Spinal analgesia : development and present status of the method : with brief summary of personal experience in 1,065 cases / William Seaman Bainbridge.

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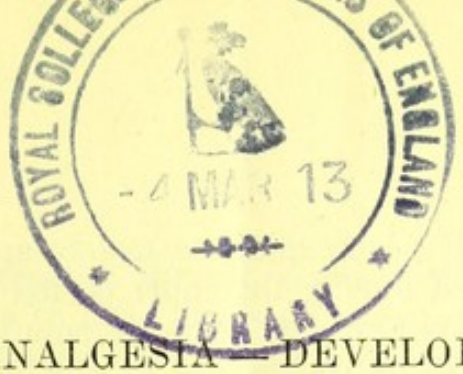

SPINAL ANALGESIA—DEVELOPMENT AND PRESENT STATUS OF THE METHOD

WITH BRIEF SUMMARY OF PERSONAL EXPERIENCE IN 1,065 CASES *

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Spinal analgesia proves no exception to the general rule which applies to new methods. Its early development was fraught with mistakes, some of which were serious and even fatal. When it was heralded throughout the world that Bier had successfully injected cocain into the spinal subarachnoid space, many surgeons adopted the method. It was a new field and little was definitely known concerning the physiologic aspects of the question, and little more with reference to the therapeutic phases of the subject. It was but natural that, as the literature of spinal analgesia developed, the number of unfortunate experiences multiplied. It was inevitable, too, that enthusiasm should wane, and that the further development of the method should be left to a limited number of surgeons who recognized in spinal analgesia a procedure of distinct advantage, with a definite field of usefulness.

Following Bier's first demonstrations of the surgical application of spinal analgesia, report of which was published in 1899, the method was quite extensively employed for two or three years. Accounts of its use then disappeared almost entirely from medical and surgical literature, though it was not abandoned by the few earnest advocates of the method. The revival of the subject in the literature about five years ago is familiar to all. It is safe to assume that spinal analgesia is now permanently established among recognized surgical pro-

* Read in the Symposium on Anesthesia in the joint meeting of the Section on Pharmacology and Therapeutics and the Section on Pathology and Physiology of the American Medical Association, at the Sixty-Third Annual Session, held at Atlantic City, June, 1912.

cedures, and will never again so nearly approach abandonment as it did during the short period of quiescence which followed its first few years of popularity.

A just estimate of the merits of any method can be reached only by a study of the accumulated experience of many observers. It is manifestly impossible on this occasion to trace the evolution of spinal analgesia by a review of the literature which chronicles the findings of the large number of surgeons who are now employing or have employed the method.

During the early stage of the development of spinal analgesia cocain and eucain were the agents most generally employed. This fact probably accounts for many of the adverse opinions formed of the method. Eucain gave a "patchy," and hence altogether unsatisfactory analgesia. Cocain was not entirely satisfactory, partly because of the reckless dosage employed by many surgeons, and partly because of the difficulties experienced in sterilizing the drug without destroying its analgesic effect or decomposing it in such a way that its by-products gave rise to unpleasant accompanying or post-operative phenomena. Bier early protested against the reckless manner in which cocain was being employed, and against the dangerously large doses which some operators used. He made a plea for an effort to find less harmful drugs for the production of spinal analgesia.

A very important part of the evolution of spinal analgesia has been concerned with the discovery of other drugs and other combinations, which would give a controllable analgesia, and at the same time lessen the dangers and eliminate the frequently disagreeable accompanying symptoms associated with the method. In the endeavor to find such a drug a great deal of careful experimental work has been conducted by different investigators. The results have been remarkably successful, and have given to the method a definite field of usefulness.

My experience with cocain was not so unfavorable to that drug, probably because at an early stage of the development of spinal analgesia I formulated a plan of sterilizing the agent,[1] which insured not only a sterile but a fresh and active solution, free from the harmful by-products so often claimed to be present and generally attributed to the methods of sterilizing by heat.

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1. Bainbridge: Med. Rec., New York, Dec. 15, 1900.

