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THE PRESENT POSITION OF NEUROSURGERY IN GYNAECOLOGY*

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The advent of autonomic surgery and its specific application by the Lyons School (Leriche, 1925; Cotte, 1925; Molin and Condamin, 1929a) twenty years ago marked an epoch in gynaecology, and since that time a variety of operations, mainly designed to interrupt sympathetic pathways from the uterus, but all concerned with the relief of pelvic pain, have been carried out by a variety of surgeons. A sufficient time has now elapsed, and a large enough number of cases have been so treated, to allow of assessment of their relative value, and it is my purpose to examine the nature of the procedures involved, their specific indications, and the long-term results of their application. The operations which have survived the initial enthusiasm are presacral, ovarian, and utero-sacral sympathectomy, cordotomy, pelvic alcohol block, and various types of spinal injection, and it will be convenient to discuss these seriatim.

Resection of the Presacral Nerve

This operation was first described by Cotte in 1925, and has since established itself as the prime pelvic sympathectomy. A logical extension of Leriche's (1925) pioneer periarterial and lumbar resections, it was based largely on the new conception of the pelvic nervous system arising from Rochet and Latarjet's (1913) brilliant anatomical description of the presacral nerve. They showed that here, in one easily accessible bundle, was concentrated practically the whole sympathetic supply to the pelvis, and that uterine denervation could be accomplished almost completely and relatively easily by resection of this main trunk.

Rationale.—The sympathetic nerves to the uterus carry motor contractile fibres, so that their section diminishes the muscular spasm which is the basic cause of spasmodic dysmenorrhoea. They also contain the majority of the sensory fibres from the organ, so that their resection will relieve not only the pain of dysmenorrhoea but also that arising from other uterine conditions. It has been shown, too, that in many cases of dysmenorrhoea and uterine carcinoma the pain is primarily due to pathological changes in the peripheral uterine sympathetic nerves (Davis, 1938; Dargent, 1948), division of which removes a constant source of irritation.

Indications.—The operation is curative in cases of severe spasmodic dysmenorrhoea, and is indicated in those patients who remain unrelieved by medicinal treatment, cervical dilatation, and alcohol injection. It is also of great value

as an adjunct to other gynaecological procedures, particularly where pain has been a prominent and long-standing symptom. The pain of pelvic carcinoma, either primary or secondary to radiotherapy, is relieved by this method, but only when it is purely visceral in type; spinal pain is naturally unaffected by sympathetic resection.

Technique

Absolute relaxation is essential, so that spinal analgesia is the ideal method. In nervous patients the pentothal-curare-cyclopropane sequence is satisfactory. The highest Trendelenburg position is also necessary to secure freedom from bowel interference. The incision is placed in the midline midway between umbilicus and symphysis, and need not be more than 1 in. (2.5 cm.) in length; the "Dan to Beersheba" gynaecological incision is unnecessary in uncomplicated cases, and serves mainly to convert a relatively minor operation into a major one. The sacral promontory and aortic bifurcation are identified, and the posterior parietal peritoneum covering the space between is picked up and incised longitudinally for 2 in. (5 cm.). The whole of the neuro-areolar tissue between the common iliac vessels is systematically separated and gathered into a median bundle, care being taken to strip the under-surface of the peritoneum, to which large nerve bundles are often attached. The presacral nerve is occasionally identifiable as a single narrow cord, but it usually consists of several parallel fibres of varying size, so that wide mass dissection is preferable to individual removal. During separation several lateral filaments will be exposed, particularly one from the fourth lumbar ganglion, and these must be divided. The nerve bundle is now elevated with an aneurysm needle and further separated above and below for a distance of 1 in., then divided at each end. This wide excision is necessary to ensure a permanent effect, for regeneration, as Haxton (1947) has shown, can be remarkably rapid and complete in sympathetic nerves.

Ligation is unnecessary, any small haemorrhage being controlled by tampon pressure. It is also unnecessary, and indeed unwise, to transgress the limits of the operative field, for vascular damage is easily accomplished and very difficult to control. The peritoneum is then sutured, the pelvis explored, and any minor abnormality corrected.

