SPINAL ANESTHESIA IN CHILDREN: REPORT BASED ON 350 PATIENTS UNDER 13 YEARS OF AGE * †

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Received for publication July 31, 1950

Spinal anesthesia is an excellent method for children under the proper circumstances and in expert hands. Our experience with 350 consecutive cases during the last four years has enabled us to define the indications, contraindications, dosage and management with a precision which should encourage the wider use of spinal anesthesia in children, thus refuting Maxson's statement, "it should seldom be used in children under twelve years" (1) and Smith's contention, "there is little indication for spinal anesthesia in children" (2).

We do not force the method on our patients except in the minority of cases when spinal anesthesia is mandatory if we are to render the best possible service to the patient and the surgeon in certain difficult situations. Indeed, many of our surgeons expect us to use spinal anesthesia in children and are disappointed when we select an alternative. This approval is significant because 95 per cent are private patients and their families are in direct contact with the anesthesiologist. An unsatisfactory or dangerous anesthetic method could not long continue under such responsible circumstances.

Spinal anesthesia is specially indicated in conditions associated with intestinal distention, respiratory infection or a full stomach. In these cases we insist on using it even though the patient may require extra time, effort and premedication to permit its administration.

Spinal anesthesia is the simplest, quickest and most reliable method of contracting the intestine—a necessity for the optimal efforts of any surgeon. The anesthesiologist who avoids spinal anesthesia when a definitive operation must be performed in the abdominal cavity in the presence of distended intestinal loops deprives the surgeon of important assistance. The surgeon who must open an abdomen tightly filled with dilated loops of intestine, especially the delicate coils of the child, is forced to work under a severe handicap. Spinal anesthesia for a patient with intestinal distention or obstruction demands meticulous care; special attention must be given to estimating and maintaining

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† Since this report was offered for publication, an additional 112 spinal anesthesias were administered to children with excellent results and no complications.

adequate blood volume with intravenous fluids of an appropriate nature, vasoconstriction with vasopressor drugs and gastric drainage with a Levin tube. With such preparation and maintenance spinal anesthesia becomes the preferred method for the child with any type of ileus.

Spinal anesthesia is the anesthesia of choice for abdominal surgery in any patient with a respiratory infection. It is true that respiratory complications are mainly related to postoperative inhibition of deep breathing and coughing and that they may be encountered as often with spinal as with general anesthesia. This equality of incidence is true, however, only of patients who do not have preoperative respiratory abnormalities. In the presence of respiratory disease general anesthesia is more likely to be followed by atelectasis or an exacerbation of infection or both.

A child frequently has eaten within a few hours of an emergency operation. To empty his stomach with a gastric tube, as we readily do in an adult, is disturbing and traumatic at times. We prefer to avoid this measure in most cases and use spinal anesthesia. We are aware that aspiration and asphyxia have occurred under high spinal anesthesia (3). This is preventable, however, by controlling the level of muscular relaxation produced by the spinal anesthesia; the cough mechanism is not seriously weakened by abdominal muscular paralysis confined to the zone below the umbilicus.

Another situation in which we favor spinal anesthesia for children is an abdominal operation in a hot and humid atmosphere. By avoiding deep or prolonged general anesthesia during this kind of weather, especially for the child with a fever, the convulsive state associated with general anesthesia is prevented.

Spinal anesthesia is strongly preferred in these instances. For most cases, however, it is simply an excellent alternative choice which many anesthetists evade because of lack of experience and guidance. Yet, if the patient were an adult, spinal anesthesia would be preferred by the same anesthesiologist to obtain its specific advantages for surgical procedures below the level of the diaphragm. If the anesthesiologist does not employ spinal anesthesia frequently in adults, he should not try it in children. When the anesthesiologist has no experience with the elective use of spinal anesthesia in children he is certainly not the one to apply it in those instances in which spinal anesthesia is most needed.