It is not necessary here to enter into the question which from time to time has been raised concerning the validity of the claims that cocain is decomposed by heat and its analgesic properties destroyed as a consequence. Whether correct or incorrect, the impression has gained currency that boiling decomposes solutions of cocain. Various methods of sterilizing this agent have, therefore, been suggested. The simplicity of the method which I have employed renders it of value for emergency work, where a rapid method is required to secure a sterile, potent solution. The method, which is applicable to other analgesic agents as well as to cocain, is as follows:

Five grains of fresh cocain crystals, carefully weighed, are placed in a sterilized measuring glass. Two drams of strong ether are added and mixed thoroughly with the cocain crystals by means of a sterilized glass rod until a paste is formed. The mixing process is continued until all the ether is evaporated and a dry powder is obtained. One-half to 1 ounce of boiled, filtered water, or sterile normal salt solution, is then added. One-half ounce makes practically a 2 per cent. solution and 1 ounce a 1 per cent. solution. The dosage varies, according to the age of the patient, the region to be operated on, etc., from 5 to 25 minims of the 2 per cent. solution, and from 10 to 40 minims of the 1 per cent. solution.

The crystals, if kept dry, do not deteriorate, as do other forms of the drug. It is advisable, however, if possible, to employ only fresh crystals, or to be sure that they have been kept perfectly dry. With active cocain at one end of the scale and inert cocain at the other, there are various grades of potency, from an analgesic point of view. The exact cause of this variation is a matter of dispute, some holding that it is due to the heat sometimes employed in sterilization, others denying the correctness of this assertion. The members of the Section on Pharmacology and Therapeutics will doubtless clear up this point in the discussion.

Following the suggestion of Bier, that less harmful agents be found for spinal analgesia, experimentation has led to the employment of the following agents: stovain, novocain, tropacocain, beta-eucain, beta-eucain lactate, alypin, holocain hydrochlorid, orthoform (new), anesthesin, and other agents. Cocain, stovain, novocain

and tropacocain are the drugs most generally used, with stovain, perhaps, in the lead.

Other drugs than cocain having been found available for spinal analgesia, attention was next directed toward making such combinations of these with other substances as to render the solution heavier or lighter than the cerebrospinal fluid, the object being to avail oneself of gravity in controlling the height of the analgesia. Experimentation along this line has led to some very interesting results, and has evolved three general classes of solutions: (1) those of lighter specific weight than the cerebrospinal fluid; (2) those of approximately equal weight; (3) those of heavier weight.

To the first class belongs the so-called "diffusible" solution employed by Babcock, in which alcohol is used to render the fluid lighter than the cerebrospinal fluid.

To the second class belong the simple solutions of the analgesic agent with water, with water plus cerebrospinal fluid, with cerebrospinal fluid alone, or with normal salt solution.

To the third class belong the so-called "non-diffusible" solutions, which are rendered heavier than the cerebrospinal fluid by the addition of glucose, dextrin or gum arabic.

To any of these solutions may be added, if desired, epinephrin or some similar product, as employed by Bier, Gray and many others, or strychnin, as suggested by Jonnesco.

In 988 of my 1,065 cases simple solutions, of the second class, were employed, the agent being sterilized after the manner described, and dissolved in plain sterile water, without the addition of any other drug. In over 500 of the 988 cases cocain was used. In the remainder the various other agents and combinations were employed. I now use, as a rule, stovain or tropacocain, because fewer unpleasant symptoms are apt to ensue, but I do not hesitate to employ cocain.

In the 1,065 cases there was one death (with the diffusible stovain solution, probably due to status lymphaticus); one case of temporary partial paralysis with complete recovery;[2] one case of failure due to so-called "dry spine," in which puncture at different levels failed to bring cerebrospinal fluid; two cases with alypin, in which there was considerable respiratory depression, and

2. Bainbridge: Med. Rec., New York, 1900, lviii, 937.

one case of idiosyncrasy in which, after several attempts by spinal and local injection, the analgesia was almost *nil.* In all the other cases there were no accompanying or post-operative symptoms of permanent or serious moment.