The operation is relatively easy, and quite safe provided careful attention is paid to the anatomical relations of the area. The ureter occasionally lies near the middle line in this position, and the pelvic mesocolon sometimes transgresses it, but neither abnormality should cause trouble if properly identified. There are also no adverse:

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effects, apart from an increase in the menstrual flow. The pain of subsequent parturition is in fact much minimized, and Blinick (1947) has reported a case of two consecutive painless labours following presacral neurectomy.

Results

The prime indication for presacral neurectomy is dysmenorrhoea, and it is in this condition that the best results are obtainable. But just how good these are is much disputed, and the figures given by different writers reveal very considerable variation. Cotte, the inventor of the operation, is naturally an enthusiastic advocate, and in a recent personal communication states that it is "always successful" in his hands. Greenhill (1942) is similarly optimistic, and Curtis and his associates (1942) are emphatic about the permanence of their cures. Cannon (1937) reports 100% cure in 10 cases, Cannaday (1938) complete or marked relief in 37 out of 40 cases, and Pike (1942) in 14 out of 15. All of De Courcy's (1934) 21 cases were cured, and similar results in smaller series have been reported by Tirelli (1928), Waters (1946), and others. Some reports are less satisfactory. Counseller and Craig (1934), in an evaluation of the end-results of the Mayo Clinic cases, found only nine of 15 cases completely cured, though the remainder were much improved. Meigs's (1939) 20 cases of presacral resection alone showed 15 complete cures, two partial and three complete failures, and Masson and Shoemaker (1938) obtained only five cures in 10 cases, though the remainder were improved. Donaldson (quoted by Bourne and Williams, 1945) gives his results in 54 cases as good in 18, fair in 16, and bad in 20, and the experience of Bourne and Williams (1945) leads them to the caustic conclusion that "the operation is not so universally successful as some would have us believe."

My own experience covers 86 cases, extending over 16 years, and the results in later cases show a considerable advance over the earlier. The patients operated on before 1934 showed a cure rate of 54%, and those up to 1945 of 71%. Of eight patients operated on since that time, however, only one is not cured, and she admits to considerable improvement. This progression is due to a variety of causes—more extensive denervation, more careful peritoneal stripping, and more extensive coincident surgery, but the main factor has been increased care in the selection of cases. It has now been established that the only dysmenorrhoea for which presacral neurectomy is basically indicated is the primary spasmodic type: congestive secondary cases may be improved, but the result is always problematical. It is accordingly my practice to limit the operation to those patients suffering from intolerable colicky pain centred over the hypogastrium, and in whom all minor and operative measures—exercises, antispasmodics, cervical dilatation, and alcohol injection—have failed. Under these circumstances the results achieved are excellent, and it is possible practically to guarantee a permanent cure in the properly chosen case.

The importance of careful choice cannot be over-emphasized, for it is unwarrantable to subject an otherwise normal young woman to operation for pain alone without a fair certainty of success. Cases of intractable primary dysmenorrhoea are not common, and the average gynaecological surgeon will see perhaps 10 a year. Masson and Shoemaker (1939) found only 15 such cases in 682 cases of dysmenorrhoea—an incidence of 2.2%, and though my own figures show the rather higher rate of 4.8% both emphasize the comparative rarity of the indication.

In *secondary dysmenorrhoea* the operation is less successful, and it should not be undertaken for this condition alone. But as an adjunct to operative procedures for the

correction of gross pelvic pathology, particularly where pain is a prominent symptom, presacral resection is invaluable, and should be carried out as a routine in these cases. It is naturally difficult to apportion the pain relief after such composite operations, but there is no doubt of the superiority of the combination.

