

REGIONAL ANALGESIA IN SURGERY*

M. ARNOLD, F.R.C.S. (EDIN.), *University of the Witwatersrand, Johannesburg*

Why do I choose to speak on this subject when the practice of general anaesthesia seems to have reached such sublime heights? Because after a certain proportion of routine operations, for which general anaesthesia has been the rule for many years, complications still arise which we, as surgeons, cannot in all honesty attribute to the operative procedure itself. The patient may leave the theatre apparently in good health, but shortly afterwards we are summoned to his bedside to find him mysteriously stricken by seeming witchcraft.

The actual cause is a serious disturbance of his normal physiology. It is apt to occur during general anaesthesia because it requires exceptional skill to maintain for more than a short period the optimum levels of oxygen, carbon dioxide, anaesthetic and relaxant. General anaesthesia is not just a science—it is also an art. It takes an artist to maintain the correct composition of the inspired gases. If the oxygen level is high, it is so at the expense of the anaesthetic, and *vice versa*. If relaxation is inadequate, there will be more trauma when muscles are retracted, and hence more shock and post-operative pain. It is also difficult to control respiration when the respiratory muscles resist the rhythmic compression of the re-breathing bag. Efficient carbon-dioxide absorption presents another major problem. Reliance may be placed on mechanical apparatus. The various gauges may show what exactly is being administered, but they cannot possibly guarantee what the patient is actually getting.

Under regional analgesia, one is reasonably assured on at least 5 points.

1. The operation is painless. This cannot lightly be assumed when the patient is being given a general anaesthetic and a relaxant, and is hence unable to show any reaction other than weeping silently and unseen beneath the sterile drapes.

2. The amount of shock is minimal and usually negligible.

3. The possibility of post-operative vomiting and coughing is more remote, and suture lines have more chance of holding.

4. The amount of post-operative pain is less, and hence the need for narcotics and the dangers of the commonly associated respiratory depression are less.

5. The patient's physiology is practically undisturbed. Post-operative complications in general are less frequent. Venous thrombosis is less likely if muscle tone is unaffected, and the patient can be encouraged to exercise his lower limbs during the operation. Respiratory complications are less frequent. An advantage which is difficult to assess is the ability of the patient to change from an irksome position during the operation as one does during normal sleep.

Why is general anaesthesia more popular? It is not because locals are not safer, but because the surgeon is more a surgeon than an anatomist. When the patient is an old man with a failing heart and a strangulated hernia, preference for local analgesia is universal and unanimous. Logically, if it is safer for the hazardous case, it must be so for the non-hazardous case. There are other hazards. Take the case of a child who falls from a tree soon after a meal, sustaining a supracondylar fracture of the humerus. Prompt reduction is highly desirable. Should one think in terms of a stomach wash-out, with its associated psychological trauma, in preparation for general anaesthesia, or simply a sedative and a brachial block?

What are the objections to local analgesia? No surgeon likes to admit that his anatomy is rusty, or that his technique is too rough for a conscious subject who will resent rough handling of the surrounding unanaesthetized tissues, or that he dislikes to have to maintain a quiet atmosphere in the theatre, or that frankly he can't be bothered. Instead, he says that locals are time-consuming, or that the patient is an unsuitable type.

Let us not exaggerate the time factor, which admittedly exists when the surgeon is his own anaesthetist. While one should not begrudge the time expended in the interests of safety, and while conceding that patience is an often necessary virtue if the infiltration is not as precise as it might have been, the delay in an average case of hernia is 5 minutes; a brachial block takes 3, and a sacral 4-10. Of course, the objection falls away if our specialist anaes-

thetist has mastered the routine techniques. As for the second red herring, premedication is so safe and simple today that unsuitable types are very, very few and far between. A barbiturate the night before, perhaps with a tranquillizer; an hour before operation an ampoule of omnopon-scopolamine; sensible psychological aids such as a light bandage over the eyes, cotton-wool ear plugs, and a silent theatre (though there is something to be said for soft music); gentle technique; and in most cases the patient snores throughout his ordeal and remembers very little of it. In hernia operations, he may be awakened if the surgeon wants him to cough to test the efficiency of the repair.

