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THE PRESACRAL NERVE ITS ANATOMY, PHYSIOLOGY, PATHOLOGY, AND SURGERY*

BY

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In January, 1932, while engaged in the study of the innervation of the pelvic viscera, it occurred to me that some types of pelvic pain—particularly certain dysmenorrhoeas, cystalgias, and pelvic neuralgias—were possibly the result of a neuro-vascular imbalance, or, at any rate, under the control of the autonomic nervous system. I had previously been particularly impressed by the brilliant results of lumbar sympathectomy obtained by Telford and Stopford in painful neuro-vascular diseases of the extremities, and suggested the possibility of similar relief for pelvic pain by an equivalent operation.

The anatomical configuration of the nerve supply to the pelvic viscera appeared to render such a procedure technically easy, as the abdominal sympathetic fibres to these organs are collected into a median accessible bundle, immediately before entering the pelvis, as the presacral nerve (superior hypogastric plexus). Cadaveric experiment proved the truth of these facts, but a good deal of diffidence was naturally felt before recommending an operation which involved entrance into the abdomen, and which was based upon such purely theoretical grounds.

Perusal of the recent literature, however, revealed that a similar procedure had been carried out in France for some few years, under the title of "resection of the presacral nerve," an operation introduced by Cotte, professor of surgery at Lyons, in 1925. The results obtained by that author and by his colleagues were impressive, so impressive that no hesitation was now felt in advising the operation for early performance.

Our first presacral sympathectomies were carried out in March, 1932. The immediate results were excellent, and it was felt that a definite field existed for the procedure, although many of the French statements appeared somewhat hyperenthusiastic. But these operative experiences exhibited many obscure points of importance concerning the surgical anatomy of the field of operation, and before proceeding further it was resolved to investigate more completely the anatomy of the nerve itself and of its relations.

This completed, a series of seventeen patients, suffering from a variety of conditions, were subjected to the operation during the subsequent twelve months. They were mostly cases of Dr. W. R. Addis's, and fourteen were operated upon by that surgeon, in ten of which I assisted. The remaining three, by kind permission of Dr. Addis, were operated upon by me, in addition to three further cases similarly treated for other surgeons.

Each specimen of presacral nerve was examined both macroscopically and microscopically, and the physiological effects of the operation upon each of the patients studied both immediately and remotely afterwards. The results

of these anatomical and physiological researches are described in the following account, in which an attempt has been made, by correlating my researches with those already published, to provide a reasonably standard description of the presacral nerve in all its aspects.

ANATOMY

The presacral nerve is that portion of the abdominal sympathetic nervous system which lies anterior to the bodies of the fourth and fifth lumbar vertebrae, in the interval between the common iliac arteries. The term "presacral nerve" is a peculiarly unfortunate one, as the structure is usually a plexus, and is pre-lumbar in position throughout its course; but the invention of this name by the anatomical authority Latarjet, and its subsequent adoption elsewhere as a less cumbersome title than the more legitimate one of "superior hypogastric plexus," make it necessary to follow precedent in its description.

The nerve extends from a point a little above the level of the aortic bifurcation to the promontory of the sacrum, a distance of approximately 5 cm. It is formed above by the confluence of the intermesenteric nerves, long fine para-aortic sympathetic trunks arising from the solar plexus and the adjacent lumbar ganglia. After passing vertically downwards, a little to the left of the midline, the nerve terminates below by spreading out into the structure which I have ventured to name the "middle hypogastric plexus." This is an isosceles-shaped mass of considerable size, from the lower angles of which emerge the bilateral inferior hypogastric plexuses, long narrow nerve bundles which run forwards and downwards along the pelvic wall to gain the pelvic ganglion, of which they form the sympathetic root proper. The parasympathetic supply to this ganglion is furnished by the nervi erigentes, and some additional (insignificant) sympathetic fibres also reach it from the sacral chain. As the pelvic viscera are supplied almost exclusively from the pelvic ganglion, it will be seen that the presacral nerve contains practically the entire nerve supply to those organs, a fact which, allied to its surgical accessibility, makes the nerve the ideal site for interruptive procedures on the pelvic sympathetic.

