chemistry, and physiology are invaluable, the final work of the hospitals, as now conducted, is far from satisfactory. It is unsafe for any man, whose training in science has started well, to accept, on an authoritative and not on an evidential basis, the mass of statement of fact and hypothesis that the final student is now called upon to accept. There is, too, the very grave objection that during several years out of those most important to a man's intellectual development he is occupied in amassing disconnected information to the exclusion of contemplation. It seems beyond reasonable denial that the full course of work, supplemented as this is by purely clinical appointments, if suited to the training of a practitioner, must be unsuited to the man who is to make science a career; it is wrong that he should so long be denied the chance of engaging in, or of being at least in close contact with, original work.

I think it is agreed that there are grave defects in medical education to-day, but agreement as to the remedy would come nearer if it were recognized that the right methods of educating practitioner and scientist are not the same. Cautious exploration may be necessary. But there is the principle to guide us—namely, a measure of separate consideration for two classes of student. I suggest as a basis of discussion the following plan in broad outline, and to simplify I shall omit considerations of those sciences which by consent form part of the basis of a general education.

There should be a first course consisting of outlines of human anatomy and physiology, both taught to ensure a clear understanding of the main mechanisms of the body and with special stress upon the needs of the final qualifying courses of instruction—that is to say, it should be particularly emphatic in teaching what is immediately applicable to the study of disease; for such matter will always command particular interest, and will be the more willingly and more easily remembered. It is not suggested that this course should consist exclusively of such material, for much must also be taught solely to illustrate the principles of the sciences concerned and their methods of work.

The second course should be one of more advanced physiology, suited to a science degree and to those who intend to take up physiology, pathology, or clinical science as a career. It should not be compulsory for medical students; it would ordinarily be taken in direct sequence to the first course, in some cases it would culminate in an honours degree, in some instances it might be delayed.

The third course should be the final or qualifying course, and it should consist on the one hand of general and practical instruction along present lines. For the qualifying examination it is necessary to demand a general standard of professional knowledge fitting the graduate to begin independent management of patients; but present-day teaching must be simplified in all its branches. What is essential to general practice should be retained and emphasized, but there should be ruthless pruning away of what is insecure, intricate, or redundant, and of what belongs peculiarly to the province of specialism. Teaching should mainly concern itself with common maladies and with remedies of proved worth and ready application. There should be a determined effort to arrange facts and ideas in thoughtful sequence, and to train students to think logically as well as to observe keenly. This simplified final course should include the outlines of clinical science, and, thus arranged, should be the regular course for all medical students. Higher examinations should, I think, definitely differentiate between two classes of students. The Royal Colleges and perhaps the universities would still hold advanced examinations primarily testing professional abilities. But there is room for a university degree in medical science,

which should not include medicine, surgery, or other branch of medical practice as such, but should centre upon disease, as this is studied in human beings; and this degree should be intended to mark those contemplating an academic career.

It is my conclusion that it is largely within the power of our universities to establish the branch of work that studies disease in living people as a science, by removing the obligation to engage in and teach the practical art, and by treating clinical science on precisely the same basis as the allied sciences, physiology and pathology, are treated, thus bringing all the work into real harmony. The maintenance of equilibrium among these three may then be left with confidence to the interplay of individual and general needs, and to the mutual sympathy that is natural in any corporation of enlightened people working to a common end.

LOCAL ANAESTHESIA IN GYNAECOLOGY

BY

ALBERT A. DAVIS, M.D., Ch.M., F.R.C.S.

LONDON

The employment of local anaesthesia for gynaecological operations has never, in this country, attained to anything like the popularity it enjoys in so many Continental and American clinics. Various explanations have been suggested for this contrast, the most likely being differences in the general standard of inhalation anaesthesia, and the extreme sensitiveness of Englishwomen to any form of genital exposure. But whatever the reasons, the fact is established, and tends to discredit a method enjoying certain advantages which cannot be ignored. In order to appreciate these advantages it will be useful, as a preliminary, to notice the defects inherent in the other types of anaesthesia generally employed.

