CONTROLLED HYPOTENSION AT INTRACRANIAL OPERATIONS

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DURING the past few years various methods have been introduced for the purpose of reducing bleeding during surgical procedures by means of induced and controlled hypotension.

The ganglion-blocking agent, hexamethonium, was introduced at the Neurosurgery Department of Serafimerlasaretet in the fall of 1951 for use at intracranial operations. After one year’s experience with over 70 patients in whom this method has been used at operation, our technic is as follows.

TECHNIC

Routine pre-operative examination is made with special attention to blood changes (anemia), cardiac history, state and function, electrocardiographic changes and renal changes.

Anemia is rectified, if possible, by pre-operative transfusions.

Premedication is usually morphine and scopolamine in individually adapted doses. Any fall in blood pressure following premedication is noted.

The routine method of anesthesia is by insufflation through a tube with a caliber as large as possible so as to ensure the greatest possible interchange of gases.

Intravenous drip of physiologic saline solution or glucose solution is given slowly from the start of the operation, though at a sufficient rate to ensure free passage through the cannula or needle. The saline and glucose flasks must be rapidly exchangeable for the administration of pre-operatively cross-tested blood, Dextran or the like.

The operating table is horizontal at the beginning of the operation. When it is desired to reduce the blood pressure, an intravenous injection is given of an individually adapted, though always relatively small dose of some hexamethonium compound, diluted with physiologic saline solution so that 1 cc. is equivalent to 10 mg. The initial dose is usually 10–20 mg.

The effect is checked for 3 minutes. If the required fall has not occurred, the same dose is repeated. If the blood pressure still has not dropped sufficiently after 50 mg., the head of the operating table is raised.

By raising and lowering the head of the table the systolic pressure is adjusted to the level required, under 80 mm. but over 50–60 mm. Hg.

In the event of an excessive drop in blood pressure, the head of the table is lowered and blood is administered in rapid drips.

Should hypotension be required over a longer period than 30 minutes, it is usually

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necessary to administer further hexamethonium in half of the initial effectual dose.

For the duration of hypotension a liberal supply of oxygen and decreased amounts of anesthetic are ensured.

Any loss of blood is immediately made good as far as possible by intravenous transfusion through the drip. Apparatus for intra-arterial transfusion is kept close at hand, facilitating transfusion in the centripetal direction, after rapid exposure of the radial artery, if the patient goes into a threatening state of shock.

When the pressure is to be raised again, this is done progressively by gradually lowering the head of the table. The pressure should not be less than 90–100 mm. Hg at conclusion of the operation. If so, we lower the head of the table slightly below the horizontal plane, this usually bringing about the required rise in blood pressure after only a few minutes. Only in exceptional cases is it necessary to resort to vaso-pressor agents, Oxedrin or the like. During the postoperative phase the blood pressure is permitted to rise spontaneously to the patient’s normal level.

Meticulous supervision is required both at operation and during the immediate postoperative phase. The operative field must be observed, bleeding and changes in color noted, the peripheral circulation watched, the pulse continually palpated and the respiration carefully checked, since respiratory obstruction occurs more readily in hypotension.

Postoperatively the pulse and blood pressure are recorded every 5 minutes for 2 hours or until the blood pressure is stabilized, and thereafter they are checked every 15 minutes.

Postoperative management of the patient is routine, with checks of the blood values, electrocardiograms, urine tests, etc.

INDICATIONS

From the present series one may distinguish three main indications for controlled hypotension at intracranial operations.

(1) Arterial aneurysms. In such cases the blood pressure is not reduced until the surgeon approaches the aneurysm, and at its exposure and ligation. With a fall in blood pressure the tension in the aneurysmal sac decreases and the risk of rupture is substantially lessened. Exposure can be done more readily, and if the aneurysm should rupture, the bleeding will naturally be easier to overcome if hypotension is present. At operations for intracranial aneurysms the blood pressure need be reduced below 70 mm. Hg only for a few minutes.

(2) Highly vascular tumors and malformations, such as meningiomas and arteriovenous aneurysms. It was an early experience in neurosurgery that at operations on highly vascular intracranial tumors the surgeon made but little progress in the early stages of the operation because of bleeding from the tumor and surrounding tissues. When the blood pressure commenced to fall after a certain loss of blood, removal of the tumor proceeded more rapidly. This observation prompted Gardner (1946) to develop his method involving arteriotomy at the beginning of the operation. The same results can be obtained with ganglion-blocking agents, administered intravenously, and induced hypotension. In such cases the operation can be completed more rapidly and with less loss of blood. In highly vascular intracranial processes the pressure is reduced at the start of operation.