The immediate *relations* of the presacral nerve are of considerable importance. In front, the nerve lies in contact with, though not attached to, the posterior parietal peritoneum, through which it is occasionally visible. Behind, it is separated from the last lumbar vertebrae by the left common iliac vein above and the middle sacral artery below. It is, however, effectively separated from these structures by being almost completely enclosed in a fairly tough bilaminar sheath formed by a condensation of the subperitoneal areolar tissue. Although the nerve is somewhat adherent to this sheath the latter is

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very easily dissectible from the structures in front and behind, a fact which explains the ease with which the whole nerve plexus may be separated at operation. The mesosigmoid lies to the left of the nerve, but occasionally it crosses the midline, in which case the nerve can only be reached by dissection through its layers.

The exact form exhibited by the presacral nerve—a matter of paramount surgical importance—has been the subject of much controversy. Latarjet, Bergier, Morrison-Lacombe, and Roussel all consider that in the majority of cases a clean-cut single true “presacral nerve” is present, but Hovelacque, Kalberg, Chianello, Delmas, Cordier, Ferey, Jianu, Bernard, Laux, Learmonth, Segond, Hartmann-Weinberg, and Elant all equally hold the opposite view that the usual disposition is one of several parallel nerves intercommunicating to form a plexus of varying width. The solution of these divergent views would appear to lie in the varying standards of dissection adopted, allied to a lack of appreciation of the condensation which, in formalin-prepared cadavers, often coalesces nerve fibres and fibrous tissue into an apparently single structure. Taking these fallacies into consideration it seems certain that the so-called presacral “nerve” is far more often a true plexus than a single nerve, a fact borne out in my own observations. Thus in 45 (75 per cent.) of my sixty dissections a plexus of some type was present, a single true nerve being found in only fifteen. Similarly, only two of ten operative specimens showed the structure of a single nerve.

HISTOLOGY

Specimens of the presacral nerve removed in fifteen operations, and from ten cadavers, were examined histologically, a variety of staining methods being employed in each case. These included supravital and intravital methylene-blues, modifications of the Golgi, Cajal, and Bielschowsky techniques, and the usual cold contrast methods, and all equally showed the nerve as consisting essentially of several nerve bundles lying in a fibro-fatty cellular network. The number of nerve bundles present varies widely in different specimens, according to the size of the individual plexus, and each contains many bundles of ganglion cells disposed amongst the nerve fibres. The sympathetic nerve fibres are myelinated and non-myelinated in about equal proportion as a rule (Cotte and Noel), but occasionally, as in some of my specimens, there is considerable predominance of one or other type. They are enclosed in a thick fibro-elastic sheath, and are accompanied by tiny vasa nervorum.

The ganglion cells are collected at intervals in each nerve bundle into microganglia, and correspond to the types described by Stohr and Cajal as characteristic of the sympathetic nervous system—namely, astrocytes, crown cells, and glomerular cells. Each contains a well-marked nucleus and nucleolus, and is surrounded with a varying number of tiny “satellite” cells.

This arrangement is identical with the histological structure of the intermesenteric nerves, as described by Leriche and Fontaine, a fact which, considering the continuity of the presacral nerve with them, is not surprising. Indeed, the whole abdominal sympathetic nervous system may be regarded as a vast arrangement of microscopic ganglia joining very short relays of sympathetic fibres, myelinated or non-myelinated in varying proportion according to level.

Central Connexions of Presacral Nerve

The spinal centres for the efferent fibres of the abdomino-pelvic sympathetic and parasympathetic systems lie respectively in the intermedio-lateral and medio-ventral columns at the base of the anterior horn. The former extends from the first dorsal to the second lumbar segment inclusive, to be continued in the sacral region over

a variable (disputed) number of segments. The parasympathetic extends from the fourth lumbar segment through the remaining portion of the cord.