Disadvantages of the Non-local Anaesthetics

Inhalation Anaesthesia.—It should be remembered that in spite of the modern use of "safe" anaesthetics like ether and nitrous oxide, and of the increasing number of professional anaesthetists, a definite mortality must still be ascribed to inhalation anaesthesia alone. Greenhill¹ found that ether was the cause of death in 0.15 per cent. of 10,325 abdominal operations, while Bartlett and Simmons² state that 12.3 per cent. of the 148 deaths following gynaecological operations investigated by them arose from the same cause. In addition, certain post-operative, though non-fatal, complications may ensue. Bronchitis, pneumonia, and toxic hepatic changes are not uncommon, while acidosis and dehydration shock may result from prolonged administration. Lastly, the painful retching and vomiting which so often accompany returning consciousness remain one of the most distressing sequels of this form of anaesthesia.

Spinal Anaesthesia.—The substitution of spinal for inhalation anaesthesia was primarily designed to eliminate most of the disadvantages of the latter, but increasing experience has been disappointing in this respect. Its dangers and difficulties may be summarized as follows. (1) It is actually less safe than inhalation anaesthesia. In a large series of cases investigated by Bortone³ there was one death for every 311 spinal as compared with one for every 1,628 general anaesthetics. Babcock⁴ found seventy-five deaths in 215,000 spinal anaesthetics, and Rapaport⁵ seven in 500. Cooke⁶ and Bower⁷ both state that there are more deaths in proportion from spinal than from general anaesthesia, while Meeker,⁸ whose experience com-

mands respect, says that the former "has a mortality still too high to recommend it as a method of choice." (2) There is always some degree of uncertainty. Osteoarthritis and deformities of the spine, the presence of physiological or pathological abdominal tumours, and other factors may prevent spinal puncture; while the degree and level of the anaesthesia cannot always be guaranteed, even in expert hands. A survey of the literature published to date reveals that spinal anaesthesia fails, from one reason or another, in approximately 8 per cent. of cases. (3) Complications are relatively common. A profound fall in blood pressure, with restlessness, anxiety, and vomiting, is a not infrequent accompaniment of the operation, while subsequent headache may be severe and prolonged. The pulmonary complications for which spinal anaesthesia was to be the panacea are at least as common as after inhalation narcosis: post-operative pneumonia complicated the cases reported by McKettuck⁹ and Arnheim¹⁰ in the proportions of 10 and 8 per cent. respectively, while Brown and Debenham¹¹ record that it is four times as common as with general anaesthesia. In addition, pregnant women, as Heim¹² has pointed out, are particularly liable to suffer from the complications above mentioned.

Intravenous Anaesthesia.—The popularity of evipan sodium injected intravenously is now almost universal, in spite of its very recent introduction. But its use is limited to operations of very short duration, for repeated doses of this drug entail many of the risks which accompany inhalation anaesthesia.

Rectal Anaesthesia.—For complete anaesthesia the rectal administration of avertin or paraldehyde is generally acknowledged to be dangerous. As a basal anaesthetic, with nitrous oxide as an adjunct, the method is an excellent one, although idiosyncrasies are not uncommon, and many anaesthetists dislike the finality of its retention. In addition, pulmonary complications are not infrequent.

Sacral Anaesthesia.—This method, originally described by Stoeckel,¹³ is identical with "extradural," "epidural," and "caudal" anaesthesia. It has been successfully employed by Laewen,¹⁴ Scholl,¹⁵ Schlimpert,¹⁶ Perrill,¹⁷ and many others, including Schlimpert and Schneider¹⁸ and Meeker and Bonar,⁸ in gynaecological conditions. But, as the last-named writers admit, technical difficulties make the anaesthesia both unreliable and variable, and failures have been recorded by Fischer,¹⁹ Pickens,²⁰ Kehrer,²¹ and Babcock⁴ in the proportions of 15, 17, 21, and 45 per cent. respectively. In addition, toxic symptoms are common (Hirschell²²).

Parasacral Nerve-block.—This consists in novocain injection of the sacral nerves at their emergence from the bone. The needles are passed through the perineum along the front of the sacrum, and the nerves of each side injected at their anterior foraminal exit. Braun,²³ who introduced it, Toelken,²⁴ and Farr²⁵ have used this method with a considerable degree of success, but all agree that the technique is difficult and the results uncertain. There is also the risk of perforating the rectum, a particular danger in a region where sepsis is so serious a complication.

