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LOCAL ANAESTHESIA IN GENERAL SURGERY

BY

HAROLD DODD, Ch.M., F.R.C.S.

*Surgeon to the King George Hospital, Ilford, and to the Royal Hospital, Richmond;
Assistant Surgeon, London Homoeopathic Hospital*

Serious interest in local anaesthesia was aroused during a visit to Budapest when Professor Adam said: "I have performed over 40,000 operations under local anaesthesia and I have never had an anaesthetic fatality." He had performed a cholecystectomy, a partial gastrectomy, a thyroidectomy, and an operation for secondary empyema under local anaesthesia with superlative dexterity and daintiness of surgical technique.

Previously local anaesthesia had been regarded as of limited usefulness in major surgery. It had been seen used in dilettante fashion in Britain, mostly for small procedures, while in major cases it was often supplemented to such an extent that the "local" became the very junior partner of the anaesthesia. A few large operations under local anaesthetics had been witnessed, but they were not painless or convincing. The Hungarian patients, hospital and private, walked or were wheeled in chairs into the theatre (including the exophthalmic goitre patient), so that the pre-anaesthesia was slight. On no occasion was the local assisted by a general anaesthesia or by other measures. The patients were visited afterwards and the highest pulse seen was 92, although clearly they were poorer surgical risks than London people.

Local anaesthesia is not new; but in Britain, at any rate, it is seldom regarded as the method of choice. Its use on the Continent is much wider, whilst in traumatic surgery Böhler's technique is classical.

Local anaesthesia has been practised by us since May, 1937, and our experience and the pertinent points arising out of it are here recorded. It took a year to develop the method with regard to patient and assistants, and to acquire the mental restraint, manual deftness, and precision necessary.

Points from Professor Adam's Technique

He used a 2-c.cm. syringe to infiltrate the skin and one of 5 c.cm. for the deeper tissues. The needles were of the fine short hypodermic type throughout. The anaesthetic medium was pantocain (decicain) 1 in 1,000. Professor Adam explained that this drug lies midway between novocain and percaine in its characteristics. Thus novocain 1/2 to 1% acts immediately and lasts for forty to sixty minutes, and is practically non-toxic. Percaine takes a quarter of an hour to act, anaesthetizes for four to six hours, is toxic, and is effective in dilutions of 1 in 1,500. Pantocain anaesthetizes for two to three hours in five minutes, and is but slightly toxic. The volume usable with safety is 150 c.cm. of 1 in 1,000 solution and ten minutes later a further 150 c.cm.; this is ample for the largest operation. The nearer the brain the operation is the smaller the amount of local anaesthetic which can be

injected with safety, as it is quickly absorbed into the general circulation and exerts its toxicity. In the leg up to 400 c.cm. can be used, but in the neck—for example, for thyroidectomy—only 60 c.cm. should be inserted initially, and then cautiously.

In abdominal operations the splanchnic ganglion was not injected directly, but 30 c.cm. was inserted in the middle line at the upper border of the pancreas, about the splenic artery. Finsterer inserts 30 c.cm. of 1/3 to 1/2% novocain into the splanchnics (private communication).

Personal Experience

Formerly Gray's 50-c.cm. syringe was used to inject local anaesthetic, but making the injection so fatigued the hand that the procedure became irksome and was soon discontinued. The 5-c.cm. syringe is a great advance: the insertion is physically easy and the light weight allows of precision in estimating the exact location of the infiltration. An addition is a two-way valve on the syringe which is connected by a tube to a bottle of pantocain. This avoids interruption for reloading and also external contamination, so that the sterility of the fluid is certain; nevertheless, two 5-c.cm. syringes charged by the assistant work quickly and smoothly.

The early experiences were humiliating, partly from lack of faith and skill and partly because of the incomplete infiltration of the operation area. The abdomen was successfully opened and a stomach or gall-bladder operation done in "heavy weather," whilst the exploration was inadequate and difficult. Closure of the peritoneum was an ordeal (the anaesthetist described it as a tea-party), and sometimes a complete general anaesthetic was required to achieve it. With practice the method has become effective, and the opinion we now hold is that in the majority of cases a local anaesthetic is preferable and safest. Bleeding is minimal, the breathing is tranquil, straining is eliminated, the blood pressure is less disturbed than by other types of anaesthesia, and the general condition is optimal throughout.