The evidence for a centre more cranially placed tends to become more dubious with advancing research, so much so that some modern writers, including Dahl, deny their existence completely, a view shared by the writer. The problem has been admirably reviewed by Cotte, who points out that while Ferrier, Franck, Bechterew, and Meyer produced contraction of the bladder by cortical stimulation, Dennig denies the existence of a specific cortical vesical centre, while the presence of similar sub-cortical centres in the thalamus (Mislavsky, Mosso, and Pellicani), or in the corpus striatum (Czylharz and Marburg), is still more problematical. Similarly, though Gall places the genital centre in the cerebellum, Goltz, Moebius, Kraft-Ebing, and Bechterew consider it present in the cortex, while Muller and Dahl deny its cranial existence altogether. The problem, it will be seen, remains more than obscure, but the recent views would appear to be more reasonable.

Course of the Nerve Fibres

The sympathetic efferent fibres pass out in the anterior root and then, via the white rami communicantes, to the corresponding ganglion of the lateral sympathetic chain. From here they pass either to the solar plexus or mesenteric ganglia, from which they are relayed to the presacral nerve, or directly from the sympathetic chain to reach the nerve or its parent trunks in their ganglionic roots. They then pass downwards through the middle and inferior hypogastric plexuses, the pelvic plexus, and its nerves of distribution, to reach the particular pelvic viscus for which they are destined.

The peripheral cell stations in these fibres lie, according to generally accepted theory, in any of the large ganglia of the pathway, or in the small ganglia lying alongside the supplied viscera, and a considerable amount of discussion has centred round the exact site adopted for these relays. But as we have shown above, the whole abdominal sympathetic system contains thousands of microganglia in its constituent fibres, and it seems unnecessary even to attempt to postulate a few definite positions of relay, when the cell stations may be situated at any one of so many places.

The parasympathetic—sacral autonomic—fibres to the pelvic viscera pass from the medio-ventral column of the sacral cord through the anterior roots of the second, third, and fourth sacral nerves. They leave these trunks to pass, without the intervention of a lateral spinal ganglion, to the pelvic plexus, in the nervi erigentes (which for this reason have been taken as homologous with white rami communicantes). Their subsequent course corresponds to that described for the sympathetic fibres proper.

The course of the afferent autonomic fibres from the pelvic viscera, and even their existence, are equally the subject of a good deal of highly theoretical dispute. Gaskell asserted that a centripetal sensory pathway was non-existent in the autonomic nervous system, visceral sensation being conveyed via the cerebro-spinal nerves, but our post-operative studies have convinced us of the truth of the teaching of the modern French school to the contrary. These fibres probably pursue a similar course to the efferent nerves, with the exception of a detour via the posterior roots to gain the centre in the posterior root ganglion.

PHYSIOLOGY

As with the functions of the sympathetic system elsewhere, the functions of the presacral nerve may be divided up as follows:

(a) Motor.	(c) Sensory.	(e) Nutritional
(b) Vasomotor.	(d) Glandular.	

It is, of course, impossible to divorce any one of these functions from the others, but for the sake of clarity they will be considered separately, correlated with current literature and the results of personal observation.

The Motor Function

Perusal of the literature written upon this subject reveals a bewildering variety of findings and opinions. Valentin, Heddaus, Scanzoni, Rohrig, Bartling, Korner, Frankenhauser, Cyon, von Basch, and Howden, on experimental grounds, ascribed a motor function for the pelvic organs to the lower abdominal sympathetic nerves, a view flatly contradicted by Beck and Killian, who asserted that they were inhibitory, while Kehrer, Reimann, Langley, and Gaskell suggested that *both* functions were served by these nerves. It would appear that the precise part played by the sympathetic in the motor supply of the pelvic organs must remain doubtful, but a probable cause for the divergence of views may be a variation in its action in different animals. The question of prime importance is: Is the abdominal sympathetic nerve supply to the pelvis—that is, the presacral nerve—motor or inhibitory?

A case of particular interest in connexion with this question occurred in our series. A patient was carefully observed during parturition, following resection of the presacral nerve. She was an elderly primipara, aged 42 years, yet the labour was precipitate, a most unusual occurrence in this type of patient. In addition, we have noticed as a striking post-operative sequel in all our cases that the bladder and rectum are emptied easily and frequently in the few hours following operation and subsequently, an unusual (and most desirable) event in abdominal surgery.