The visceral pain of incurable *pelvic carcinoma* may be relieved by the operation, though the spinal pain, often predominant, naturally remains unaffected. It is consequently important to make a careful differentiation in each case, and to limit sympathectomy to those with a minimum of somatic pain. Leriche (1939), Todd (1937), and Greenhill (1941) have described the visceral pain as being characteristically diffusely spread over the hypogastrium and lower lumbar region, with rectal tenesmus and cystalgia as a frequent accompaniment. Radiation into the thighs and vulva is common but remains diffuse and non-somatic. Somatic pain may present as a girdle pain or be referred along the affected nerves (sciatic, pudendal, obturator), and is usually easily identifiable. True visceral pain is relieved by sympathectomy, and Greenhill (1933), who has done most to popularize this application, states that it will yield almost perfect results if restricted to appropriate cases. As early as 1933 he reported complete relief in 10 patients suffering from cervical carcinoma, and similar success has been claimed by Wetherell (1933), Paolucci (1928), Pereira (1946), and others. Of Behney's (1934) 21 cases, 16 were relieved for the remainder of their lives, over periods from four weeks to 13 months. Other surgeons, however, have not been so fortunate. Cotte (1936) himself says that pain in the bladder and rectum is not always relieved: Atlee (1935) was successful in two out of five cases, and Dargent (1948) in one out of three; Verbrugghen (1940) says that relief is obtained only while the growth is limited to the body of the uterus; while Cutler (1938) states that only 50% of cases will show a good result, "in spite of the loud clamour of the gynaecologists."

My own experience in eight patients has not been encouraging. The operation was technically impossible in two because the malignant mass encroached on the promontory, in two the pain was unaffected, one was slightly relieved (this might easily have been psychological), and the remaining three were definitely improved, though for only three weeks in one of these. Such failure is probably explained by several factors. Pathological change in the sympathetic nerves adjacent to a carcinoma is early and extensive (Pereira 1946; Dargent, 1948; Jiano *et al.*, 1928), and may have already spread proximal to the operative site. Sensory impulses might also be conveyed by way of the lumbar sympathetic chains and the sacral parasympathetics, both of which remain intact, and high lymph nodes may cause local pressure on the lumbar and thoracic cords. These same trunks may also be the site of interstitial sclerosis—a common result of deep radiotherapy; and this intraneural pressure is undoubtedly a cause of intractable neuralgia referred to the pelvis. Too much should therefore not be expected in these cases, but in suitable patients the operation is well worth a trial.

Ovarian Sympathectomy

In some cases of dysmenorrhoea the cause of the pain is ovarian, as shown by its characteristic distribution, its persistence after uterine denervation, and its elicitation on bimanual compression. For this syndrome, which Browne (1939) states accounts for nearly 12% of all cases of dysmenorrhoea, he advocates section of the ovarian nerves. The operation has also been applied successfully to cases of severe ovulalgia, and as a palliative in ovarian endometriosis.

Technique.—The ideal operation postulates a systematic dissection of the ovarian nerves as they lie within the folds of the infundibulo-pelvic ligament; but this is rarely possible, for they lie intertwined with the complicated ovarian venous plexus, and haemorrhage is an invariable accompaniment. Apart from obscuring the operative field, this is usually uncontrollable by individual ligation, so that the ligament itself must be tied at a higher level. The only practical procedure, therefore, is to divide the whole ligament near the pelvic brim after mass ligation, and this is the one generally adopted.

Results. There is no doubt of the value of the operation in some carefully selected cases. Browne reports cures in 10 of 16 patients with ovarian dysmenorrhoea, and though most surgeons will disagree with his estimate of the frequency of the condition the occasional case encountered is gratifyingly relieved. The operation is also useful as an adjunct to conservative operations on the adnexae, particularly where pain has been a marked factor, as in endometriosis, and I have had good results in three such cases. Severe ovulgia—"mittelschmerz"—is a rare condition, and is due to tubal hypercontraction, excessive follicular spill, or pressure on the circular nerves which embrace the distended follicle (Davis, 1939). Where this last factor is the cause ovarian denervation gives an immediate and surprisingly complete cure.

It is, however, questionable whether the advantages of this operation outweigh its possible dangers. It certainly delays follicle development in dogs, and, though the hormonal function of the human ovary appears to be independent of its nerve supply, the latter is so rich that it must be assumed to have some important controlling role. Interruption of the main vascular supply to the organ must similarly exert an adverse effect on its function. The operation should therefore not be undertaken in young non-parous women, except for the most urgent indication, and should generally be reserved for the few selected types described above.