ILLUSTRATIVE CASES WITH THE THREE CLASSES OF SOLUTIONS

SIMPLE SOLUTION (COCAIN WITH WATER)

CASE 1.—J. P. D., aged 31, was operated on Nov. 27, 1902, (case of Dr. William T. Scovil, of Richmond Hill, Long Island), under spinal analgesia, which I administered. The patient had been operated on two years before by Dr. George Ryerson Fowler for appendicitis, at which time ether anesthesia was employed. The patient suffered for a year and a half from postanesthetic asthma of such severity that it was necessary for him to sit up at night in order to breathe. This gradually subsided and for six months before I saw him he had not been troubled with it. When I was called in consultation, the patient was suffering from multiple strictures, which had become so tight that there was almost complete retention of urine. A filiform bougie could not be passed. Albumin and casts were present in the urine. Chronic endocarditis further complicated the condition. The patient's testimony was absolutely necessary in a forthcoming murder trial in which circumstantial evidence was so strong against the defendant that a verdict of guilty was almost a certainty. Nothing but the patient's testimony could save the man.

Treatment.—To operate under inhalation anesthesia was practically impossible. It was determined, therefore, to employ spinal analgesia. Cocain, 20 minims of a 2 per cent. solution, was injected and external and internal urethrotomy performed. Analgesia lasted two hours and ten minutes. The patient read and smoked during the operation. In two weeks he went into court, gave his testimony and cleared the defendant. The patient, who is still living and in a fair degree of health, has never suffered from asthma since the operation under spinal analgesia—an interesting coincidence at least.

CASE 2.—Mrs. M. D., aged 43, was admitted to the New York Skin and Cancer Hospital in October, 1911. Examination revealed a large deep tuberculous ulcer of the left leg, 6 by 5 inches in diameter, of three years' duration. On Dec. 20, 1911. the ulcer was excised, and the surface exposed to fulguration according to the de Keating-Hart method, with the long, high-frequency, high-tension, electric spark. Analgesia in this case was induced by means of 20 minims of a 2 per cent. solution of cocain. Eight minims injected at first proved insufficient, and after ten minutes another injection of 12 minims was made. Analgesia was complete to the nipple line in four minutes and lasted over an hour. There were no

accompanying or postoperative symptoms of any moment, convalescence being entirely uneventful.

GLUCOSE-EPINEPHRIN-STOVAIN SOLUTION (NON-DIFFUSIBLE)

CASE 3.—L. L., female, aged 58, was admitted to the New York Skin and Cancer Hospital, March 18, 1911, for operation for lipomas of the abdominal wall, papilloma of neck, angiomas of abdominal wall and varicose veins of the legs. The operation was March 20, 1911. Various growths were removed, and the varicose veins excised. Analgesia was induced by the glucose-epinephrin-stovain, so-called "non-diffusible" solution obtained from Gray, of London, one ampule, 2 c.c., 3 per cent. stovain, being injected. Adjuvant medication consisted of strychnin, 1/60 grain, and nitroglycerin, 1/200 grain. Analgesia extended to the neck, and lasted for one hour and fifty-five minutes. There was no nausea, no vomiting, no headache, or other unfavorable symptoms. The patient was cheerful throughout the operation, her facial expression giving no evidence of pain or distress. Recovery was uneventful.

The only death which I have to chronicle in my 1,065 cases occurred when the Babcock "diffusible" solution was employed. It may be stated in advance, however, that the fatality is not necessarily attributable to this agent.

STOVAIN-ALCOHOL-WATER (DIFFUSIBLE)

CASE 4.—The patient, a male child, aged 2, on my service at Randall's Island, New York City Children's Hospital and School, was in very poor general condition, with chronic bronchitis, some dulness in the chest and distressing inflammation and prolapse of the rectum. Operation was definitely indicated, and inhalation anesthesia was positively contraindicated. It seemed justifiable, therefore, to attempt to relieve the condition by operation under spinal analgesia. An injection of 0.5 c.c. of the Babcock diffusible stovain solution was employed. The child died almost immediately after the injection was made. Autopsy was not allowed, but from the apparent slight enlargement of the thymus gland which was present, the dulness in the chest, and the general appearance of the child, it may be that death was due to that more or less mysterious condition known as status lymphaticus. We may give the diffusible solution the benefit of the doubt.