There is nowadays a tendency to refuse to accept the old theory of the action of the sympathetic as an inhibitor, and of the *nervi erigentes* as excitator, of contraction of the pelvic organs, but the case cited above, and the post-operative sequelae mentioned, are a striking corroboration of that mode of action. It must be admitted that the case was an isolated one, and that the phenomenon is very occasionally reproduced normally; but being quite divorced from any influence by the subject herself, and so admissible as an uncontrolled experiment, it does provide some support for the view of the presacral nerve as an inhibitor of contraction. When the presacral nerve—the sympathetic supply—is resected the sacral parasympathetic system is allowed unchecked activity in performing its function as a detractor of the uterus, just as it is of the bladder and rectum. (It is interesting to note that three patients, previously constipated, were completely cured of this disability after resection of the presacral nerve for other conditions.)

It is possible, as was partly suggested by Bard, that the spasmodic cystalgias, dysmenorrhoeas, and rectalgias are due to irregular contraction, with spasm, of the musculature of the appropriate organ, the result of an upset of the normal sympathetic-parasympathetic equilibrium. The spasm would appear to be the result of overaction of the sympathetic inhibitory factor, removal of which, by resection of the presacral nerve, cures the condition by allowing the peristaltic action of the sacral parasympathetic supply to proceed untrammelled. This reasoning is, of course, highly theoretical, but it does suggest a factor which, in view of our cases, cannot be ignored.

The Vasomotor Function

Spielberg, von Basch and Hoffman, Rein, Langley and Anderson, and Crainicianu all stated, on experimental grounds, that the hypogastric nerves were vaso-constrictor, but Barrington holds that they are vaso-dilator, while Rohrig suggested that they were both dilator and con-

strictor. Leriche and Stricker showed that excitation of the presacral nerves produced vaso-dilatation in the pelvic viscera verified microscopically, but, on the other hand, Sweet and Thorpe found that lower abdominal sympathectomy exercised no apparent influence upon the oestrous cycle of rats. In short, some authors believe that the sympathetic is vaso-constrictor to the pelvic viscera, and the parasympathetic vaso-dilator, while the reverse opinion is held by others.

Now one of the most striking sequelae of resection of the presacral nerve in our cases has been the almost universal increase in the time and quantity of menstruation. A period of two or three days has often been lengthened to one of seven or eight, while the menorrhagia has occasionally been a source of considerable inconvenience. In addition, a striking post-operative result in all cases was the appearance of a menstrual period twenty-four to thirty-six hours after operation. This period, although possessing the characteristics of normal menstruation, had usually no relation to the normal rhythm, which remained unchanged, the next period appearing at the usual time. It would thus appear that the presacral nerve exercises a profound effect of a vaso-constrictor or vasotonic nature upon the blood vessels of the pelvic viscera, a fact which explains the abundance of the sympathetic nerve supply to the vessels of those organs.

The Sensory Function

A variety of authors have published a very considerable number of cases in which resection of the presacral nerve has produced complete and lasting relief of pelvic pain, a sequel which we have repeatedly observed in our own cases. The question remains: Has the sympathetic system in general, and the presacral nerve in particular, any sensory function in the usually accepted sense of the term? The experiments of Learmonth and of Leriche, who managed to elicit pain by traction on the central cut end of the presacral nerve in a patient and a dog respectively, and the fact that both Frigyesi and Finsterer could perform pelvic operations under local anaesthesia of the nerve, are each corroborative evidence of the existence of such a sensory function. Cotte, Lawen, Mixter, Kuntz, Aburel, and Crainicianu all support this view of the sympathetic as a conductor of pain fibres, though the majority of modern authorities, in the absence of any anatomical proof, have been so far unable to accept it. But there is no doubt that sympathectomy *does*—though not invariably—relieve pain, and that permanently; and though the hypotheses that have been advanced to explain this are all, singly, somewhat unsatisfactory, each lies within the region of possibility. They are:

1. The sympathetic system contains specific sensory fibres (Aburel).
2. The relief of pain is the result of vaso-dilatation, the subsequent increase in blood supply allowing of more efficient removal of metabolic products (Telford and Stopford, Lewis).
3. The pain is vasomotor in origin, being an upset of the normal sympathetic-parasympathetic balance. Correction of this by removal of the offending constituent—the sympathetic presacral nerve—cures the condition by restoring equilibrium (Bard).
4. The sensory fibres in the sympathetic nerves are really cerebro-spinal in derivation (Mixter).

