CONTINUOUS SPINAL ANESTHESIA IN THE POOR RISK AND AGED SURGICAL PATIENT

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ANESTHESIA in the poor risk and the aged surgical patient has always been of prime interest to both the surgeon and the anesthesiologist. An anesthetic method must be selected which not only gives adequate relaxation and analgesia, but which is compatible with the patient's debilitated condition.

Anesthesia in the poor risk patient requires (1) the least possible dosage of a relatively nontoxic anesthetic agent; (2) minimal disturbance of an already unstable physiology, and (3) adequate relaxation. Continuous spinal anesthesia utilizing the ureteral catheter technic[1,2] satisfies these requirements. The indwelling spinal catheter permits small and repeated injections of the anesthetic agent; thereby the dosage can be adjusted individually to each of these extremely ill patients. To avoid the fall in blood pressure which follows widespread motor and vasomotor paralysis, the segmental type of continuous spinal anesthesia is used.[3] During continuous spinal anesthesia, the patient is awake and cooperative except when supplementary agents are employed. The protective reflexes therefore are not attenuated. The relaxation is maximal, an item of particular interest to the surgeon.

The technic differs little from the original descriptions of Tuohy[1,2] and Saklad.[3] The patient is placed in the lateral recumbent position; the skin of the back is prepared with a satisfactory antiseptic solution. A syringe containing 2 cc. of a solution of procaine (1 per cent) and ephedrine (50 mg.) is used to raise a cutaneous wheal at the intended site of puncture (L-3 or 4). The remainder of this solution is injected laterally into the muscles of the back. A 3½ inch 16 gauge Tuohy needle is inserted into the dural sac. An attempt is made to introduce the needle at an angle of 45 degrees with the plane of the skin. This is frequently impossible in the aged if the midline interspinous approach is used. Bony changes and limited flexion may necessitate the use of the lateral approach for lumbar puncture.

A 3½ French spinal catheter with stylet in place is inserted through the spinal needle. Care and gentleness must be observed in this latter procedure. If parasthesias are elicited as the catheter is advanced, the needle may be rotated cautiously whereupon the catheter again is advanced carefully to the level sought.[4] Under no circumstances should the catheter be withdrawn from the needle. The stylet is withdrawn, the needle removed from the back, and an adapter placed upon the free end of the catheter. A 2 cc. syringe is fitted to this adapter. When the catheter is placed correctly in the dural sac, spinal fluid can be aspirated by gentle suction.

In all lower abdominal surgery and in operations upon the lower extremities, the catheter is inserted only 5 cm. beyond the Huber point of the spinal needle. If the incision is to be above the level of the umbilicus, the tip of the

catheter is placed at an interspace 2 to 3 dermatomes lower than the desired uppermost level of anesthesia. The patient is placed in the surgical position.

Procaine hydrochloride crystals (100 mg.) and pontocaine hydrochloride (10 mg.) are made up to 10 cc. with normal saline solution. Both of these agents have low coefficients of toxicity.[5] The action of procaine alone is too transient. Conversely, pontocaine anesthesia is slow in onset but longer in duration. This solution may be considered as isobaric and is administered in units of 1 cc. Injections are made as slowly as possible; thus, the jet-like stream which would be caused by a forceful injection is avoided, and the anesthetic drug pools within a few segments and does not diffuse in the subarachnoid space. A segmental type of anesthesia results, involving only a few segments in the immediate vicinity of the tip of the catheter.

The concentration of the drugs in this solution is adequate to produce motor nerve paralysis. The degree of this paralysis, however, varies with the individual. Analgesia is evident 1 to 2 minutes after the initial intradural injection. Muscle relaxation is not apparent in many instances for 5 minutes.[6] If it fails to occur at this time, another cubic centimeter of solution is injected slowly. At this point only 20 mg. of procaine and 2 mg. of pontocaine in 2 cc. solution have been injected. This low total quantity in such dilution not only avoids damage to the nerve tissue but permits adjustment of the dosage to the individual patient.[7]

Procaine-pontocaine solution is added as necessary to maintain adequate anesthesia. One cubic centimeter of procaine-pontocaine solution will give additional anesthesia for a 32 minute average. These subsequent doses are small and are capable of prolonging anesthesia, the induction of which originally requires two to four times these amounts.[6]

Motor paralysis is limited to those few segments affected; the widespread and profound muscle relaxation of the classical spinal anesthesia is not present. The legs can be moved at will and the integrity of their vasomotor tone maintained. The incidence of phlebothrombosis consequently may be reduced.

Occasionally in the combined abdominoperineal resections, with the patient in steep Trendelenburg's position, it is necessary to anesthetize segments caudad to the tip of the catheter. In this situation, a hypobaric solution of niphanoid pontocaine hydrochloride in distilled sterile water (each cubic centimeter containing 2 mg. of agent) is administered in doses of 1 cc. The position of the patient is not altered.

Preanesthetic Medication

Due to the poor condition of patients in this category, the preanesthetic medication is prescribed individually. Often only atropine is given.

Management

Supplementary agents are indicated to control vomiting, retching, and the discomfort of traction. Pentothal sodium in small amounts, nitrous oxide or intravenous nembutal will control these symptoms. Quantities which may cause the patient to lose consciousness should not be administered. Frequently small amounts of morphine can be given in lieu of other anesthetic agents.

