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"Many physicians do not appreciate the great importance of supervising the patient under spinal anesthesia after the injection has been given and the anesthesia established. . . . Conditions may arise during this period which may be quite dangerous; but these can be prevented or controlled if properly handled. . . . Supervision of the patient after the establishment of anesthesia is an important and responsible job, and should be assigned only to one well qualified for it by training and experience. . . . Fall in blood pressure . . . is a much discussed and almost constant accompaniment of spinal anesthesia. A slight fall in blood pressure may be normal and usually demands no treatment. It is a question, however, just how far this drop may go without detriment to the patient. . . . The blood pressure is a rather mechanical guide to treatment and is therefore not always reliable. The condition of the patient, as evidenced by mental alertness, color, pulse volume, breathing, temperature of extremities, and so forth, is much more reliable. Naturally no exact rule can be given for this either. Experience and gradually acquired judgment must guide. A dulling of the intellect, with pallor, diminished pulse volume, shallow respiration and cool extremities, suggests need for supporting treatment. The least trace of cyanosis calls for instant treatment. . . . The most important effect of a marked fall in blood pressure is its depressing effect on the vital nerve centers. This may to some extent be mitigated or counteracted by slight Trendelenburg position. . . . Some protection is also afforded by the prophylactic use of ephedrine, now practically universally employed. . . .

"Epinephrine, though powerful, is

very short-lived, so that it is usually necessary to give repeated small doses or to employ ephedrine in addition for its sustaining effect. . . . Neosynephrin, a synthetic drug, has an action similar to that of epinephrine, but without the undesirable action of increasing cardiac irritability. The effect is as rapid as that of epinephrine but slightly more prolonged. Melville, Raginsky and Bourne have suggested the use of a mixture of 5 units of pitressin and 25 mg. of ephedrine. We have employed this mixture with considerable satisfaction. When this mixture is given subcutaneously or intramuscularly, it not only raises the blood pressure but sustains this rise for a much longer period than either epinephrine or neosynephrin, although the effect is not as rapid. . . . If the need is urgent, these drugs should be given intravenously. . . . With very sick patients or with very severe operations, it is usually well to start an intravenous saline infusion running before operation, so that if restorative measures are quickly needed during operation, time may not be lost in getting a needle into a vein. Not every fall in blood pressure, however, occurring during spinal anesthesia is due entirely to the anesthesia. Operative procedures, particularly in abdominal operations, produce well marked effects. . . . If the operative procedure is unusually severe or is unduly prolonged, however, real surgical shock may ensue. In this case the use of pressor drugs alone is not desirable, but the ordinary treatment of surgical shock, of which transfusion is usually the most effective, is indicated. . . .

"Nausea and vomiting . . . is uncomfortable for the patient and may interfere to some extent with any operation, but if the operation is an abdominal one, it may interfere so seriously as to constitute a very great danger. . . . Rather, the immediate cause seems to be certain surgical pro-

cedures, as with the surgically caused drop in blood pressure which it often accompanies. Indeed, in upper abdominal operations especially, there is sometimes produced a condition which closely resembles that seen in an athlete who has received a severe blow in the epigastrium during a sports encounter. There is an abrupt fall in blood pressure, diminished pulse volume, pallor, dyspnea, and nausea and vomiting. . . . Treatment of this condition is precisely similar to that of the surgically caused fall in blood pressure. . . . The only thing which will stop it quickly and with reasonable certainty is a general anesthetic. Pentothal sodium as a general anesthetic is a good preventive if started before vomiting has occurred, and either it or cyclopropane is usually effective in terminating vomiting even after it has begun. . . .

"Depressed or arrested respiration . . . may be caused either peripherally, from paralysis of the muscles of respiration, or centrally, from depression of the vital centers. . . . The lesser degrees of intercostal paralysis demand no treatment since they produce little or no effect on the general condition of the patient; larger degrees, however, produce anoxia, which is very bad for the patient and produces marked general effects. . . . It is therefore usually wise to anticipate these effects by supplying the patient with oxygen as soon as upper intercostal paralysis becomes evident. This may be done with a simple mask and breathing bag, with carbon dioxide absorption. As long as the breathing is of reasonable volume, simple application of oxygen for the patient to inhale is all that is necessary; but when breathing becomes more seriously affected (usually evidenced by action of the accessory muscles), some assistance to inspiration by gentle pressure on the breathing bag is of benefit. If paralysis progresses, this pressure is gradually increased

until, finally, with complete paralysis of respiration, complete artificial respiration is carried on by means of rhythmic bag pressure with a closed carbon-dioxide absorption system. Intratracheal intubation insures a clear air passage. The procedures are extremely effective, so much so in fact that stimulation with pressor drugs is not ordinarily required, the blood pressure and pulse volume being practically always well maintained. Patients with complete paralysis of respiration have been carried along in this way by many different anesthetists for periods up to about one-half hour with uneventful recovery. Central failure of respiration is a much more serious affair, and is secondary to a severe fall in blood pressure. A measure of prophylaxis is obtained by the usual procedures of Trendelenburg position and preliminary administration of ephedrine. . . . While oxygen must of course be supplied to prevent any possible anoxia, the essential treatment is that of fall of blood pressure. . . . By far the best treatment of this condition is preventive. . . .

"A less serious but still a quite disturbing factor may intrude in the shape of discomfort suffered by the patient. . . . A sufficient amount of preliminary medication, which puts the patient in a drowsy and 'don't care' attitude, is a great help in preventing this discomfort. If it nevertheless occurs during the operation, it may usually be relieved either by a supplementary dose of medication in the form of intravenous morphine and scopolamine or by resorting to a supplementary general anesthetic, usually one of the intravenous barbiturates, pentothal preferably, or a light gaseous inhalation anesthesia, cyclopropane in particular. . . . The importance of proper supervision appears even greater than usual when the new method of continuous spinal anesthesia is employed."

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