The technic of spinal anesthesia to be applied to children should be the same as that with which the anesthesiologist has gained experience in adults. This is our chief criticism of several recent reports. Etherington-Wilson (4), Hawksley (5), Lund (6) and Stephen and Slater (7) have had favorable experiences with hypobaric solutions of procaine, pontocaine and nupercaine. Because hypobaric solutions are not popular for adults in this country, it is easy to understand the absence of an enthusiastic reception for these technics in children.

Our method of spinal anesthesia in children is simply an extension of the hyperbaric technic which we have employed in over 30,000 adults. We have been guided by the experience of Gray (8), Babcock (9), Koster (10), Junkin (11) and Amster (12) with spinal anesthesia for children. We have avoided, however, the hazards they faced which stemmed from the relative lack of physiologic information available in their day. Of these, the greatest is the choice of spinal anesthetic agent for the patient "too ill for general anesthesia." The pathologic characteristic of the critically ill individual of most concern in spinal anesthesia is the reduced blood volume. When this all-important feature of the bodily economy has been greatly reduced, spinal anesthesia is dangerous even with vasopressor support. A very helpful sign in forming an estimate of the ability of the patient to tolerate the effect of spinal anesthesia on the peripheral circulation is the degree of venous dilatation evident in the arms or neck of the patient in a horizontal position. When the veins are obviously contracted and venous pressure is apparently low the patient with a suspected depletion of blood volume is likely to give the anesthesiologist more difficulty under spinal anesthesia than under general or regional anesthesia. If spinal anesthesia is mandatory in such a case the preanesthetic safeguards are a wide needle well-placed in a vein, large volumes of blood volume restoratives at hand, ready means of introducing blood or other indicated replacement fluids at a rapid rate, Trendelenburg position and effective doses of neosynephrin before and, if necessary, during anesthesia. Without such meticulous and expert care, spinal anesthesia should not be used for these critically ill patients for they will die on the operating table, as in Koster's case (10).

On the other hand we have also avoided the extreme enthusiasm of some, such as Junkin (11), Koster (10) and Leigh (13), who would apply spinal anesthesia to children undergoing surgical procedures on the chest or of those, such as Gray (8), Robson (14) and Koster (10), who would use it in infants subjected to pyloromyotomy. These patients and operations are managed more easily and smoothly with expertly administered inhalation technics than with spinal anesthesia. Although spinal anesthesia has been employed safely for these cases it is unnecessary; the specific values of spinal anesthesia already described are not required for these patients.

Continuous spinal anesthesia is feasible in children as demonstrated by the report of Lemmon and Hager (15) who applied it in 33 children 10 years old or less. We have not found it necessary in children although we are enthusiastic advocates of its value in a selected small minority of problem cases in adults. Continuous spinal anesthesia is more likely to be followed by an uncertain or delayed arrival of an adequate level, by headache and neurologic sequelae (16). It should be reserved for the rare instance when spinal anesthesia is mandatory for an intra-abdominal operation for which the required duration cannot be estimated.

TECHNIC AND MANAGEMENT

Procaine hydrochloride crystals dissolved in spinal fluid 50 mg. per cubic centimeter, is the usual agent. For operations expected to last between forty-five and ninety minutes in the upper abdomen or between one and two hours below the umbilicus *1 per cent pontocaine hydrochloride solution* is selected. *Nupercaine hydrochloride solution,* 0.5 per cent, is used when anesthesia is expected to persist more than ninety minutes in the upper part of the abdomen or more than two hours below the umbilicus. To the calculated *pontocaine* or *nupercaine fluid* we add an equal volume of a *5 per cent solution* of *procaine hydrochloride crystals* in *spinal fluid.* As described originally by Romberger (17), the 5 per cent procaine solution insures the hyperbaricity of the procaine-pontocaine and the procaine-nupercaine mixtures. Procaine is preferred to glucose for weighting the anesthetic fluid because the prompt action of procaine permits earlier arrival and more accurate observation of the progress of the level of anesthesia.