Alcohol Injection of the Pelvic Plexus

This operation was originally introduced (Davis, 1936) with the object of blocking the nerve pathway to the uterus at its nearest externally accessible point.

Rationale.—The pelvic plexus is the main uterine ganglion, receiving the bulk of the nerve supply designed for that organ. It is formed by the confluence of the inferior hypogastric plexus and the nervi erigentes, the former carrying abdominal sympathetic and the latter sacral parasymphathetic fibres, and the nerves are distributed to the uterus in the form of several fine strands emerging from the anterior border of the plexus. It thus presents an ideal site for direct and complete interruption of these pathways, for practically the whole of the uterine nerve supply is here concentrated in a comparatively small area.

The plexus is a large flattened mass of nervous tissue lying in a fairly compact sheet at the side and in front of the ampulla of the rectum. From here it stretches forward to the uterus in the form of long tough fibres which enter the organ just above the cervix. It lies immediately beneath the floor of the pouch of Douglas at its postero-lateral angle and above the corresponding lateral vaginal fornix, the lowest part being contained within the folds of the utero-sacral ligament. The ureter crosses its superior border, and the uterine artery lies close to its lateral surface, the internal iliac vessels passing behind and below.

Indications.—The method is primarily of value in cases of severe spasmodic dysmenorrhoea which have failed to react to medical treatment. In these it should be combined

with cervical dilatation, which, as I have shown elsewhere (Davis, 1933), is itself a type of sympathectomy, for the external os is surrounded by a circular sympathetic plexus rupture of which is the basic factor in the pain relief obtained by this simple procedure. It is also indicated in cases of painful parametritis and vaginal neuralgia, and as an adjunct to cervical cauterization in Young's syndrome of iliac-fossa pain.

Technique.—Under intravenous anaesthesia the cervix is pulled to one side and the opposite lateral fornix exposed by retraction. A strong spinal needle is inserted into the vaginal mucosa at its highest point, 1 cm. lateral to the cervix. The needle is then passed laterally and posteriorly at an angle of 45 degrees to both the vertical and the horizontal planes for 2 cm., being guided to the side of the rectal ampulla by a finger placed in that organ. The needle is then withdrawn for 0.5 cm. and, after preliminary aspiration, 1 ml. of absolute alcohol is slowly injected, the point being kept moving throughout. The needle is then almost completely withdrawn and reinserted into the lateral parametrium just by the side of the supravaginal cervix and a further 1 ml. infiltrated into this area. This last injection, originally advocated by Bloss (1929), effectively deals with any fibres which have escaped the original block. The whole procedure is then repeated for the other side. It is important to avoid perforation of the rectum, for cellulitis may follow. This is avoided by keeping the needle-point 0.5 cm. from the organ, as determined by the internal finger. Both the ureter and the uterine artery are medial to the operative field, but constant movement of the needle-point will eliminate the danger of damage to these structures. The amount of alcohol employed is also important, for if the suggested quantity is exceeded there is danger of complete destruction of the plexus, with subsequent urinary retention, for the motor fibres in its upper portion are indispensable for normal bladder function.

Results.—Of 61 cases of primary spasmodic dysmenorrhoea recently reviewed 43 (nearly 70%) were permanently and adequately relieved. (It should be mentioned that five of these had the injection repeated for recurrence after a short interval, but the effect of the second operation was permanent.) Eleven patients were relieved to the extent that the subsequent periods, though still painful, were tolerable, and in the remaining seven there was no appreciable change. These results, though far from perfect, show a considerable advance on those obtained from simple cervical dilatation, which cures an average of 20% of patients, and the operation should be utilized for all primary spasmodic cases which remain unrelieved by medical and physiotherapeutic measures.

Intrathecal Alcohol Injection

Intraspinal alcohol injection was introduced by Dogliotti in 1931 for the relief of intractable neuralgia, and it has since been applied successfully by Stern (1934), Greenhill and Schmitz (1936), Todd (1937), and others to cases of cervical carcinoma.