The following case illustrates the successful application of the method by means of the diffusible solution:

CASE 5.—J. R., female, aged 50, was received at Randall's Island. Operation, Dec. 14, 1911, consisted of panhysterectomy for fibroid tumors of uterus and cystic ovaries, the incision and suture of "Lane's bands" and appendectomy. Preliminary medication consisted of 1/4 grain morphin

and 1/200 grain atropin hypodermically half an hour before operation. Spinal puncture was made in median line between first and second lumbar vertebræ; 3 c.c. of stovain-alcohol solution injected, at 10:15. Analgesia was complete to nipple line at 10:19. Median abdominal incision was made at 10:25; patient experienced no pain or discomfort. Exploration revealed three distinct peritoneal bands, narrowing the lumen of the ileum and causing marked angulation at the crest of the pelvis. These were sectioned and sutured, and the appendix removed. This part of the operation was completed by 10:45, and panhysterectomy begun. At 11 o'clock the patient complained of discomfort due to the stretching of the abdominal wound, but cutting, suturing or clamping the tissues caused no pain. Her condition at this time was excellent. At 11:30 patient asked for a drink of water, which was given her, with a small quantity of whisky. Respiration and pulse were regular, and the expression of the face revealed no real discomfort. There was no nausea, no vomiting and no coughing at any time during the operation. The color of the skin remained good throughout. Operation was completed and abdominal wound closed at 12 noon. Patient left table at 12:05, talking quietly, and in excellent condition. Analgesia persisted for one hour after completion of the operation. At no time did the patient's temperature rise above 101 degrees F. There were no postoperative complications, recovery was uneventful, and at the end of the third week the patient was walking around the ward perfectly well.

The patient in this instance was an ideal illustration of the field for spinal analgesia. She was old beyond her years, with some thickening of the arterial walls, with abnormally small kidneys, excreting urine of low specific gravity, with some albumin and casts. There was no postoperative interference with the action of the kidneys, such as would very probably have occurred after the administration of ether.

With certain notable exceptions, both the experimental and the clinical investigations of the early period of the evolution of spinal analgesia were concerned with the production of analgesia below the diaphragm, and its application to the surgery of these regions. It is not to be wondered at, however, that the advocates of the method were unwilling, in many cases, to rest with this limited field of application to the lower parts of the body, and that they began to extend it to the parts of the body above the diaphragm.

Tait and Caglieri of San Francisco, Morton of the same place, Chaput of France, and others, performed operations on various parts of the body above the level

of the diaphragm, as early as 1900, thus antedating this particular part of the work of Jonnesco of Bucharest, by about eight years. Tait and Caglieri, in 1900, reported three cases in which cocain was injected into the sixth cervical space, without untoward effects. The patients were examined weeks after the injection and found to be free from any complication. Similar results were obtained by others.

So far as I have been able to ascertain, the work of Tait and Caglieri, Morton, Chaput and others, with high injection, has not been followed up with further clinical applications, and for this reason, perhaps, originality in this regard has been generally accorded to Jonnesco. The "new method" of spinal analgesia reported by Jonnesco in 1908 consists in piercing the spinal column at all levels, according to the operation, and injecting stovain, novocain, or tropacocain, with strychnin, into the subarachnoid space. As is well known, Jonnesco considers the fact that the respiratory nerves are not involved in the high injections as due to the influence of the strychnin.

I have never employed the high-injection method of Jonnesco, in either the original or the modified form (in which he confines the injection to the superior dorsal and the dorsolumbar sites). I have been able, however, in some instances, to operate on practically any portion of the body under spinal analgesia as induced by the various solutions, plus the head-high or the head-low position of the patient. Years ago I used strychnin and glonoin hypodermatically as supportive and corrective medication at the time of the spinal injection. The only thing new in Jonnesco's method, so far as strychnin is concerned, is injecting this drug, with the analgesic agent, into the canal.

The evolution of spinal analgesia was not completed with the discovery of less harmful agents as suggested by Bier. With the perfection of combinations of the analgesic agents with other substances, giving a more or less diffusible solution and a consequently more or less controllable analgesia, and with the extension of the application of the method to the upper part of the body, the indications and contra-indications for the method have also been carefully studied, and no inconsequent part of its development is concerned with the widening of the scope of spinal analgesia.

One of the most telling illustrations of this increased sphere of application is its use with children. In the earlier days of spinal analgesia perhaps the majority of writers on the subject named infancy and childhood among the contra-indications. Even now many advocates of the method do not approve of its use in this class of patients.