The amount of *procaine hydrochloride* chosen when it is the only drug to be injected intrathecally is 1 mg. per pound of body weight or 10 mg. per year of age. The procaine hydrochloride crystals are dissolved in sufficient spinal fluid to form a 3 to 5 per cent solution. The concentration varies with the height and intensity of anesthesia desired and the degree to which the length of the child varies above or below the average. The *volume* of *1 per cent pontocaine fluid* to be injected depends on the rule of 0.1 mg. per pound or 1 mg. per year. The *volume* of *0.5 per cent nupercaine solution* is obtained by the rule of 0.01 cc. per pound or 0.1 cc. per year. The *larger* of the two doses obtained by these rules of calculation is the one used unless the child is small for his age. The *volume* of *5 per cent procaine hydrochloride* in *spinal fluid* to be added to make the *pontocaine* or *nupercaine solution* hyperbaric is equal to the volume of the *1 per cent pontocaine* or *0.5 per cent nupercaine solution* selected as the primary anesthetic agent.

The calculated doses and volumes are varied more or less by 20 per cent by the following factors: (a) the dose of the primary anesthetic agent is reduced for a brief operation or a child smaller than normal; (b) the total volume of the anesthetic solution is increased for a child much taller than normal.

The spinal puncture is performed through the usual fourth or fifth lumbar interspace with the patient lying on his side. He is held sitting only when a prolonged low analgesia is desired, as for an operation confined to the areas supplied by the lumbosacral nerves. The child is truthfully told that he will feel the prick of a needle like that which he received when the preanesthetic medication was administered in the ward. We permit only an intern, an operating room nurse or an anesthetist to hold the patient for the spinal puncture; the surgeon or the family physician is usually not likely to perform this important chore well. A procaine wheal and subcutaneous infiltration with a 25 gauge hypodermic needle prevent pain and muscle spasm during spinal puncture. An inhalation anesthetic is administered to insure absence of motion when the child is too young or too disturbed to be controlled by the anesthetist's preliminary explanation of the intended procedure. Inhalation "sleep" is employed only when spinal anesthesia is considered mandatory and heavy premedication has not been ordered.

To hold the cooperation of the patient the spinal puncture must be done with precision and gentleness. A 22 gauge 5 cm. long sharp needle with gradual steady penetration of the tissues exactly in the midline through the skin wheal produces a painless "tap" without paresthesias. To avoid partial or complete failure of anesthesia the needle should be advanced 1 mm. beyond the depth at which spinal fluid is first seen to well out of the needle.

Spinal fluid is aspirated to obtain the exact volume necessary to form a 5 per cent solution of procaine hydrochloride crystals. The desired amount of this 5 per cent solution of procaine may be used as the sole anesthetic fluid or added to the 1 per cent pontocaine or 0.5 per cent nupercaine fluid, if either of these longer-acting agents is to be used. The anesthetic solution is injected at the rate of 1 cc. per five seconds. The injection is performed only after the anesthetist has determined that the patient does not have any pain or paresthesia at the moment and that spinal fluid can be aspirated easily, without causing paresthesia. The needle is then withdrawn gradually. The child is turned promptly to lie on his back with his head raised on a small sandbag. The operating table is immediately placed in a 10 to 20 degree head-down position if the operation is an abdominal one, otherwise the table remains horizontal.

The hyperbaric technic of spinal analgesia depends primarily on gravity to spread the level cephalad. Although a head-down position is usually unnecessary to obtain adequate lower abdominal anesthesia, we prefer to place all abdominal patients in the Trendelenburg position immediately until we are sure of the appropriate level. A hyperbaric solution in small volume permits this position without danger. Indeed, for upper or mid-abdominal anesthesia the head-down position is often needed for several minutes, especially with the use of 0.5 per cent nupercaine fluid.