Another advance was the addition of a colour to the local anaesthetic, making it green or blue. This stains the tissues and indicates exactly how far the anaesthetic has penetrated: thus where there is no colour there is no anaesthetic and therefore no anaesthesia. Two dyes have been used. The first, kiton fast green V, was supplied by Mr. Arnold Sorsby, one drop of the 10% solution added to 8 oz. being sufficient to tinge the tissues green. No biologically standardized preparation of this textile dye is yet on the market. The second was indigo-carmine, as injected for chromoscopy, suggested by Mr. Kenneth James; a few drops are added until the fluid is

medium blue. No ill effects such as sepsis or delayed healing have been observed, and the helpfulness of these dyes is undoubted.

The Pre-anaesthetic for Local Anaesthesia

The pre-anaesthetic for local anaesthesia has been standardized in adults to: omnopon 1/3 to 2/3 grain, hyoscine 1/150 to 1/100 grain. For children it is morphine 1/75 grain for each year of life. Most subjects are rendered drowsy or, at any rate, indifferent to their surroundings. Where this effect has not been produced another 1/3 grain of omnopon may be given in the theatre. A long period of trial of pre-anaesthetics since 1932 has shown the variableness of other remedies, and experience finally crystallized in the twin injection. It is simple and safe to administer, it minimizes error, and it allows of accuracy in assessing results. Each person, however, is considered individually. Heavy morphinization is a fertile cause of post-operative vomiting.

Supplementary Anaesthesia during Operation

The local anaesthesia has been supplemented by various general anaesthetics in order to eliminate the psychical trauma, as indicated by tension and clutching of the fingers. Several media have been used for this purpose.

1. *The Minnitt Gas Apparatus for Midwifery.*—This was successfully employed in a series of cases. Patients were somewhat averse to administering the gas themselves, but the instrument is of real help and can be used by one inexperienced in gas anaesthesia.

2. *Gas and Oxygen.*—Gas and oxygen have been given for periods of twenty seconds up to the duration of the operation. There is an understandable desire by the anaesthetist to give a full anaesthetic, to insert an airway, and occasionally to mop out the throat, etc., thus carrying the risks of a straight general anaesthetic, with little advantage except that the patient is saved psychical trauma. The respiration is jerky and the abdominal muscles are tightened; it is an interesting fact that these effects disappear when the inhalation anaesthetic is stopped. In a number of cases gas had been administered during the minute or so necessary to explore the abdomen, as in a partial gastrectomy or gall-stones. In infants and in apprehensive persons whose self-control and co-operation are doubtful a whiff of gas is given for a few seconds while the appendix is delivered from the abdomen. Latterly it has seldom been required, especially when the incision is adequate: thus local anaesthesia has proved the superiority of the plain incised oblique right iliac incision (not the gridiron) over all others for appendicectomy.

An important effect of gas-and-oxygen anaesthesia by the ordinary closed circuit, with or without an absorber, is that the abdomen becomes rigid and can scarcely be closed until it is stopped, when the respiration becomes tranquil and the abdominal wall soft, otherwise the anaesthesia must be pressed to a full surgical degree by ether. Similar tight abdomens preventing suture of the peritoneum by straining and evisceration were caused by giving oxygen through a mask strapped to the face; this condition also occurred in an edentulous woman who had had an airway left in the mouth after cyclopropane for thirty seconds during a laparotomy for cancer of the rectum. In each case the removal was followed by silent rhythmic breathing. These effects are important in operations under local anaesthesia. The ordinary airway is particularly potent in causing rigidity.