In the early stage of the application of spinal analgesia I began to employ the method, being particularly interested at that time in its use in young children. Several cases of children operated on under spinal analgesia were reported by me,[3] the youngest being 2½, the oldest 11 years old. The former patient was apparently the youngest on whom the method had been employed at that time. I reported an additional series of forty cases,[4] twenty-four of which were given in detail, the youngest being 7½ and the oldest 19 years of age. In July of the same year I reported twelve operations[5] on infants and young children, the youngest of this series being 3 months and the oldest 5 years of age.

Since that time a large number of children have been operated on by various surgeons, the most notable series of cases being that reported by H. Tyrrell Gray, of the Hospital for Sick Children, London. He employed the method in all abdominal work on children, holding that when it is used the mortality record in such cases is materially lowered.

Along with the perfection of the method in the matter of agents, sites for injection, scope of application, etc., there was much to be evolved with reference to the preliminary preparation of the patient, the selection of the analgesic agent best suited for the given case, the careful estimation of the dose required for the individual patient and the actual technic of injection.

As the method has been developed, various needles and syringes for the injection have been devised, and the technic has been varied to suit the ideas of the individual operator. Time does not permit, nor is it necessary, to detail the different modifications of the method. The technic which has answered my needs best is given below.

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3. Med. Rec., New York, Dec. 15, 1900.
4. Med. News, May 4, 1901.
5. Arch. Pediat., July, 1901.

PRELIMINARY PREPARATION OF PATIENT

Preliminary preparation of the patient as regards diet, catharsis, etc., which is of so great importance in inhalation anesthesia, is not so essential in spinal analgesia, except in operations on the intestines. In a certain percentage of cases incontinence of urine and feces occurs from relaxed sphincters, when rectum and bladder have not been emptied. Patients coming into the hospital from the street, with no preliminary preparation, have been operated on as successfully, and with as few accompanying and postoperative phenomena, as have those who have been subjected to the most careful preparatory care. Generally speaking, however, attention to all details which conserve the patient's vitality and comfort should be observed.

A hypodermic injection of morphin (⅛ to ¼ grain), combined in some cases with atropin or scopolamin, may be given half an hour before spinal puncture. It serves to tranquilize the patient and to make him less susceptible to any possible pain or discomfort contingent on the initial procedure. Bromids instead of morphin may be given the day before, or nitroglycerin (1/200 to 1/100 grain) may be advantageous, administered at the time of injection. Strychnin (1/60 grain) given subcutaneously at the time of the spinal injection is supportive. Combined with nitroglycerin it lessens the danger of headache, shock and other disagreeable symptoms.

No preliminary medication is given to children.

APPARATUS

The apparatus for giving the injection of the analgesic agent consists of a syringe and two cannulas.

The syringe, which is made by Ford and Company or the Kny-Scheerer Company of New York, is entirely of metal, including the piston, so that it expands uniformly on boiling. It has a capacity of 5 c.c., the corresponding quantities in the two systems being graduated on the piston.

The cannulas are made in two sizes, of three lengths. The points are ground short and beveled, with a cutting-edge all round. The shank is of flexible metal, so that it will bend without breaking. The cannula slips on a ground joint, fitting accurately the handle, without washers or screws. The proximal end is fitted with a

handle which can be firmly grasped. Through the cannula runs a stylet, the proximal end of which is rounded, knob-like, so that it can be pressed against the base of the index finger, adding firmness of grip.

The entire instrument can be taken apart and thoroughly sterilized.

TECHNIC OF INJECTION

The usual aseptic precautions are observed. The site of puncture may be cleansed in the usual way, by scrubbing, etc., or by painting the skin with tincture of iodin. The patient, in the sitting posture, the feet hanging over the side of the table, with the puncture site painted with iodin, is draped with a sterilized sheet. This sheet has cut in it a hole or window large enough for purposes of injection. The operator, in making his examination and identification of landmarks, runs no risk of contaminating his hands by contact with skin surfaces which have not been rendered aseptic.

The site of puncture is now determined in the following manner:

1. The highest points on the crests of the ilia are located. On this level is the spinous process of the fourth lumbar vertebra.