Technique.—The patient lies on the side, with the body inclined to the prone position and the back arched as much as possible. The table is tilted to an angle of 15 degrees, the head end being lower. A procaine wheal is raised over the interspace between the fourth and fifth lumbar spines and a spinal needle inserted into the subarachnoid space. Absolute alcohol is then injected very slowly to a total quantity of 0.5 ml. without admixture of cerebrospinal fluid. The patient remains in the same position for an hour before being returned to bed, and the whole procedure is repeated for the other side after an interval of 10 days.

The method is an extremely easy one, requiring the minimum of preparation and apparatus, and it has the additional advantage (as emphasized by Greenhill) of being applicable to bed-ridden patients at home. But it carries several disadvantages: incontinence of faeces and urine is a not infrequent sequel, and other paralytic complications resulting from cord damage are occasionally seen. The operation is therefore restricted to cases of inoperable carcinoma. Complete relief of pain is also by no means guaranteed in spite of the somewhat optimistic reports of some of the earlier workers (Saltzstein, 1934; Stern, 1940) and it is noteworthy that Greenhill (1947), one of the pioneers in this field, has reduced his estimated relief rate from 92% in 1935 to somewhat "more than half" in 1947. However, when the operation is successful the completeness and permanence of the pain relief are extremely gratifying, and the patient is in addition saved from the depression and mental stultification incidental to prolonged morphinization.

Subarachnoid alcohol injection is therefore indicated in all cases of visceral pain arising from incurable pelvic carcinoma. I have recently advocated reinforcement of this procedure with simultaneous alcohol injection of the pelvic plexus, and the combination, where practicable, seems to give considerably better results.

Intraspinal Sulphate Injection

To circumvent some of the difficulties inherent in alcohol injection Bates and Judovich (1942) substituted magnesium sulphate. While adequately destructive to nervous tissue it is much less so than alcohol, and therefore may be used in larger quantity and over a greater area.

The *technique* consists in the intraspinal injection of 250 mg. of ammonium sulphate dissolved in 5 ml. of sterile water after preliminary spinal procaine analgesia to minimize the pain of injection. The third interspace is employed, and the patient subsequently sits up to allow of caudal diffusion of the heavy solution.

The originators of this method are optimistic of its permanent benefit, but in two personal cases the pain of injection was worse than the original complaint, and in neither was there a reasonable degree of subsequent relief. Bourne and Williams (1945) cite similar disappointing results in their own cases, but, as they state, it is yet too early to form a final opinion, particularly as other workers have been more favourably impressed.

Section of the Utero-sacral Ligaments

This is the original pelvic sympathectomy, and was first advocated in 1899 by Jaboulay, who ruptured the pelvic parasympathetic nerves by serum injection and blunt dissection of the retrorectal space. It was at first received enthusiastically, but rapidly fell into desuetude as the result of the frequent and severe complications following the somewhat crude avulsion technique of the earlier surgeons. The operation was revived and modernized by Condamin in 1927, and since then this worker, together with Molin, has published several reports describing excellent results in a variety of painful pelvic conditions.

Rationale.—The posterior parametrium of the utero-sacral folds contains the utero-sacral ligaments proper, some smooth muscle, fine blood vessels and lymphatics, and numerous nerve bundles lying in loose fibro-fatty areolar tissue. The nervous element consists of the lower border of the pelvic (Lee-Frankenhauser) plexus and its forward branches to the uterus, and so comprises the main supply to that organ. These postganglionic nerves are easily accessible in the anterior part of the utero-sacral ligament, and intervention at this level would appear to be the ideal uterine sympathectomy.