3. *Pentothal and Evipan.*—Pentothal is an efficient additional anaesthetic. It is given either continuously or during the few seconds required for a laparotomy. Seldom has more than 1 gramme been used, and then in an operation lasting nearly three hours; 0.5 gramme is the average amount. Evipan has been similarly employed. Patients like the method, and many have awakened inquiring when they were to have their operation. Pentothal and evipan avoid mechanical interference with the respiratory tract or mouth; no respiratory or cardiac weakness or failure has been noticed. They are given after the peritoneum is opened, preparatory to the sympa-

thetic injection and exploration. After the initial dose to cause unconsciousness (3 to 5 c.cm.) they are trickled in 1 c.cm. at a time, as needed. This has no effect on the blood pressure, but several c.cm. given quickly will cause a prompt fall.

A disadvantage of the method is the difficulty in finding and entering a vein at the instant it is required—that is, when the fingers are noticed to twitch or flex or the patient sighs. This obstacle is overcome by inserting a slow-drip intravenous saline at the start of the operation, and injecting as required into the rubber tube near to the needle or cannula in the vein. Another small objection is a slight duskiness due to defective aeration: keeping the jaw forward and the inhalation of oxygen correct this and also extend the effectiveness of the drug. Pentothal is the supplementary agent of choice, being by far the most efficient. The use of continuous evipan caused pronounced duskiness, jactitation, some rigidity, and post-operative excitement, and we no longer give this drug.

Apparatus used for Local Anaesthetic

The pantocain 1 in 1,000 is contained in an 8-oz. one-orificed babies' feeding-bottle (glass stands boiling). It is secured by a rubber vaccine cap which has been perforated once. The colouring agent is added, and sterilization is done by autoclaving in a dressing drum or by boiling in an instrument sterilizer. Neither procedure affects the anaesthetic or the colour. (With me, novocain 1/2 % has decomposed on boiling and is useless, although Farr (1929) states that it stands 100° C.) Time must be allowed for cooling to body temperature before use.

At the operation the rubber cover is removed and 1 minim of adrenaline per 1 oz. of anaesthetic is added. A stopper with two tubes through it (as generally used for open ether drip) which has been boiled is plugged in, pressure tubing is fitted to connect it with the two-way valve of the syringe, and the apparatus is complete. The container lies on the instrument tray, which usually stands over the patient at operation.

The surgeon, assistant, or anaesthetist proceeds with the infiltration without further help and with the assurance that the medium is sterile and cannot be contaminated by air or by the powder off the gloves. The pantocain must be filtered before bottling and the receptacle be quite clean, for the smallest particle of foreign matter may block the fine No. 17 needles, which have proved just right for the injection. When the syringe is not in use it hangs on one of the hooks of an Ogilvie stand (Fig. 1).

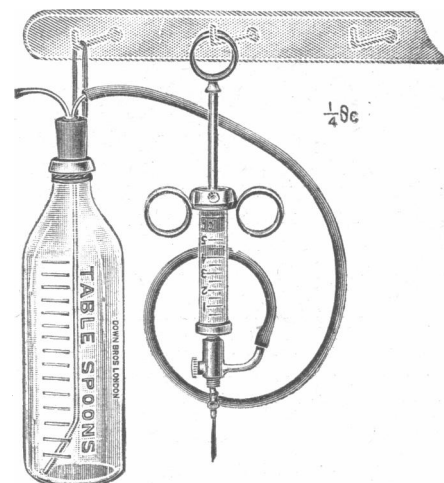


FIG. 1.—The local anaesthetic apparatus. Note the simplicity and the 5-c.cm. syringe.

Injection of Local Anaesthetic

The method employed has been a combination of direct local infiltration and a regional field block. The steps mentioned here apply mainly to the abdomen; the needle throughout has been a No. 17 hypodermic seven-eighths of an inch long. The injections require little muscular effort; 2½ to 3 c.cm. is inserted under the skin for the length of the needle and another 2½ to 3 c.cm. is placed while slowly

passing vertically down into the muscle. In most subjects this reaches the peritoneum through the muscle sheath, but in stout patients a needle one and a quarter inches long is required. The small syringe and the fine needle permit a delicate touch which transmits the resistance of the various fascial layers.