In South Africa, the country practitioner is often required to operate under circumstances where general anaesthesia, especially in combination with safe yet adequate relaxation, is often not available. Surely regional analgesia is the answer in those cases where its technique can easily be mastered? Intra-abdominal surgery presents a bigger problem, and few surgeons care for the tedious technique of multiple intercostal blocks and posterior splanchnic block; but an outstanding indication for local analgesia is as an adjunct to general anaesthesia to lessen neurogenic shock. This applies to gastric, biliary-tract and intestinal operations especially. After the abdomen has been opened, it is a simple matter to infiltrate the omentum or mesentery under vision, and there is no reason why this step should not be routine.

While on the subject of restricted rural facilities, one other great advantage of local analgesia should be mentioned. The patient does not need a special nurse to remain in attendance until his reflexes have returned.

Historical Note

A 1750 text-book of surgery commences its description of the operation for vesical calculi with the words—'The patient having been properly secured . . .'

The history of modern anaesthesia commenced in about 1844 with the discovery of the anaesthetic properties of nitrous oxide, ether and chloroform. Nothing in the history of medicine can compare with that discovery—no single achievement in the past or foreseeable future. The discoveries of antiseptics and aseptics cannot compete. Without anaesthesia, we should have benefited little from these. It is interesting to ponder for a moment on what might have been the course of medicine had the introduction of cocaine and its derivatives preceded that of the volatile anaesthetics by half a century. With that start, the art of local analgesia might well have reached a stage of perfection far beyond its present state. A stage may have been reached when a patient would have rejected a general anaesthetic for a localized lesion as he would today reject amputation of a limb for a crush of a terminal phalanx.

Unfortunately, the reverse sequence occurred. Though the hypodermic needle was invented in 1853, by Alexander Wood of Edinburgh, he had no local anaesthetic to inject until 1884, when Koller introduced cocaine to the medical profession. Tragedy attended the use of cocaine so frequently that local analgesia fell into disrepute until 1904, when Einhorn synthesized novocaine. Today it has several worthy rivals, but its safety, simplicity and effectiveness have stood the test of time.

Precautions

Toxicity. All local anaesthetics are tissue poisons; they should be localized to the area of infiltration and prevented from spreading to higher centres. Injections should therefore not be intravascular or into the sub-arachnoid space, should be given slowly, combined with adrenalin to retard absorption, should be as dilute as possible, and should be confined by a tourniquet in limb surgery.

Aspiration Test. It is not enough to fail to obtain blood or C.S.F. on attempting aspiration. The needle may be blocked. If no fluid is withdrawn, inject 2-3 minims and watch the syringe closely to make sure that there is no leak. Then try aspiration again.

Sensitivity. Proved instances of novocain sensitivity are extremely rare. Before indicting the drug, one must exclude sensitivity to adrenaline, emotional reaction, too rapid injection, or injection into the blood-stream or sub-arachnoid space. With

* Paper read at the First Congress of the South African Association of Surgeons, Cape Town, April 1958.

proper precautions, I feel that the possibility of sensitivity can be ignored.

Technique

It should be a rule that the patient should feel only one painful prick of the needle, and that while the point is being advanced, the plunger of the syringe should be steadily depressed so that the solution is in advance of the point. Subsequent injections should be made through a secondary wheel raised slowly from below the surface.

Brachial block. The patient lies supine, with the head turned to the opposite side, and the shoulder on the affected side depressed. This opens up the posterior triangle of the neck without undue stretching of the tissues. The landmark is the first rib, just lateral to the sternocleidomastoid and above the palpable pulsation of the subclavian artery. After raising a wheal, a 1½-inch needle is inserted vertically *backwards*, aiming at the rib. If this prescription is followed, it will be impossible to pierce the pleura medial to the rib, or the artery, below the wheal. If paraesthesia is elicited, 20 c.c. of the solution (2% novocaine to which has been added 3 minims of adrenaline 1 in 1,000 and 3 minims of hyalase solution) is injected, provided that no resistance is felt. If there is resistance, the needle may be in a nerve trunk (probably the lower trunk) and should be withdrawn slightly. Usually the rib is felt without eliciting paraesthesia, and the injection is made after withdrawing the point slightly to clear the periosteum. Another 20 c.c. is spread more laterally to catch the middle and upper trunks. A practical test for the success of the block is to ask the patient to raise both arms above his head. If the affected limb lags behind, analgesia can be assumed. It is unwise to ask the patient if he can feel the prick of a needle, as he is very apt to confuse pressure with pain. A better test is to transfix a fold of skin slowly and watch his reaction.