Technique.—The ligaments may be divided from above, but this is justifiable only when laparotomy has been performed for the correction of some basic pathology. Otherwise the vaginal approach is indicated. In this the posterior lip of the cervix is seized with vulsellum forceps and pulled downwards and forwards so as to put the utero-sacral ligaments on the stretch. A semicircular incision is made through the vaginal epithelium at the level of the cervico-vaginal junction from the base of one broad ligament to the other. The subjacent parametrium behind the uterus is separated by finger-swab pressure, leaving the utero-sacral ligaments free and more clearly defined. They are then cut away with scissors from their somewhat wide insertion into the uterus, and the free ends further separated by blunt dissection to prevent subsequent regeneration. The operation is technically very simple, but haemorrhage from small vessels is usually troublesome and difficult to control. Ligation is complicated by retraction of the cut end, and the tedious swab pressure required is a poor substitute. Sometimes this is quite ineffective, and blood collects in the posterior parametrium, forming a large haematoma which usually becomes infected.

Indications.—Utero-sacral resection is of value in intractable dysmenorrhoea, but is mainly indicated for the relief of what may be called the "posterior parametritis syndrome." The basic pathology of this condition is a utero-sacral lymphangitis secondary to cervicitis, with diffuse inflammation, perineural sclerosis, and smooth-muscle spasm. The prime resulting symptom is chronic low backache aggravated by walking, menstruation, and coitus, and examination reveals the tender, contracted cord-like ligaments.

Results.—The efficacy of the operation is controversial. Louros (1927) obtained 12 cures in 14 patients with posterior parametritis; Molin and Condamin (1929a) give no definite figures, but claim success in "the majority" of cases; and Freund (quoted by Cotte, 1929) in a review of the literature states that on the whole the results are satisfactory. Schockaert (quoted by Cotte, 1929), on the other hand, gave up the procedure after six attempts, in none of which was he successful in producing the slightest symptomatic benefit; while Molin and Condamin (1929b) have reported two cases of subsequent re-formation of the divided ligaments by a painful fibrous band, so that the patients were actually worse than before. Cotte (1929) reports similar failure in 12 cases. This discrepancy is probably due to variation in the depth and extent of the sympathectomy. The nerves are distributed over a fairly wide area within the utero-sacral folds, and unless the dissection is thorough the majority will escape intact. Most surgeons are chary of this type of blind manoeuvre, and are inclined to limit it to the visible minimum, with the result that the actual neurectomy is a relatively small one. Individual anatomical variations also undoubtedly play a part. My own results in four cases have been disappointing, probably as a result of these factors.

In spite of these deficiencies, however, utero-sacral resection retains some of the best features of the ideal sympathectomy, for it is an easy, minor, and relatively safe procedure. In carefully selected cases, and after preliminary procaine analgesia to test the ultimate result, its efficacy is undoubted, and if the dissection is kept well forward there should be little danger of inclusion of vesical or rectal filaments or of damage to the ureters and uterine arteries. Remote complications are rare, for menstruation, pregnancy, and parturition are unaffected, and as the ligaments appear to play little part in supporting the uterus (Segond, 1926) prolapse is not a sequel. The operation therefore seems worthy of more extended trial.

Utero-sacral Alcohol Injection

This is a good though temporary substitute for resection, and is indicated for the same conditions. It is also a useful adjuvant to pelvic plexus injection, catching any filaments that may have escaped the primary needle.

The technique is simple, and consists merely in the injection of 0.5 ml. of absolute alcohol into the uterine end of each ligament, identified by strong anterior traction on the cervix. The alcohol must be placed superficially, to avoid involvement of the adjacent ureters, and medially, to escape the uterine vessels.

I have found this procedure particularly valuable in cases of painful utero-sacral spasm complicated by coitus interruptus. The dyspareunia disappears immediately and relief of the spasm allows of resolution of the contained subacute inflammation.

Epidural Block

Epidural procaine analgesia, used extensively in obstetrics, has been employed with moderate success in cases of uterine carcinoma by Todd (1937) and, more recently, by Kenny (1947), the latter using a long-lasting preparation.

Technique (Kenny).—With the patient in the left lateral position the skin and deep tissues over the caudal opening of the sacral canal are infiltrated with 2% procaine. A stout 3-in. (7.5-cm.) needle is directed to the aperture at an angle of 45 degrees to the skin and the fibrous membrane covering it pierced; the needle is then depressed to an angle of 15 degrees and pushed steadily on until about 1 in. (2.5 cm.) of its length is lying freely movable within the canal. Then 50 ml. of warmed procaine (a 1.5% solution of procaine in arachis oil) is very slowly injected, the procedure lasting about 10 minutes.