2. The sites of the second, third, fourth and fifth lumbar vertebræ are marked.

3. The thumb is placed in the space between the twelfth dorsal and first lumbar, second and third, third and fourth, or fourth and fifth lumbar vertebræ, according to the selection of site, at the mid-point between the two. One-half inch to either side of this is the site for the puncture. I usually inject between the fourth and fifth or third and fourth lumbar vertebræ.

The puncture-point being located, the assistant plays a spray of ethyl chlorid on the area, or, if preferred, a preliminary subcutaneous injection of cocain or other local analgesic agent may be given. A small incision is now made through the true skin, which may be rendered hemostatic as well as analgesic by the ethyl chlorid.

The needle is passed through the incised skin and subcutaneous tissue, straight forward. The head is then depressed, the point being made to go upward, forward and inward toward the median line. It is inserted from 1½ to 2½ inches, according to the thickness of the patient's body.

When the needle is felt to impinge on the bone surrounding the foramen, it is depressed a little more and pushed forward, when it comes on the ligamentum subflavum, then the dura mater. In piercing the ligament and dura there is a peculiar sensation like the "popping" of a membrane. This signifies the entrance to the subarachnoid space.

The cerebrospinal fluid escapes under ordinary circumstances. If it does not flow freely something is wrong. The needle may not have entered the right place, or it may be clogged. A stylet should not be inserted into the needle. Another syringe should be ready, and with this, if one cannot draw out blood or fluid, the needle should be withdrawn entirely and then, after being rendered patent, reinserted. I prefer not to proceed with the injection unless the fluid issues with at least an approximate quantity and tension. Others, notably Gray,[6] are not agreed on this point, being willing to proceed with the injection when the fluid issues only in slow drops, or when it is slightly blood-stained.

In some cases, despite careful technic and repeated attempts at different sites, no cerebrospinal fluid is obtainable. Such cases have doubtless led to the expression "dry spine," but it is rather to be inferred that they come under the category mentioned by Gerstenberg and Hein,[7] Lusk[8] and others, in which the arachnoid membrane is adherent to the posterior surface of the cord at the levels entered, so that no fluid is obtained for the reason that, at the given locality, the subarachnoid space is obliterated posteriorly. I have had one such personal experience. Despite four attempts, in each of which the canal was entered, two between the fourth and fifth, one between the third and fourth, and one between the second and third lumbar vertebræ, no fluid was obtained. The attempt was then abandoned and the operation (appendectomy) successfully performed under ether anesthesia.

The analgesic solution is now injected slowly. The obliquity of the passage of the needle has the advantage that no tract is formed for the fluid to follow as the needle is withdrawn. The body of the vertebræ in front should not be touched with the needle, because of the

6. Gray: Lancet, London, Sept. 25 and Oct. 2, 1909.
7. Gerstenberg and Hein: Ztschr. f. Geburtsh. u. Gynäk., 1907-1908, lxi, 524; also Verhandl. d. Gesellsch. f. Geburtsh. u. Gynäk. zu Berlin, 1907-1908.
8. Lusk: Ann. Surg., October, 1911.

presence there of a large plexus of blood-vessels. When the needle is withdrawn a cotton and collodion dressing is applied.

If low analgesia is desired for operations on the lower part of the body, the patient should be allowed to sit up for a few minutes after the injection, or the head should be elevated, when solutions of the same or heavier specific weight than the cerebrospinal fluid are used. If the lighter fluid is employed, it must be borne in mind that the head must be lowered *at once* after the injection to prevent the rapid diffusion of the analgesic agent and the danger of death from respiratory paralysis. When high analgesia is desired, for operations on the upper parts of the body, the patient may be placed in a more or less marked Trendelenburg position, with the heavier solutions. The "diffusible" solution may be used if, after the initial lowering of the head, the head of the table is slowly and carefully elevated. My own feeling is that operations on the head and neck should not be undertaken under spinal analgesia unless other methods are absolutely contra-indicated and operation is essential.