Trans-sacral Nerve-block.—With this form of anaesthesia the sacral nerves are infiltrated through the posterior sacral foramina. Pauchet,²⁶ Oliviera,²⁷ and Meeker and Frazer²⁸ employ it with success in gynaecological cases, but the technique is tedious and difficult; and as it does not appear superior to low intradural anaesthesia, it is unlikely that it will be widely adopted.

Hypogastric Anaesthesia.—Similar objections apply to the posterior route hypogastric plexus injection of Frigyesi.²⁹ As Fekete³⁰ says, the technique is difficult

and uncertain, and pulmonary complications are not uncommon. Also, the anaesthesia obtained is necessarily very limited, and has usually to be supplemented either locally or generally.

Advantages of Local Anaesthesia

Local anaesthesia is free from nearly all the disadvantages discussed above. There is practically no mortality. Rollison³¹ found six deaths in 6,062 general and none in 1,981 local anaesthetics, and of 107 anaesthetic deaths collected by Kaye³² only eight occurred under local anaesthesia. Both Frey³³ and Greenhill³⁴ have used this method in very large series of gynaecological operations, in both instances without fatality.

In addition, the more positive advantages peculiar to local anaesthesia should be taken into consideration in assessing its comparative value. First, haemorrhage is much diminished by the adrenaline content of the anaesthetic solution, this effect being of considerable advantage in the colporrhaphies, where oozing resulting from the mucous separation is uncontrollable by any other method. Secondly, the fluid intake by mouth can be continued before, during, and immediately after operation, thus preventing dangerous dehydration. Lastly, the patient gains, and local healing is accelerated, by the extra gentleness required of the operator by the avoidance of the painful effects of undue traction.

Technique

Premedication.—It is essential that the patient's perceptions be rendered insensible to the psychical and physical discomforts of the operation table. Scopolamine-morphine narcosis is often employed for this purpose, but I have found nembutal more satisfactory. It occasionally causes some restlessness, but it is free from the depressing and nauseating effects of morphine: 1½ grains are given the night preceding, and 3 grains half an hour before, operation. Particular care is taken to make the patient comfortable and, if conscious, to distract her attention from the operative procedures.

External Tumours and Cysts.—These may be removed by circular field block around and beneath the tumour, after the method of Braun. More extensive procedures on the vulva require complete circular field block of the part. This is performed by travelling the needles subcutaneously around the vulva from a starting-point at the central point of the perineum. Binet,³⁵ Ilmer,³⁶ King,³⁷ and Lillienfeld³⁸ state that block of the internal pudic nerve alone is sufficient to allow of the painless performance of superficial vulval and perineal operations. My own experience, however, is similar to that of Gellhorn,³⁹ who found the anaesthesia from this method both unsatisfactory and unreliable, an opinion also shared by the authorities Pauchet and Labat.⁴⁰

Operations on the Cervix.—For dilatation of the os cervicis the injection is made directly into the pelvic plexus of Lee-Frankenhauser. I have elsewhere⁴¹ described the anatomy of this plexus in detail, and it is only necessary to state here that it is a bilateral, flat, fenestrated, quadrilateral mass of nerve fibres lying on either side of the anterior portion of the ampulla of the rectum. The cervix is seized with vulsellae, steadied by very gentle slight traction, and held in this position by an assistant. The needle, which is a very long one, is passed into the vagina along the forefinger of the right hand, until it impinges on the postero-lateral fornix. The vaginal wall is then perforated at this point by gentle, firm pressure, and the needle, guided by a finger in the rectum, is passed upwards and backwards for 1 cm.: 10 c.cm. of a 1 per cent. solution of novocain are then injected, the needle-

point being kept continually moving and perforation of the rectum being carefully avoided. The procedure is then repeated on the other side.