The first theory exhibits too many unsatisfactory points for complete acceptance. It is based almost entirely on theory, and is not verified anatomically. The second is more satisfactory, but is even more theoretical, as the immediate relief of pain following sympathectomy (which would appear to support it) was not characteristic of our cases, in several of whom the first menstrual period was still more painful than the preceding. The third is an old theory revived, and, apart from its purely hypothetical basis, leaves the question open as to why the

sympathetic constituent alone should be the cause of upset. The last is unverified anatomically. One is therefore inclined to conclude that the presacral nerve has no specific sensory function *per se*, and that the relief of pain following its eradication is vaso-dilator in origin, the exact mode of action being unknown.

The Glandular Function

Barrington has shown that the hypogastric nerves control the mucin secretion of the glands of Cowper and Bartholin, and Cotte and others have cured extreme leucorrhoea by resection of the presacral nerve, a result also obtained in two of our own cases. Gaskell states in his book that the nerve cells which supply secretory fibres to purely epidermal glands—for example, the sweat glands—all belong to the sympathetic system, and are connected with the central nervous system by the thoracico-lumbar outflow of connector nerves. At the extremities of the body, where the entoderm and ectoderm come together, the ectodermal and entodermal glands may become fused to form one gland, with the result that the gland is supplied with secretory nerves both from the sympathetic and from the external nervous systems.

Now several cases of pruritus have been reported cured by resection of the presacral nerve, and we ourselves have observed similar results. There have, on the other hand, been failures, and it is tempting to ascribe the cure, on the one hand, to a glandular origin for pruritus, and the failure, on the other, to an embryological anomaly. It must, of course, be admitted that the theory of direct sympathetic sensory supply to the skin itself is untenable as an explanation of these cases. I examined every case submitted to presacral resection carefully for anaesthesia, and in only one could find even a suggestion of change.

The Nutritional Function

Takahashi found degenerative changes in the testis following excision of the hypogastric nerves, but Bacq failed to confirm these findings. Cannon and his associates have shown that no nutritional changes follow complete sympathectomy in rats, yet Leriche cured a case of kraurosis by sympathectomy. We ourselves have noticed no change of a nutritional nature in our cases. The relief of kraurosis was probably vaso-dilator in origin, and it would appear that all similar cases have a similar source. But the sympathetic supply to the skin glands is significant; and although the skin changes in some vaso-motor disorders are probably vascular in origin, it is possible that the sympathetic does exercise a separate nutritional function in the integument, although its presence there does not appear indispensable.

Summary of Functions of Presacral Nerve

The presacral nerve is motor and vaso-constrictor to the pelvic organs. In addition, it is glandulomotor, and possibly nutritional. The relief of pain which follows resection of the nerve is probably the result of the vaso-motor rather than of any sensory function, but the absence of any definite sensory fibres in its substance is by no means certain.

PATHOLOGY

Present knowledge of the pathology of the sympathetic system is both sparse and theoretical, principally on account of the fact that so many variations occur in apparently normal characteristics that the basis of normality remains extremely doubtful. We have, however, encountered changes which, even if later shown to be within the bounds accepted as normal, are of a certain interest from the possibly pathological point of view.

In several specimens changes indicative of a subacute inflammatory reaction were present in the presacral nerve. These changes were similar to those described by Cotte and Dechaume, and Jianu, and consisted in congestion of the nerve, capillary thrombi, leucocytic nodules, oedema of the sheaths, and often a small round-celled infiltration. The ganglion cells themselves, however, showed the most profound changes. In many groups some cells were complete, others showed absence of nucleus, others absence of nucleolus, the last being accompanied by an increase in the number of "satellite" cells and by thickening of the microganglion sheaths. In one specimen the single presacral nerve present was found to be permeated by squamous epithelium from a coincident carcinoma of the cervix, in a similar manner to the case reported by Ferey.

