressing lying over the . . . catheter or needle. During the postpartum period the sacrococcygeal region must be watched carefully for possible infection. If the patient complains of soreness or if there is any suggestion of swelling and redness in this region, it must be reported to the physician immediately." 1 reference.

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