This method has the advantage of relative safety, but anatomical variation in the configuration of the sacral canal often makes the approach difficult and sometimes impossible. In addition the relief obtained is generally of short duration, though Kenny's results show that the prospects of more permanent amelioration are better when longer-acting analgesics are employed.

Paravertebral Block

It has been shown experimentally by Cleland (1933) that the afferent sympathetic fibres from the uterus enter the cord through the 11th and 12th thoracic roots, and that section of the corresponding roots and their rami communicantes in dogs has no apparent adverse effect on parturition. Shumacker noted by chance that a patient with bilateral lumbar sympathectomy underwent an almost painless labour, and he and his colleagues (1943), Jarvis (1944), Cleland, and others have since produced a similar analgesia by procaine block of the sympathetic chain at the level of the first and second lumbar ganglia. (The method was originally described by Delliapiane and Badiano in 1927, and the credit of originality must be given to these workers, but unilateral block only was then advocated, with correspondingly incomplete effect.)

Technique.—With the patient sitting up and bent forward a spinal needle is inserted at a point 5 cm. lateral to the first lumbar spine. It is then inclined inwards towards the spine at an angle of 60 degrees to the skin and passed between the transverse processes of the first and second lumbar vertebrae until the vertebral body is touched. The depth of this point varies from 7 to 11 cm. (Jarvis), but it is fairly easily identified. The needle is then straightened to an angle of 90 degrees to the skin and passed by the side of the body for a further 1.5 cm.; 25 ml.

of a 2% solution of procaine is injected into this area after aspiration and the whole procedure repeated on the other side. As a rule it is only necessary to block the second ganglion, but in cases presenting technical difficulty or in which analgesia is imperfect the third and fourth should also be done (Flothow, 1935).

The great disadvantage of this procedure is its impermanence, for the longest period of analgesia obtained is two hours. During labour it can, of course, be repeated and adequate relief provided, but for the generality of painful conditions this temporary analgesia is obviously useless. Its main indication would seem to lie in the determination of whether pain is of visceral origin or not. If the pain of dysmenorrhoea, pelvic neuralgia, or carcinoma is abolished by paravertebral analgesia it will very likely be permanently relieved by presacral neurectomy; if not, the operation is contraindicated.

Paravertebral alcohol injection in the same situation has been suggested by Pereira (1946) for the relief of neuralgia secondary to pelvic malignancy, but as yet no surgeon has been intrepid enough to attempt it. In quite hopeless cases, however, where the expectation of life is very short, the method might well be worthy of trial.

Cordotomy

Section of the lateral spino-thalamic tracts, one of the earliest neurosurgical procedures, is advocated by Shannon (1945) as the ideal operation for pain due to pelvic carcinoma. Complete and permanent relief is certainly ensured by this procedure, but, involving as it does a tedious laminectomy and delicate intraspinal manipulation, it is doubtful whether the operation is applicable to any but a very few cases.

Conclusions

The initial enthusiasm with which most of the operations discussed above were greeted was bound to provoke a compensatory disappointment, particularly when it was found that pain of all types was not inevitably cured by sympathectomy. But the third phase of critical analysis has now been reached, and this leaves no doubt of the permanent value of these procedures. They are themselves easy of performance: the secret lies in careful case selection. Given this, and the equally careful application of the appropriate operation, the great majority of cases of pelvic pain can be adequately relieved in one way or another, and it is more than justifiable to give these patients the benefit of such relief. Too many women suffer from much unnecessary pain, and the results of sympathectomy are now good enough to warrant its more extended application.