By this method cervical dilatation is quite painless. Its efficacy is well demonstrated in those cases in which, for some reason or other, it is impossible to inject both plexuses, when the dilatation is accompanied by severe pain on the unanaesthetized side only. It is particularly useful for the insertion of radium according to the Heyman technique, avoiding as it does the necessity for three separate anaesthetics. The method is also of value for cauterization of the cervix and insufflation or lipiodol injection of the tubes. Perforation of the uterine artery is, of course, possible in this injection, but it is rare and apparently of little importance. I have only once encountered this complication, which resulted in that case in a small, symptomless, parametric haematoma. If the needle is moved continuously during the injection there is very little danger of collapse from the entrance of novocain into artery or vein, as in the two cases encountered by Braun. For curettage the above technique should be supplemented by the direct application of novocain (on a gauze strip) to the uterine endometrium, which sometimes remains sensitive.

In trachelorrhaphy and other cervical operations, although pelvic plexus infiltration alone is often sufficient, it is desirable as a routine to inject additionally, (a) the whole lateral parametrium, and (b) the cervix itself. The former is performed at the same time as the plexus injection, and eliminates the pain due to a certain amount of inevitable cervical traction. The latter is a sub-mucous injection all round the base of the cervix, and is useful in its haemostatic effect. It has, in addition, a definite anaesthetic value, for by this means afferent impulses are interrupted from the sensory structure I have elsewhere described as the "subepithelial plexus of the tip."

Colporrhaphy.—In anterior colporrhaphy the pelvic plexus and parametric injections are combined with a generous submucous infiltration of the whole anterior vaginal wall. A further injection is made beneath the bladder before its separation. It is useful, in addition, to anaesthetize the terminal urethra and the meatus with gauze strips soaked in 2 per cent. cocaine. A small posterior colporrhaphy may be carried out with a similar anaesthetic technique to the above, but for more extensive procedures it must be combined with block infiltration of the perineum. This method, which has been carefully elaborated by Braun, is also useful for uncombined *perineorrhaphy*, and is carried out as follows.

From a midline cutaneous wheal midway between vulva and anus, the tissue between the vagina and rectum is infiltrated with a long needle almost to the fornices. The needle is controlled by a finger in the rectum, and by its partial withdrawal and reintroduction in several horizontal planes a considerable area is anaesthetized. By directing the needle more and more transversely, a wall of infiltration is eventually built up across the upper part of the ischio-rectal fossa, thus effectively blocking the branches of the pudic nerve as they cross the fossa. Combined with parametric and pelvic plexus infiltration, and with the circular subcutaneous vulval block described above, this method gives a very satisfactory anaesthesia. Further relaxation of the pelvic floor, with consequent greater ease in approximating the levatores, is obtained by the injection of a few cubic centimetres of novocain directly into those muscles.

Pudic Nerve Block.—As stated above, direct block of the pudic nerve is itself of little value, but it is a useful adjunct to the technique described for *perineorrhaphy*, helping considerably to produce relaxation of the muscular

floor of the pelvis. The nerve is reached as it lies along the medial surface of the inferior ischial ramus. The tuber ischii is identified, the needle plunged through the skin and subcutaneous fat in direct contact with the ramus, and 10 c.cm. of the anaesthetic solution injected against it. A further 10 c.cm. is then injected into the adjacent part of the ischio-rectal fossa. Franke and Posner⁴² inject the pudic nerve as it lies on the spine of the ischium, but their technique is more difficult and uncertain than the one just described. It has the advantage of avoiding the possibility of pressure-necrosis of the badly nourished fat in the ischio-rectal fossa, but this appears to be a purely theoretical risk.

Conclusions

1. While in no way advocating the widespread substitution of local for general anaesthesia in gynaecology, it is suggested that a considerable number of minor operations may be advantageously performed by this method. It is probable that the majority of patients are psychologically unfitted for local anaesthesia, but there remains a number whom it would benefit considerably.

2. It is suggested that the increased safety and efficacy of the various sacral anaesthesias do not compensate for the difficulties and uncertainties of these methods.

3. It will be noticed that no mention has been made above of the performance of vaginal hysterectomy or of any abdomino-pelvic operation under local anaesthesia. I believe that the latter is unsuitable in every way for both these types of procedure, which are more adequately carried out under low spinal anaesthesia.

4. Local anaesthesia is easy, safe, and efficacious. Its use is necessarily restricted, but it has many advantages over other methods in selected cases.