Recently, and not included in this present series of cases, intravenous Ban-

thine bromide (50 mg.) has been administered to prevent or control the nausea and vomiting and discomfort of traction during spinal anesthesia.

Hypotension directly due to the anesthetic agent usually occurs within the first 20 minutes of the intradural injection. The average decline in blood pressure in this series was 28.4 mm. of mercury. In many instances a rise rather than a fall in blood pressure occurs.

Whole blood always must be available in order to enable the anesthesiologist to cope with a pre-existing low blood volume or a significant blood loss during surgery. Intravenous transfusions are given through a 15 gauge needle in any convenient vein. In cases of greatly reduced hemoglobin, severe preoperative hypotension or extreme hemorrhage during surgery, arterial infusion may be used.

Neosynephrin is used to sustain blood pressure and to reverse any serious hypotensive trend.[8]

Oxygen is administered by means of a face mask during all anesthesias.

Discussion

This series of cases totals 100. All patients were poor operative risks because of (1) the severity of the disease requiring surgery; (2) pre-existing disease processes; and/or (3) advanced age. Thirty-three were above the age of 70, and all presented unusually unsatisfactory conditions. In most instances a definitive surgical procedure was carried out instead of exploration or a palliative operation. The average length of anesthesia was 1 hour and 37 minutes and required 3 cc. of anesthetic solution or 30 mg. of procaine and 3 mg. of pontocaine.

Upper abdominal operations	27
Operations on small bowel	9
Operations on large bowel (Including abdominoperineal resections)	51
Herniorrhaphies (Including radical inguinal dissections)	5
Pelvic operations	5
Hip operations	3

Case 1. The longest operative procedure was a total colectomy on a 60 year old man having ulcerative colitis. The entire process lasted 4 hours during which time 60 mg. of procaine hydrochloride and 6 mg. of pontocaine hydrochloride were required. The systolic blood pressure varied between 140 and 100 mm. of mercury, the pulse between 80 and 92.

Case 2. The highest preanesthetic blood pressure was recorded as 220/90 in a 50 year old man in whom the diagnosis of massive inguinal herniation with intestinal obstruction was made along with incidental diagnoses of obesity (243 pounds), and syphilitic heart disease with malignant hypertension. The lowest pressure recorded during surgery was 182/76 (chart 1). Anesthetic drugs administered consisted of 30 mg. procaine and 3 mg. pontocaine.

Case 3. The lowest preanesthetic blood pressure recorded in this series was that of a 60 year old woman who nearly was exsanguinated from the bleeding of a large gastric ulcer. The initial systolic reading was questionable at 40 mm. of mercury. Arterial

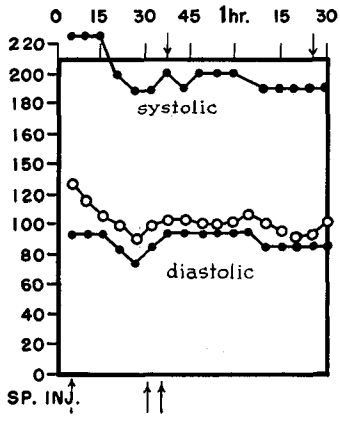

Chart 1

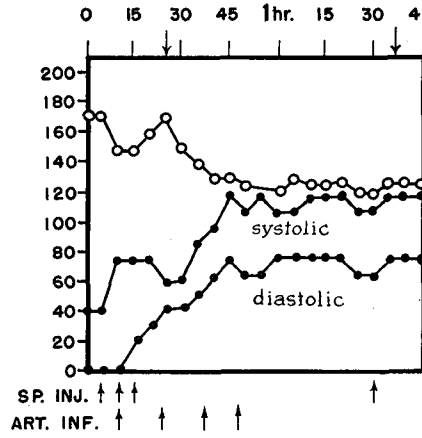

Chart 2

infusions of 2000 cc. of whole blood were given during surgery to restore the depleted blood volume and maintain adequate arterial tension. At the completion of the operation, the blood pressure registered 110/70 (chart 2). A total of 30 mg. procaine and 3 mg. pontocaine was administered in three separate intrathecal injections.

Complications

The incidence of postspinal headache in this series was 9 per cent. This compares favorably with the statistics of other authors who report an incidence up to 30 per cent.[9]

Postoperative atelectasis	1
Urinary retention	5
Phlebothrombosis	1
Headache	9
Mortality (anesthetic)	0

Hospital Deaths

Age	Diagnosis	Postoperative Day of Death
71	Carcinoma of stomach	30
50	Carcinoma of urinary bladder	27
69	Carcinoma of rectum	58

Summary

The advantages of the segmental type of continuous spinal anesthesia are identical with the requirements for anesthesia of the aged and the poor risk surgical patient: (1) minimal amounts of anesthetic drugs are used; (2) relaxation is maximal for the area involved; (3) physiologic processes of the body are not disturbed further by the agents utilized, and (4) duration of the anesthesia is controlled.

The greatest disadvantage is the time-consuming technic, which we believe is far exceeded by the element of safety provided the patient.

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