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PETHIDINE AND SCOPOLAMINE IN LABOUR

BY

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Pethidine and scopolamine have been used for obstetric analgesia in the obstetric department of the Postgraduate Medical School of London during the past two years. Scopolamine was employed in addition to pethidine in order to secure a more certain analgesia than can be obtained with pethidine alone. The experience of others has demonstrated the safety of pethidine, but at the same time it has become apparent that in a relatively high proportion of cases the analgesia induced by it alone may be inadequate (Barnes, 1947; Cripps, Hall, and Haultain, 1944; Gallen and Prescott, 1944).

Our aim has been to provide rest and sleep during the latter and more painful part of the first stage of labour and to give relief during the second stage without impairing the patient's power of co-operation. There has been no hesitation in complementing the pethidine and scopolamine with gas-and-air or "trilene" inhalations if necessary during the second stage or during the actual delivery. There were 2,651 deliveries in the department from Oct. 1, 1946, to Dec. 1, 1947, and in 885 of these the mothers received pethidine and scopolamine; 500 of the latter group were personally observed, and these form the material of this communication.

Except for five cases of toxæmia of pregnancy, one patient with hydramnios and mitral stenosis, and two cases of mild ante-partum hæmorrhage of undetermined origin, all the cases were normal. We do not regard pethidine and scopolamine as contraindicated in toxæmia. In fact, it is only in eclamptic cases that pethidine and scopolamine are not given, because these need a more intensive sedation.

The 500 cases include four twin pregnancies and one set of triplets, making 506 infants in all. There were 378 primiparae and 122 multiparae.

Dosage

When the administration of pethidine and scopolamine was first introduced into this department the following rules were laid down for guidance: (1) Labour must be established before administration of analgesia. Uterine contractions must be of good amplitude and occur at regular intervals. (2) Dilatation of the os uteri must have reached at least three fingers in a primipara and two fingers in a multipara.

The first dose consists of pethidine, 100 mg., and scopolamine, 1/150 gr. (0.43 mg.), intramuscularly. A second similar dose is given one hour after the first, but its administration must be judged according to the merits of each case and in relation to (a) the rate of dilatation of the os uteri, and (b) the degree of dilatation one hour after the first dose. If the os is rather more than three-quarters dilated it is not advisable to give the dose unless pethidine alone is given.

Subsequent doses can be given at intervals of four to six hours; however, if possible scopolamine is not given within two hours (at least) of delivery, as it may promote some non-cooperation of the mother and some respiratory depression of the infant. The maximum dosage of scopolamine in this series was three doses each of 1/150 gr., and it was given over a period of 18 hours together with 400 mg. of pethidine. The labour lasted 33 hours altogether. It has been found that the intervals between the doses are lengthened as time and labour go on, the amount and frequency varying with each patient. The maximum amount of pethidine used in a single case in this series was 500 mg., and this was given over a period of 30 hours together with two doses of scopolamine, each of 1/150 gr.

Route of Administration

The drugs were generally given intramuscularly, but if the patient was suffering unduly and immediate relief was required the first dose was given intravenously, at least three minutes being taken over the injection. Subsequent doses were given intramuscularly. Schumann (1944) recommends intravenous administration if the patient is expected to be delivered in two hours. For three months pethidine has been administered intravenously at full dilatation of the os, and also in the second stage up to within 10 minutes of delivery, without adverse effect on the foetus. The dose of 100 mg. is diluted with either sterile distilled water or sterile normal saline to double its former volume and is given over a period of three minutes or more to avoid the subjective symptoms of nausea, vomiting, and dizziness. This was used to show that women need not be deprived of adequate relief from pain although they might be well advanced in labour on admission to hospital, and this method was found to be very satisfactory. The patient is eased of her pain to a marked degree, and gas-and-air or gas-and-oxygen is given during the delivery if necessary.

Two years' continued use of pethidine and scopolamine as an analgesic during labour has shown that a large percentage of the cases require only the first dose or the first dose plus 100 mg. of pethidine one hour later. An analysis of the dosage given to the 500 cases is shown in Table I. It will be seen that the majority of cases required only the smaller doses of pethidine and scopolamine; this is particularly noticeable in the multiparae, although at least 13 primiparae who received pethidine, 100 mg., and scopolamine, 1/150 gr., would have benefited from another dose of 100 mg. of pethidine.