It should be noted that several sections were taken almost serially to prove that the appearances described were not due to the level of section. In many cases the changes were striking, and included loss of cell substance and fragmentation of the Nissl bodies. But these changes have been observed elsewhere in apparently normal sympathetic nerves, and before a standard of what may be considered as basically normal is adopted one must hesitate to accept the appearances described as pathological, particularly as they did not correspond with the clinical symptoms in any definite manner. On the other hand, importance is lent to these findings by the fact that in only one out of forty-one specimens of the lumbar sympathetic cord removed by them for neuro-vascular diseases of the lower extremity did Telford and Stopford find any pathological changes.

SURGERY

The physiological basis upon which is founded the surgery of the sympathetic system in general has been, and still remains, more highly controversial and doubtful in its fundamental aspects than almost any other operative rationale, and from what has been gathered from the preceding consideration of the physiology of the presacral nerve itself it will be appreciated that indications for its removal must necessarily rest upon a very insecure foundation.

Indications for Resection of Presacral Nerve

Indeed, most of the physiology of the nerve has been studied post- rather than pre-operatively, the indications being arrived at on purely theoretical grounds. As a consequence, when resection of the presacral nerve was first mooted by Cotte, these indications were somewhat limited. With advancing experience and enthusiasm, however, more and more diseases were subjected to the procedure, with the result that it became used as a sort of universal panacea for a great variety of pelvic conditions, thus repeating the very similar wave which followed the introduction by Leriche of that authority's earlier sympathetic operations (on some of which, it should be stated, Cotte's operation is merely a slight advancement).

At the present time, Continental opinion (with one or two exceptions) remains at the peak of enthusiasm. Our own experience, however, based upon operative work and combined with caution and close consideration of the physiological facts and theories, has considerably restricted our ability to agree to all the indications suggested by the French authorities, and has limited our indications to the following diseases:

1. Dysmenorrhoea.
2. Idiopathic pelvic neuralgia in both sexes.
3. Pelvic pain the result of inoperable carcinoma.
4. Cystalgia.
5. Rectalgia.

We have, moreover, severely limited ourselves in the individual cases, using the procedure as a last resort in practically all the patients subjected to it. Only those cases in which all the usual medicinal and minor operative procedures had been tried out and found insufficient were treated by resection of the nerve, and then only after consideration of the possible presence of neurosis. As an additional and most frequent indication we have added the operation to other procedures decided upon beforehand as a preventive of the persistence of pain in cases of pelvic disease in which pain has been a long-standing symptom.

Technique of the Operation

I have elsewhere described the technique of the operation of resection of the presacral nerve in considerable detail, and it is only necessary to mention here its more salient features. The abdomen is entered via a generous paramedian incision, and the bowel packed away from the operative site. The sacral promontory is then identified and the level of the aortic bifurcation noted. A longitudinal incision is made in the posterior parietal peritoneum in the mid-line, extending from just above the bifurcation to the promontory. The divided peritoneum is lifted on either side of the incision and its deep surface carefully denuded of the sub-jacent attached areolar and nervous tissue. The presacral nerve or plexus is then removed completely by excising all the fibro-nervous tissue in the interiliac space, the left common iliac vein and both common iliac arteries being carefully denuded. Haemorrhage is negligible, and it is unnecessary, and indeed inadvisable, to ligature the cut ends of the nerve.

The operation is fairly easy in the majority of cases, and if the various anatomical anomalies are kept in mind should present few difficulties.

Results of Resection

In order to assess the value of the operation a survey was made of all the cases published to date. These included cases operated upon by Cotte (200), Fontaine and Hermann (22), de Grisogono (19), Michon and Haour (17), Donaldson (16), Hamant (15), Aubert (15), Ferey (15), Walther (14), Ekkert-Petersen (9), Jianu (9), Bernard (8), Pieri (4), Mornard (3), Paolucci (3), Tirelli (3), Heitz (2), and Michon, Chianello, Oliver, Baranger, and Hallopeau one case each. Most of the cases were necessarily gynaecological, but a definite percentage of surgical cases were also included, a number which is steadily increasing with increasing publicity. Cotte himself was responsible for the majority of the operations, and his results are uniformly excellent. Most of the rest show extremely good results, though Fontaine had a death. But the periods of follow-up are very short, and many authors appear somewhat hyperenthusiastic, while close examination often reveals that the term "cure" has been used a little elastically. Again, in nearly all the published cases some other, and often major, operative procedure accompanied the presacral resection, a very fallacious addition.