The cephalad spread of anesthesia is followed closely by watching the progress of paralysis in the anterior or lateral abdominal muscles as the child cries, talks or coughs in response to our request that he do so. The "cough test" for the determination of spinal anesthetic paralysis is a valuable feature of our technic (18). Even a 3-year-old patient will cough if asked or shown what is desired. The paralyzed muscles bulge outward and the nonparalyzed muscles contract inward during any expiratory act. Since the level of analgesia is a few dermotomes cephalad to the level of muscular relaxation the anesthetist can be more certain of the analgesic level than with skin-testing a child for pain. Skin-testing is unsatisfactory in children because it is unreliable and disturbing. Skin-testing is time-consuming and prevents the performance of other duties about the patient. Most importantly, it does not indicate that the all-important muscular relaxation has reached a height adequate for the operation. The appearance of a scaphoid abdomen—a sign widely used to estimate the level of spinal anesthesia—is also unreliable. The abdomen is often normally scaphoid in children. Flattening of the abdomen under spinal anesthesia is evidence only of intestinal contraction as a result of sympathetic nerve block to the sixth thoracic level. Inasmuch as the level of sympathetic blockade is always cephalad to the sensory and motor levels, a scaphoid abdomen may be seen without analgesia or muscular relaxation in the upper or mid-abdomen.

When muscular paralysis has arrived at the desired level the table is leveled to horizontal and the surgeon may start the operation assured of relaxation and analgesia. It is interesting and important to observe the wide variation in the duration of Trendelenburg position required before a proper level of anesthesia is obtained in the upper or mid-abdomen. With all factors apparently the same, one child may require a minute or two whereas another child must be maintained in the head-down position for five minutes.

The behavior of the child before and during anesthesia and operation depends on (a) the personality of the patient, (b) the effectiveness of premedication and (c) the supplementary hypnotic agents. (a) The child who is friendly, not obviously frightened, willing to listen to the anesthetist and able to cooperate during the preliminary visit is likely to be a good subject for spinal anesthesia even though premedication may be inadequate. (b) Effective premedication increases the comfort and cooperation of the child. We, therefore, usually prescribe rectal pentobarbital sodium, morphine and scopolamine or atropine in the manner described by Leigh and Belton (19) to produce a drowsy and indifferent child who can respond to questions and commands. For the unruly child for whom spinal anesthesia is imperative in our judgment, we administer a 10 per cent solution of pentothal sodium by rectum twenty to thirty minutes before spinal puncture; the dose is based on the proportion of 1 gm. of pentothal per 50 to 75 pounds of body weight (20). If this is inadequate or cannot be given, a light sleep with an inhalation agent is used. (c) During the operation a dilute pentothal sodium infusion (21) or a mixture of nitrous oxide-oxygen, 75 to 25, is administered if necessary. Supplementary hypnosis is often required when the cecum is pulled or bone is pounded; it is always needed for the traction discomforts associated with upper abdominal procedures. A very light anesthetic sleep was produced in 20 per cent of all cases. In only 3 instances was general anesthesia necessary as the primary method; one was a complete failure early in our experience and in the other two it was required to replace spinal anesthesia that disappeared before the end of the operation.

A preanesthetic vasopressor drug is always desirable even though it is usually unnecessary. Most reports correctly stress the remarkable stability of a child's blood pressure in the absence of vasopressor support (7, 13, 14). We insist on a prophylactic vasoconstrictor, however, even in the good risk patient to avoid at least the nausea, vomiting or retching frequently caused by the usually transient fall of blood pressure. Hypotension is unimportant in most cases but it does upset the patient and the surgeon. The acutely or seriously ill patient should always receive a vasopressor drug before and, if indicated, during anesthesia. The vasopressor of choice for children is neosynephrin hydrochloride because it does not excite the cerebral cortex or increase the heart rate; both of these effects are especially undesirable in children. Ephedrine sulfate is preferred only for asthmatic children. The dose of neosynephrin is based on the body weight in the proportion on 1 mg. (0.1 cc. of 1 per cent solution) per 25 pounds. Preanesthetic neosynephrin is injected subcutaneously or intramuscularly, depending on the estimated time to elapse before spinal puncture. Neosynephrin required during anesthesia is administered with greatest effectiveness and precisions of dosage by the dilute infusion method described by Thomas and Sica (22). The veins of the foot are dilated and painlessly entered after the onset of spinal anesthesia.