In the abdominal cavity the creeping technique is used: it has been found more satisfactory than the splanchnic injection. Partial gastrectomy, gall-bladder operations, anastomosis of the intestine or the colon, nephrectomy, appendectomy, and herniae have been smoothly performed. At the end of a long intra-abdominal procedure of two to three hours closure is sometimes difficult owing to a tight abdominal wall, but a reinjection of the anaesthetic into the muscle and peritoneum overcomes this satisfactorily. There is a natural temptation to try to finish without stopping for the anaesthetic, but its use is entirely worth while.

The technique has been acquired quickly by house-surgeons and anaesthetists, thus expediting operating sessions.

Blood-pressure Readings during Operations under Local Anaesthesia

Since 1932 at most of our major operations blood-pressure and pulse charts have been made and much valuable and illuminating information has been gained concerning the changes that occur during surgical procedures. Thus the variations of pressure at an operation performed under spinal anaesthesia are precipitate rises and falls which can to some extent be modified by a preliminary injection of 1 grain of ephedrine, but even then the curve is one of oscillations. The readings taken during general anaesthesia show graphs that can be likened to pictures of the Alps. A feature of operations performed under local anaesthesia is the steadiness of the systolic and diastolic pressure and the pulse readings: the more painstaking the infiltration the steadier they are (Figs. 2-5).

ILLUSTRATIVE CASES

Case 1.—The patient, a woman aged 30, had a posterior gastro-enterostomy performed for chronic duodenal ulcer.

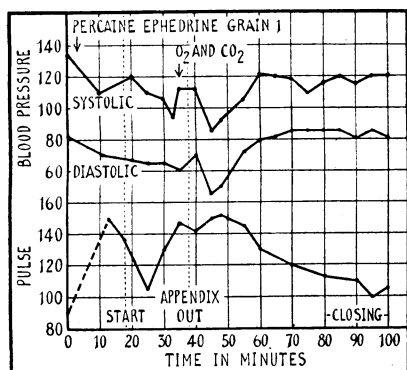


FIG. 2.—Case 1: Operation record for gastro-enterostomy (spinal anaesthetic).

For premedication she was given 2/3 grain of omnopon, 1/150 grain of scopolamine, and 0.85 c.cm. of coramine. The spinal anaesthetic used was percaine, 14 c.cm. of a 1 in 1,500 solution. The operation began about a quarter of an hour after the spinal anaesthetic had been given. Fig. 2 gives the blood pressure and the pulse rate.

Case 2.—Fig. 3 shows the blood pressure and pulse rate of a gastro-enterostomy done under a general anaesthetic. The case was that of a man aged 71 with a pyloric ulcer. He was given 1/3 grain of omnopon, 1/150 grain of scopolamine, and 0.85 c.cm. of coramine as premedication, the anaesthetics used being gas, cyclopropane, and ether.

Case 3.—This patient, a man aged 63, had duodenal ulcer with pyloric narrowing. Posterior gastro-enterostomy and appendectomy were done under local anaesthesia and

pentothal. Fig. 4 shows that the blood pressure and the pulse rate ran a steadier course than in the previous two cases.

Case 4.—The patient, a man aged 58 with a chronic gastric ulcer, had a partial gastrectomy (Billroth I) performed under local anaesthesia with pentothal. The pulse rate and blood pressure were remarkably steady (Fig. 5).

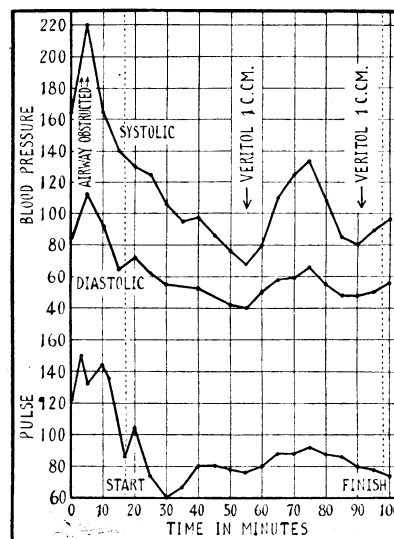


FIG. 3.—Case 2: Operation record for gastro-enterostomy (general anaesthetic).