Our own cases show a cure rate of approximately 50 per cent., and I would suggest that this figure represents the result which may be expected in the majority. It would appear to suggest that more care than has hitherto been the custom should be employed in the selection of cases for what is, after all, a major operation, with all the inconveniences and risks implied in that term. In suitable cases the operation is often brilliantly successful, converting a life of misery into one of at least tolerance, and there is no doubt that when the present wave of somewhat misguided enthusiasm has abated, resection of the presacral nerve will take its deservedly secure place in the select list of the permanently beneficial operations.

CONCLUSIONS

1. The presacral nerve or superior hypogastric plexus is never presacral, and rarely a single nerve.
2. Histologically it is composed of sympathetic nerve fibres and microganglia.
3. It is vaso-constrictor and motor to the pelvic viscera. Its pseudo-sensory properties are probably vasomotor in foundation. It is also glandulomotor to the superficial and deep glands, and nutritional to the external genitalia.
4. The pathology is problematical, in view of the absence of a standard of normality.
5. The indications for its resection are limited.
6. The operation itself, usually easy, exhibits occasional difficulties and dangers.

7. The results of the operation in our own series gave an approximate cure of 50 per cent., a considerably lower figure than most of the published statistics.

8. We would suggest that the operation is indicated in cases of intractable pelvic neuralgias of any type (including, of course, the dysmenorrhoeas of spasmodic origin), in which minor surgical procedures had failed to relieve; in certain cystalgias and rectalgias in male patients; as an accessory to other operative procedures in the pelvis where pain has been a characteristic of the case; and in certain rare cases of pruritus, after failure of the usual external procedures.

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THYROID ADDICTION

BY

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Thyroid addiction has not been previously described, so far as I know, and the following cases are reported as likely to throw light on other instances of obscure hyperthyroidism and for their intrinsic interest.

Case I

A woman, now aged 36, after a healthy childhood was much upset by menstruation, which began at 15; the periods were irregular in time of onset and duration, sparse rather than excessive, and always accompanied by abdominal pain, back-ache, vomiting, and attacks of diarrhoea. Married at 21, she had dilatation and curetting the following year, and four times inflation of the tubes during the next five years. She became pregnant once, but miscarried at the fifth month. At the age of 25 the bowels became more troublesome, with alternate diarrhoea and constipation. She was treated in Berlin with dieting, and improved; at the same time her weight was reduced by large doses of thyroid. On returning to England she relapsed, and had an operation at which the appendix and a cystic left ovary were removed. This was in 1925; the abdominal symptoms were not much improved, and the attacks continued in spite of varied treatment.

About 1929 frequency of micturition began, for which she had been cystoscoped four times, but nothing abnormal was found. In 1932 tachycardia started, and there has been a very rapid pulse since. About this time she was thoroughly investigated in Berlin; the findings were: super-acid gastric juice; spastic colon; raised blood pressure (175/95); and raised basal metabolic rate (+45 per cent.). The thyroid was not enlarged, and no evidence of substernal thyroid was found on x-ray examination. Improvement followed antithyroidin (Moeblus).

SYMPTOMS

On admission to Ruthin Castle in 1933 she was a small, well-nourished woman, with pulse 140 resting in bed, and blood pressure 180/95; the heart was regular, and there was no murmur. The electrocardiogram showed rapid regular rhythm and reversed T III. The basal metabolic rate was +50 per cent.; the sugar tolerance curve was normal and the thyroid was not enlarged. There was a severe x-ray burn of the chin and chest, said to have been caused by a beauty specialist. The urine contained a few pus cells, but no bacteria, the stools a little mucus, but nothing else abnormal. X-ray examination showed residues of lipiodol injections in lumbar and gluteal muscles; the chest and stomach were normal, and the transverse colon spastic. The pelvic organs were healthy. A diagnosis of simple hyperthyroidism was made.