REFERENCES

- Greenhill, J. P.: *Journ. Amer. Med. Assoc.*, 1934, cii, 28.
- Bartlett, M. K., and Simmons, F. A.: *Surg., Gynecol. and Obstet.*, 1932, lv, 777.
- Bortone, F.: *Anesthesia and Analgesia*, 1932, xi, 256.
- Ealcock, M. E.: *Ibid.*, 1932, xi, 184.
- Rapaport, B. D.: *New England Journ. Med.*, 1928, cxviii, 447.
- Cooke, W. R.: *Med. Record and Ann.*, 1929, xxiii, 435.
- Bower, J., et al.: *Journ. Amer. Med. Assoc.*, 1933, c, 245.
- Meeker, W. R., and Bonar, B. E.: *Surg., Gynecol. and Obstet.*, 1926, xliii, 891.
- McKettuck, L. S., et al.: *Ibid.*, 1931, lii, 898.
- Arnheim, E. E., and Mage, S.: *Ibid.*, 1932, liv, 826.
- Brown, A. L., and Debenham, N. W.: *Journ. Amer. Med. Assoc.*, 1932, xcix, 209.
- Heim, K.: *Monats. f. Geburt. u. Gynäk.*, 1930, lxxxiv, 45.
- Stoessel, W.: *Zentralbl. f. Gynäk.*, 1909, xxxiii, 1.
- Laewen, A.: *Ergeb. d. Chir. u. Orthop.*, 1913, v, 39.
- Scholl, A. J.: *Amer. Journ. Urol.*, 1921, vi, 149.
- Schlimpert, S.: *Deut. med. Woch.*, 1911, xxxvii, 719.
- Perrill, I.: *Illinois Med. Journ.*, 1920, xxxviii, 236.
- Schlimpert, S., and Schneider, J.: *Munch. med. Woch.*, 1910, lvii, 2561.
- Fischer, W.: *Deut. Zeit. f. Chir.*, 1916, cxxxvi, 561.
- Pickens, R.: *Journ. Tennessee Med. Assoc.*, 1916, ix, 120.
- Kehrer, E.: *Monats. f. Geburt. u. Gynäk.*, 1915, xlii, 95.
- Hirschell, G.: *Lehrbuch der Lokalanästhesie*, J. F. Bergmann, Wiesbaden, 1916.
- Braun, H.: *Oertliche Betäubung*, fifth edition, J. A. Barth, 1919, p. 375.
- Toelken, P.: *Deut. med. Woch.*, 1914, i, 174.
- Farr, R. E.: *Amer. Journ. Obstet. and Gynecol.*, 1922, iii, 400.
- Pauchet, V.: *Amer. Journ. Surg.*, 1920, xxxiv, 1.
- Oliviera, E. M.: *Prensa Med.*, 1915, ii, 233 (quoted by Meeker).
- Meeker, W. R., and Frazer, E. B.: *Surg., Gynecol. and Obstet.*, 1922, xxxv, 801.
- Frigyesi: Quoted by Pauchet (q.v.).
- Fekete, A.: Quoted by Lilienfeld (q.v.).
- Rollison, J. W.: *Med. Journ. Australia*, 1929, ii, 580.
- Kaye, G.: *Ibid.*, 1929, ii, 579.
- Frey: *Zentralbl. f. Gynäk.*, 1928, lii, 2485.
- Greenhill, J. P.: *Journ. Amer. Med. Assoc.*, 1934, cii, 31.
- Binet, A.: *La Gynecol.*, 1932, x, 529.
- Ilmer, W.: *Zentralbl. f. Gynäk.*, 1910, xxxiv, 699.
- King, R. W.: *Surg., Gynecol. and Obstet.*, 1916, xxiii, 615.
- Lilienfeld, M. C. C.: *Med. Journ. and Record*, 1933, cxxxvii, 270.
- Gellhorn, G.: *Surg. Gynecol. and Obstet.*, 1927, xlv, 105.
- Pauchet, V., Sourdet, P., and Labat, G.: *L'Anesthésie Régionale, Anesthésie Paravertébrale Sacrée*, Paris, Doin, 1921, p. 124.
- Davis, A. A.: *Journ. Obstet. and Gynaecol. British Empire*, 1933, xl, 481.
- Franke, C., and Posner, H. L.: *Arch. f. Klin. Chir.*, 1912, xcix, 139.