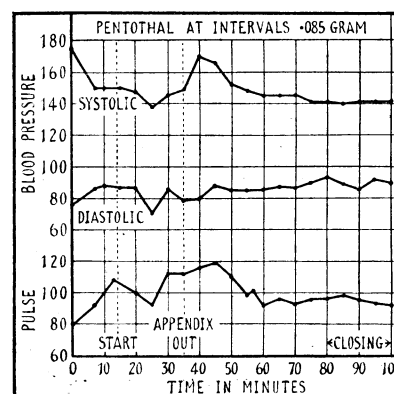


FIG. 4.—Case 3: Blood-pressure chart made during operation for gastro-enterostomy (local anaesthetic with pentothal).

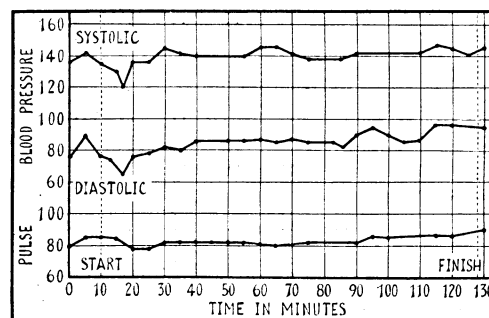


FIG. 5.—Case 4: Operation record for partial gastrectomy (local anaesthetic with pentothal).

Reaction of Patients to Local Anaesthesia

An operation performed under local anaesthesia is not readily acceptable to the average British patient, who expects to be "put under" and go to sleep. A few are glad not to be forcibly rendered unconscious and are interested and co-operative in the experience. The main body of patients prove amenable when the position is carefully and sympathetically explained beforehand. With

the pre-anaesthesia detailed for each patient and a timely shot of pentothal or whiff of gas and oxygen the local anaesthetic is robbed of its terrors. Some patients have declared that they would not wish for any other method.

The After-progress

After the average major operation patients are well mentally and physically. The day after operation they are obviously subdued, with a raised pulse rate, but thereafter progress is uneventful. There is a complete absence of the anxious, suffused, and chesty facies and of headaches, and seldom is there any vomiting. The old troubles of the post-operative chest—cough and hiccup, distension of the abdomen, and retention of urine—have practically disappeared. A former house-surgeon said: "Every case of partial gastrectomy done under a spinal or general anaesthetic had a cough of some sort about the third day, but not these patients done under local." Another said concerning partial gastrectomy subjects under local anaesthesia: "After the first day they recover 'like an appendix.'"

An early disadvantage experienced was that a few wounds broke down superficially and healed slowly, which was considered to be due to adrenaline in the anaesthetic: 2 minims per 1 oz. was then used. This was reduced to 1 minim per 1 oz., and healing has since been perfect, even in carcinomatous subjects.

Several operations were on children; these passed off smoothly, and the recoveries were uneventful. A whiff of gas was given during the intra-abdominal manipulation, lasting in each case less than a minute. The proceedings were explained to the children with the same courtesy and detail as to an adult, and they co-operated admirably.

TABLE I.—367 Cases Operated on Mainly under Local Anaesthesia (September, 1937, to April, 1940, inclusive)

Local infiltration only	194
" " plus gas and oxygen	90
" " " pentothal or evipan	62
" " " light open ether	12
" " " auto-administration of gas (by Minnitt gas apparatus)	9

TABLE II.—The Cases Detailed

Acute appendicitis	49 (no deaths)
Ligature and injection of varicose veins (groin and knee—many bilateral)	39
Hernia, radical cure	37
Partial gastrectomy	40
Cholecystectomy with drainage of common bile duct	27
Laparotomy and colostomy	13
Laparotomy and chronic appendix	33
Steinach II ligature	12
Thyroidectomy (toxic goitre)	11
Suprapubic cystostomy	11
Meatotomy, circumcision, or amputation of penis	10
Gastro-enterostomy	9
Carcinoma of recto-sigmoid junction (Hartmann's operation)	8
Operations on the kidney	7
Perforated peptic ulcer	4
Lobectomy for simple tumour of breast	5
Prostatectomy	4
Tuberculous glands of neck	4
Cholecystgastrostomy	3
Radical excision of the breast for carcinoma	3
Fractured patella	4
Intestinal obstruction	4
Chronic appendicitis	3
Operations on uterus and ovaries	2
Carcinoma of bladder: partial cystectomy	1
Subacute osteomyelitis of skull: resection of area of skull	1
Various minor operations	23