The symptoms were fatigue and sense of exhaustion; frequent attacks of palpitation, not sudden in onset or in finishing, in which the pulse rate was about 140; abdominal pain and generalized aching, worse when constipated; irregularity of the

bowels, small lumps of formed or semisolid faeces being passed up to thirty times a day; frequency of micturition during the day but not at night; severe hiccup, sometimes followed by vomiting; and occasional attacks of severe pain in the lower abdomen with inability to pass urine or faeces.

With treatment the abdominal symptoms lessened, but the pulse rate remained high, and progress was interrupted by crises during which the heart rate, though regular, was 130-160 per minute. At these times there was great abdominal discomfort, tenesmus, and feeling of incomplete evacuation of the bowels, with much frequency of micturition, which was not controlled by any of the measures usually efficacious. After finding some empty bottles it was possible to discover the whole story. Merck's thyroïdin was obtained in London, the labels of the bottles were washed off, and the bottles sent in with supplies of cigarettes. This procedure had been going on for at least three and a half years, and the day previous to special tests such as the B.M.R. in London a large number of tablets had been consumed. It is difficult to say how much thyroid extract had been taken, but seven empty bottles, each of which had contained 100 tablets, were found, a tablet being equivalent to about 0.5 gram of fresh gland.

This patient was a neurotic woman with dysmenorrhoea and spastic colon, whose maternal instincts were thwarted by inability to have a child, which she greatly desired. She had developed a craving for interest and sympathy, and tried to deceive everyone and to remain a medical problem and a puzzling anxiety to her friends and relatives. Even when confronted with the whole chain of evidence she denied having taken any thyroid gland for the past eight years. Her doctor wrote some months later, however, that the patient's health was now very much better, for obvious reasons.

Case II

A woman, aged 43, had had rheumatic fever over twenty years ago, also repeated attacks of quinsy until the tonsils were enucleated at the age of 30. At one time she had weighed 13 st., and had been treated with dieting and small doses of thyroid. About a year before her admission in 1929 she felt done up, and began to sleep badly after an acute streptococcal sore throat; and about six months later became much thinner and breathless. Her weight fell from 11 st. 2 lb. to 7 st. in three months. She complained of profound weakness, shortness of breath on the slightest exertion or mental excitement, fidgets and restlessness, insomnia, palpitation, disinclination for food, and periodic attacks of nausea and vomiting.

CONDITION ON ADMISSION

On admission she weighed 6 st., and was very emaciated. The heart rate was 110-130 per minute, with a mitral regurgitant murmur; the blood pressure was 125/80; and there was a mild secondary anaemia. There was no evidence of disease of the lungs. The nervous system was normal except for right nerve deafness, though at times transient diplopia was complained of. The roots of the remaining teeth were grossly septic; the digestive tract was otherwise normal. It was not possible to obtain reliable figures for the basal metabolic rate on account of the restlessness; the sugar tolerance curve was of non-diabetic type, and showed a lowered renal threshold.

A few tablets were found on making the bed, and, on searching, six packets, each containing 5-grain tablets of thyroid, and 200 to 300 tablets of aspirin and thyroid loose in a cardboard box in a cupboard. A week after their removal the pulse rate was 80 per minute and the breathing normal; the muscle movements had disappeared and the appetite improved. The septic teeth were then extracted. The patient gained 17 lb. in four weeks, and a further 1½ st. in the following six months. There was then a recurrence of symptoms of excitement, breathlessness, fidgets, and insomnia, with pulse rate of 130-160, and a number of empty bottles with thyroid gland labels were found. Improvement followed a stay in hospital of four weeks. Six months later there was auricular fibrillation and pulmonary infarction, from which a good recovery was made. During the next two years four attacks of heart failure, with decompensation and oedema, occurred. The family physician felt almost certain that the patient was continuing to take thyroid, and on admission to hospital in a fifth attack of congestive heart failure 20 5-grain tablets of the thyroid were found in the fingers of a glove. A year later the general condi-