SUMMARY

From the weight of conflicting testimony with reference to the indications and contra-indications for spinal analgesia, it may be deduced, in a general way, that, granting the need of operation and the impracticability of local or regional analgesia, *the indications for spinal analgesia are the contra-indications for inhalation anesthesia.* So far as the character of the operative procedure is concerned, there are practically no contra-indications to the employment of spinal analgesia. A person already in marked shock or profoundly septic should not be subjected to this procedure. A number of surgeons with wide experience accept practically no limitations to its use. Some operators firmly believe that in certain cases this method is safest and best.

The real objections to spinal analgesia in my opinion are:

1. The operator is absolutely committed to the dose, whatever it be. It can be increased by an additional injection, but it cannot be decreased once given. With the changes in the position of the patient, with carefully graded dosage, control can be exercised.

2. In prolonged operations the analgesic effect may pass before the surgical procedure is finished. In some cases, as in laparotomy, it is quite inconvenient to turn the patient over for another injection.

It would be safe to assume that even its most enthusiastic adherents would not advocate the usual employment of spinal analgesia by the surgical novice. It must, therefore, continue to occupy a somewhat limited sphere until further accurate and scientific experimentation has led to more certain conclusions with reference to the physiologic action of the agents employed and the dosage in which they may be used to obtain a given result. Until such information is definitely in hand, spinal analgesia should be employed, as a rule, only by those experienced with the method and having careful technic.

34 Grammercy Park.

AN ADDITIONAL CASE (No. 1069), OF SPECIAL INTEREST.

During the Clinical Congress of Surgeons of North America, held in New York City in November, 1912, a patient, on my service at the New York Polyclinic Hospital, died after a lumbar subarachnoid injection of stovain, preparatory to the performance of an operation for hernia.

History.—P. H., Irish, male, age given as 50 years, probably 60 or more; chronic alcoholic. Came to my clinic at the New York Polyclinic Medical School and Hospital, October 18, 1912, seeking relief for a condition which proved, upon examination, to be right inguinal hernia, at times irreducible, and causing great suffering. The man gave a history of having felt a sharp, tearing pain in the right groin, while operating a taxicab, about three months previous to coming to the clinic. Since that time he had been to several dispensaries in a vain search for relief. He had used a truss without success. Failing to obtain relief by other measures, he wished to be operated upon at once.

From the general physical examination the patient was found to be in a very bad condition, as the result of the prolonged excessive use of alcoholic stimulants. The following conditions were present: general atheroma of the arteries; renal insufficiency, due to chronic Bright's disease; marked enlargement of the liver; myocarditis, with systolic murmur at the base; emphysema; râles over the bases of both lungs. A history of chronic gastritis was also elicited.

The patient's general condition was such that immediate operation was not deemed advisable. He was told, accordingly, to abstain from the use of intoxicants, and to refrain from lifting or straining; he was put upon a diet, tonics, etc., and was kept under observation for about three weeks. Despite the fact that only slight improvement followed this régime, he insisted upon operation. He was then admitted to the hospital, on November 14, and prepared for operation the next day.

Because of the man's general condition, inhalation anesthesia was considered contraindicated. He was prepared, accordingly, for operation under spinal analgesia. Before the members of the Congress of Surgeons present, I injected into the cauda equina twenty-six minims of a one per cent. solution of stovain. The patient, who presented no symptoms differing from those of the average subject during the spinal injection, was then sent to another room to be operated upon by Dr. E. M. Foote and Dr. Claude A. Frink, of my staff, while I concluded my lecture before the Congress. The man's mind was perfectly clear, his pulse was good, there was no nausea, no cyanosis, no respiratory embarrassment—in fact, *none of the symptoms of stovain poisoning.* He suddenly turned pale, said, "I am dying," and instantly died.

The case was made a Coroner's case, and an autopsy was performed the next day, with the following findings:

Marked edema of the brain, so-called "wet brain"; myocarditis; atheroma of aorta; aortic insufficiency; emphysema of lungs; chronic interstitial splenitis; chronic gastritis; chronic enteritis; chronic interstitial nephritis. Spinal chord showed no gross lesion.

The Coroner's inquest was held on December 4, 1912. The jury, after listening to the testimony of the above facts and a number of experts as to the indications of death by stovain poisoning, did not find that the man died of stovain poisoning but that death was caused "by pathological conditions" as above described, and all concerned were exonerated from blame.