The acutely ill, vomiting and distended child, for whom spinal anesthesia is particularly valuable, should have an infusion flowing before the spinal puncture is made. Spinal anesthesia for these poor risk patients is dangerous if the depleted blood volume is not under immediate control. With neosynephrin and blood volume restoratives ready to enter the circulation with certainty, the anesthesiologist is in command of the only lethal hazard which threatens a seriously ill patient under spinal anesthesia.

CLINICAL EXPERIENCES

Our experience with spinal anesthesia in children has been entirely favorable—without a death, a near fatality, a neurologic sequel or even a postspinal headache. We do not regard this as entirely due to good fortune. It has been readily duplicated by our residents and associates who have performed spinal anesthesia in scores of cases not included in our study.

Death due to spinal anesthesia is entirely preventable with (a) oxygen under pressure to control an unduly high level of muscular paralysis and (b) vasopressor medication and blood volume restoratives administered before anesthesia to maintain an efficient peripheral circulation. Delay and inadequate dosage in the administration of these corrective measures are the fundamental errors underlying all deaths resulting from spinal anesthesia.

Neurologic sequelae are avoidable with attention to the following points in technic:

1. Sterility and chemical purity of all equipment and drugs.
2. Injection of the anesthetic fluid only when spinal fluid is easily aspirated without producing parasthesia.
3. Avoidance of excessive concentrations of anesthetic agent; highly hyperbaric or hypobaric solutions; prolonged maintenance of a sitting posture to fix a low spinal level with a hyperbaric solution; obstructing or traumatizing continuous spinal catheters or malleable needles.

The typical postspinal headache is the result of leakage of spinal fluid through a persistently patent puncture in a patient whose hydration is inadequate to form spinal fluid as fast as it is lost (23). A 22 gauge needle is sufficiently fine to permit the highly elastic dura of the child to close promptly before the volume and pressure of the cerebrospinal fluid have fallen so low as to cause the typical postpuncture headache.

Postspinal cranial nerve palsies are prevented by the same care that is directed toward avoiding the postspinal headache because they are both fundamentally related to the inadequately replaced loss of cerebrospinal fluid through a dural puncture (24).

We have never failed to enter the spinal canal of any child except one. This happened before we were aware of the value of light inhalation anesthesia to secure a motionless infant. This one-month-old infant with a tremendously distended abdomen was subjected to an emergency operation under drop ether after repeated failures to enter the subarachnoid space. The "tissue-paper-thin" colon ruptured dur-

TABLE 1

Age, Years	Number of Operations
0–2	1
2–4	8
4–6	26
6–8	62
8–10	110
10–12	143
	350

Surgical Condition	Number of Patients
Appendicitis	307
Hernia	27
Intestinal obstruction	5
Orchidopexy	3
Cystoscopy	2
Nephrectomy	2
Rectal polyp	1
Slipped epiphysis, femoral	1
Biopsy of ilium	1
Ruptured spleen	1
	350

ing the surgeon's manipulations. Exploration revealed no obstruction, only a simple megacolon. The child died of peritonitis. Had it received spinal anesthesia, it would have promptly emptied its colon on the operating table and made the emergency operation obviously unnecessary.