All emergencies have been done with local anaesthesia whenever possible: the mortality and complications have been reduced and the after-progress has largely been uneventful.

Conclusion

In order to operate effectively under local anaesthesia the following points must be observed:

The anaesthetic must be injected into the entire operation area. This is so obvious as to seem redundant, but the need is often forgotten, and the surgeon is reluctant to stop operating, with the consequence that pain, straining, groans,

and dissatisfaction result. "Taking a chance" that a part is insensitive is mostly unsuccessful.

The surgeon must wait for the anaesthetic to act; therefore operations under local anaesthesia, especially in the early stages, last longer than those under general or spinal; but later, taking the induction period into account, the difference in the time is not so wide.

A precision of technique and a daintiness are exacted which are unnecessary with the conventional methods. The tissues are divided by cutting instead of tearing and stripping, and swabbing must be minimal. A measure of discipline and control is required from the surgical team that is not necessary with the usual anaesthetics.

Local anaesthesia cannot be popular in teaching hospitals, for students must have anaesthetic practice; but where there is not this additional responsibility, continued use has crystallized in the opinion that for most operations of general surgery local anaesthesia carries the maximum of safety to the patient.

Summary

Personal experiences of the use of local anaesthesia practised since May, 1937, are given, together with the salient points that have arisen.

Pre-anaesthesia and supplementary anaesthesia are dealt with.

General, spinal, and local anaesthesia are compared in their effects on the blood pressure and pulse rate.

Points to be observed in operating under local anaesthesia are stressed.

REFERENCE

Farr, R. E. (1929). *Practical Local Anaesthesia*, p. 72, Philadelphia.

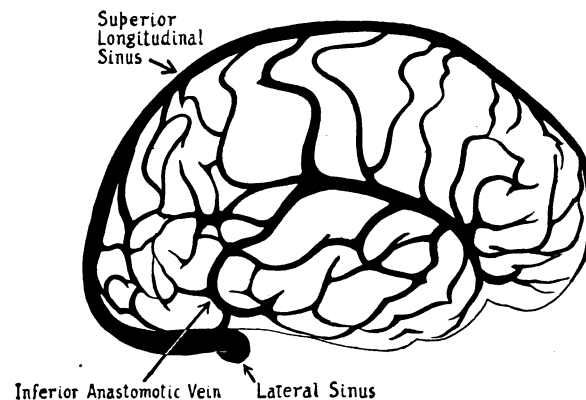
CEREBRAL THROMBOPHLEBITIS

BY

C. P. SYMONDS, D.M., F.R.C.P.

Group Captain, R.A.F.V.R.; Consultant in Neurology, R.A.F.;
Honorary Consultant Physician, Military Hospital (Head Injuries); Physician for Nervous Diseases, Guy's Hospital; Physician to Out-patients, National Hospital, Queen Square

Thrombophlebitis of the superficial cerebral veins is a well-recognized complication of otitis media. Courville and Nielsen (1934, 1935, 1937) believe that the pathway of infection is as a rule by way of the lateral sinus. Thence the thrombosis may spread upwards into the superior longitudinal sinus and so downwards into tributary veins, or it may take the path offered by the inferior anastomotic vein (vein of Labbé), which opens at one end into the genu of the lateral sinus and at the other end into the superficial middle cerebral vein (see Figure). In either



case cerebral symptoms may be absent unless or until one of the main tributary veins from the region of the Rolandic fissure is involved. There is then a rapid onset of weakness or paralysis, often preceded by focal epileptic attacks.