Sacral block. The patient lies prone, with the buttocks raised on a bolster or rolled pillow. The landmark is the sacral hiatus, below the 4th (sometimes the 3rd) spine. It accommodates the tip of one's index finger snugly. After raising a wheal, a rigid 2-inch needle is inserted at 30° to the plane of the sacrum until it is felt to traverse the resistance of the tough ligament which covers the hiatus. The syringe is then lowered to the plane of the sacrum and the needle advanced for ½ inch. The sub-arachnoid space extends down to the 2nd spine, and is liable to be entered if the needle is entered too deeply. 40 c.c. of the solution is injected over a 2-minute period. The indications for sacral block are operations on the perineum and the second stage of labour. Operations on the scrotum may require infiltration of the ilio-inguinal nerve at the superficial inguinal ring.

Dorsal nerve block. The patient lies supine. A moist gauze swab is

wrapped around the penis, which is held slightly on the stretch with one hand, between the thighs. The landmark is the symphysis pubis, and 1 inch distal to this, a wheal is raised in the dorsal mid-line of the penis. A 1-inch needle is inserted towards the symphysis at 30° to the horizontal until a 'plop' is felt as it pierces the suspensory ligament, beneath which lie the two dorsal nerves of the penis. 20 c.c. of the solution is injected.

Hernia block. The line of incision is first infiltrated with 10-15 c.c. of 1% solution. Then a secondary wheal is raised 1 inch above and medial to the landmark, which is the anterior superior iliac spine. Through this a long needle (3-5 inches) is inserted vertically backwards until it is felt to pierce the aponeurosis of the external oblique. Here 30 c.c. of 1% solution is deposited, catching the ilio-hypogastric and ilio-inguinal nerves. The needle is then passed more deeply, care being taken to maintain a steady flow. It pierces the deeper muscles and enters the extraperitoneal fatty plane. It will not pierce the peritoneum unless adhesions from a previous operation prevent the peritoneum from being floated away by the fluid. 10 c.c. are injected during this manoeuvre. The needle is then directed towards the edge of the rectus and another 10 c.c. is injected similarly. Once again, the needle is redirected, this time to reach the iliac bone, 10 c.c. being injected during this step. Occasionally 1-2 c.c. must be injected into the spermatic cord as it emerges from the deep inguinal ring to make its mobilization and dissection quite painless.

Digital block. A wheal is raised on the mid-line of the dorsum of the finger opposite the web. The needle is then passed forwards and a wheal is raised in the groove between the bone and pad of the proximal phalanx on each side. The needle is then re-inserted perpendicularly into this groove and 0.25 c.c. injected to catch the palmar digital nerve. A gauze swab is wrapped around the root of the digit and a tourniquet applied at that level. With experience, a 2-c.c. ampoule of 2% novocaine-adrenaline will suffice to complete the block.

Wound block. In a transverse wound on a limb, the central portion of the distal edge is anaesthetic because cutaneous nerve fibres have been divided. A needle is inserted here and a wheal is raised on each side of the wound. Through these wheals, the needle is re-inserted and the proximal edge is infiltrated. If the wound is oblique, the anaesthetic area will be nearer the distal end of the distal edge. In a vertical wound, such an area will probably not exist, and a wheal should be raised proximally and an infiltration made on each side in the shape of an inverted V or U. Except in vertical wounds, if the patient is not permitted to watch the procedure, the injection and subsequent operation can be done without the patient's knowledge. This is very desirable in nervous patients, especially small children.