We have always respected any spontaneous refusal of spinal anesthesia communicated to us in advance by the family physician or surgeon unless the method is essential for the maximal safety of the patient and the success of the operation. By avoiding spinal anesthesia in a conscious child of 8 years or older who has heard parental alarms about possible damage to the central nervous system we have not been faced with a colleague's experience with hysterical paralysis, that is, a functional scoliosis which persisted for several days until the diagnosis was made and the preoperative conversation of the parent was recalled. The appropriate explanation and encouragement produced immediate recovery.

We emphasize the fact that spinal anesthesia is not routinely applied. Many children are emotionally unsuitable; most operations in children do not require the specific advantages of spinal anesthesia. Thus, for example, we have used spinal anesthesia in only 50 per cent of our last 100 appendectomies in children. Table 1 shows the number of spinal anesthesias administered for the various age groups and types of operation.

CASE REPORTS

The following cases are presented to illustrate the principles of choice and management of spinal anesthesia for pediatric surgery.

Case 1. A one-year-old boy with an incarcerated hernia and one day of intestinal obstruction was brought to the operating room at 8 p.m. without a Levin tube, premedication or preparation. The abdomen was grossly distended; the child had been vomiting fecal fluid. Light, brief, ether narcosis was used to induce vomiting; it was tremenduously profuse. Then 2 mg. of neosynephrin was injected intramuscularly and spinal anesthesia was induced through the fifth lumbar interspace with 30 mg. of procaine hydrochloride crystals in 1 cc. of spinal fluid. The operation was uneventful; the reduction of the hernia and the inguinal herniorraphy required thirty minutes, and the infant was moving his legs at the end of the operation. Water was retained at the first feeding at midnight; there was no vomiting at any time after the onset of spinal anesthesia. The infant was discharged on the second postoperative day.

Case 2. A 3-year-old girl, sturdy and cooperative, required an emergency appendectomy during convalescence from measles. She had a severe productive cough. The temperature was 103° F. No opportunity for premedication had been given the anesthetist. Spinal anesthesia was produced with 40 mg. of procaine hydrochloride in 1 cc. of spinal fluid through the fourth lumbar interspace for an appendectomy lasting thirty minutes. Neosynephrin, 2 mg., had been given hypodermically five minutes before induction of anesthesia. Anesthesia reached the level of the umbilicus in five minutes. The child was able to cough throughout the operation. Recovery was uneventful.

Case 3. A 4-year-old daughter of a physician was premedicated with morphine, 3 mg. (1/20 grain) and scopolamine, 0.2 mg. (1/300 grain) for a midnight appendectomy. Neosynephrin, 2.5 mg., was administered by hypodermic injection five minutes before the spinal puncture. Anesthesia was entirely smooth with procaine, 60 mg. in 1.5 cc. spinal fluid. Recovery was uncomplicated.

Case 4. An 8-year-old boy was markedly distended with peritonitis and intestinal obstruction; acidosis, pyelonephritis, temperature of 102° F. and pulse of 120 were the other significant findings. Neosynephrin, 4 mg. was given before the spinal injection of 90 mg. of procaine hydrochloride in 2 cc. of spinal fluid. Anesthesia was entirely satisfactory for the fifty minutes required for the resection of 8 inches of gangrenous ileum. Death occurred two days later as a result of peritonitis; it was in no way related to the anesthesia.

Case 5. A 4-year-old boy with generalized peritonitis due to appendicitis was dehydrated, greatly distended, toxic, vomiting fecal fluid profusely and coughing frequently and productively; respirations were 98 per minute and accompanied by flaring alae nasi. The child was cooperative and alert; his veins were full and easily visible. Neosynephrin, 2.5 mg. was injected subcutaneously; spinal anesthesia was obtained with 40 mg. of procaine in 1 cc. of spinal fluid. Plasma and saline solution were infused during the appendectomy. Pentothal sodium, 50 cc. of a 0.1 per cent solution, was allowed to drip intravenously throughout the operation to produce drowsiness. The child coughed and vomited efficiently. The anesthesia was excellent for the required thirty minutes. The immediate recovery was excellent but intestinal obstruction followed. An ileostomy under local anesthesia was performed three days after the first operation; death occurred the next day.

Case 6. A 12-year-old boy with appendiceal peritonitis was markedly distended; the temperature was 103 and pulse 140. Marked apprehension was converted into drowsy cooperation by an intravenous injection of morphine, 5 mg. (1/12 grain) and scopolamine, 0.2 mg. (1/300 grain) a few minutes before anesthesia was induced. Neosynephrin, 5 mg., was given subcutaneously. Spinal anesthesia with 80 mg. of procaine in 2 cc. of spinal fluid was excellent for the required forty minutes. Saline solution and blood were infused during operation; the pulse gradually decreased to 110 a minute. After a transient rise in the temperature to 105.4° F. and delirium on the first postoperative day, recovery was uneventful.

Case 7. An 11-year-old girl with appendicitis had severe diabetes. The blood sugar value was 359 mg. per 100 cc. and glycosuria 12.5 per cent. No urinary acetone or diacetic acid was present. She was slightly dehydrated and drowsy. Spinal anesthesia with 100 mg. of procaine hydrochloride in 2 cc. of spinal fluid was excellent for the required forty minutes. The pulse rate fell from 120 to 80 per minute under the influence of the preanesthetic dose of 5 mg. of neosynephrin. Recovery was normal.

Case 8. An 11-year-old boy was toxic and coughing severely with a pneumonitis in the right middle and lower lobes. The temperature was 103° F. and the pulse rate was 140. The abdomen was distended with an obvious generalized peritonitis. A gangrenous appendix was removed under spinal anesthesia with 120 mg. of procaine hydrochloride in 2.5 cc. of spinal fluid. With 5 mg. of neosynephrin administered ten minutes before anesthesia the systolic blood pressure varied from 120 to 100 mm. of mercury and the pulse rate gradually fell to 84 per minute. Recovery was uneventful.

CONCLUSIONS AND SUMMARY

We have presented, discussed and illustrated the subarachnoid use of hyperbaric solutions of procaine, pontocaine and nupercaine for surgical procedures below the level of the diaphragm as a result of an experience with 350 spinal anesthesias in children under 13 years of age. ‡ Meticulous technic and management have enabled us to apply to children without a single complication the same hyperbaric solutions commonly used in this country for adults. The choice of spinal anesthesia is especially favored in the presence of intestinal distention, respiratory infection, a full stomach or hyperpyrexic circumstances. Furthermore, it may be electively selected for a large percentage of abdominal operations in cooperative or premedicated children. We believe that our excellent results are readily duplicated by anyone expert in administering spinal anesthesia for adults provided the premedication and personality of the patient are correctly evaluated, the puncture is practically painless, vasopressor and blood volume support are adequate and the level of relaxation is controlled by gravity and observed by the use of the "cough test." The all-important factors are experienced judgment in the choice of patient and anesthetic drugs, acute and alert observation during anesthesia and complete anesthetic safeguards. Spinal anesthesia in children is a special method suitable for use only by anesthesiologists expert in administering spinal anesthesia for adults.

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‡ Of the additional administrations referred to in the footnote on page 376, two patients were 3 years old and sixteen in the 4 to 6 age group. The operations consisted of appendectomies and inguinal hernioplasties, except for one splenectomy and one splenic colon polypectomy.

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AMERICAN BOARD OF ANESTHESIOLOGY

Dr. Edward B. Tuohy of the Georgetown Medical Center, Washington, D. C., was elected a Director of the American Board of Anesthesiology at a meeting in Coronado, California, April 6, 1951. Dr. Tuohy is one of the five members of the Board of Directors representing the Section on Anesthesiology of the American Medical Association and is replacing Dr. Henry S. Ruth of Philadelphia who resigned as a Director of the Board on April 6, 1951. Dr. Tuohy's term will expire at the annual meeting of the Board in October, 1955.

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