in the third stage, much less. If the pregnancy is allowed to go on until after the middle period, very little can be hoped for as far as the mother is concerned from interrupting the pregnancy. In general, it is better to terminate the pregnancy early than to try to get a living child. In regard to a tuberculous mother nursing the child, the French Society for the Prevention of Tuberculosis reports 250 children removed from tuberculous mothers and in no instance did tuberculosis develop.

Dr. J. C. LITZENBERG, Minneapolis: Two years ago in the Schauta clinic there were twenty-two abortions in the women entering the clinic in five months. Von Rosthorn was also of the opinion that certain women with active tuberculosis should have the uterus emptied. One woman came in for the sixth therapeutic abortion. Only then was she sterilized. This opinion was also shared by the men in the medical clinic. We sometimes form opinions and do things when we really do not have the statistics to back them up. Unless they have changed their opinion in two years the clinicians in Vienna believe that every woman with active tuberculosis should in early pregnancy have the uterus emptied. There is an exception made in those far advanced. There is another condition in which operation is done if seen early—those with tuberculosis of the larynx, of whom 100 per cent. die if the pregnancy is allowed to continue.

Dr. L. M. GATES, Scranton, Pa.: I do not believe that you can cauterize and be sure that you are doing any thing more than producing a stricture, and you are thereby liable to produce the worse condition of ectopic pregnancy. I would also repudiate the use of chloroform in these cases as being an irritant to the lungs and an injury to the blood. We all know that the use of chloroform increases the amount of blood lost by the patient. The tendency with tuberculous women is to be relaxed, and chloroform is a further relaxant. When labor is over the effect of the chloroform is to cause post-partum hemorrhage. I would not use chloroform in the termination of labor with forceps in these cases.

Dr. T. M. BURNS, Denver: It seems to be true that a certain proportion of patients get worse, not because of the pregnancy, but because of the disease. Another proportion get worse because of the pregnancy. Another proportion stay quiescent, and another proportion get better. From my experience in Colorado I do not believe that the internist is capable of saying when we should produce abortion. I know of several cases in which an internist said abortion should be induced but in which the patient went on to labor and was better than before pregnancy. When the patient comes to us in pregnancy, I believe the better way is to watch her and as soon as she starts to get worse, induce premature labor or abortion, by means of two catheters or two bougies in the uterus and gauze tampon or a rubber bag in the vagina. I do not believe this will produce any shock unless an anesthetic is necessary. In many curettements morphin will take the place of ether or chloroform.

Dr. H. G. WETHERILL, Denver: I have not practiced sterilization, but it seems to me in view of the very great simplicity of sterilizing the male by vasectomy that the time has come when this simple operation should be considered to prevent pregnancy under these circumstances, rather than an abdominal operation on the woman.

Dr. C. S. BACON, Chicago: Whether a woman is cured of tuberculosis and whether or not she dare marry are questions which we must leave to the specialist for determination. I think the suggestion of Dr. Stoll that two years' freedom from the disease is desirable is a good one. The rule given by Martin of one year's freedom from the disease is generally adopted and I had that in mind. I think two years would be still better. I cannot understand how one can advocate inducing abortion on the same patient time after time for this condition. If we are obliged in any particular case because of the special indications to induce abortion we should afterward insist on sterilization. Nothing seems to me more harmful from all sides than a repeated induction of abortion. As to the method of sterilization, of course, these instruments of Dr. Dickinson are interesting but we cannot rely on them at

present. We must have absolutely reliable methods. Those who have spoken have assumed an abdominal laparotomy for tubal sterilization. We can do a vaginal celiotomy with much less shock. Some anesthesia may be desirable. The ether anesthesia, as little as we can get along with, is much safer than chloroform. The use of forceps is, of course, not to be recommended in all cases. A symphysiotomy may be done. Under no circumstances should a dangerous forceps operation be undertaken. The same obstetric principles as apply in all cases are to be observed.

INTRADURAL ROOT ANASTOMOSIS FOR THE RELIEF OF PARALYSIS OF THE BLADDER

AND THE APPLICATION OF THE SAME METHOD IN
OTHER PARALYTIC AFFECTIONS *

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Any method of surgical treatment which promises relief or cure of a distressing condition hitherto irremediable by any known treatment, medical or surgical, is worthy of close attention and of adoption after its value has been demonstrated. Incontinence of urine and of feces, especially the former, in cases of traumatism causing complete or partial paraplegia is always a distressing condition, and not infrequently one of danger through the probabilities of cystitis and general infection.

We believe that the following case is the first in which the operation of intradural anastomosis of spinal nerve roots (the first lumbar to the third and fourth sacral) has been successfully accomplished, and in only one instance has it, so far as we know, hitherto been tried. The case, as the history will show, was one of severe traumatism at first causing complete paraplegia, including incontinence of urine and feces. In a few months the paraplegia and accompanying anesthesia were largely recovered from, but the patient was left with an absolute incontinence. Eight months after the operation the patient stated that he could dispense with the urinal, which he had hitherto worn constantly, for a period of twelve hours and that with the assistance of pressure over the suprapubic region, partial evacuation of the bladder was possible.

Of course several months are required for physiologic union to take place fully in a case of either peripheral or root anastomosis, but the result in this case so far is most satisfactory. The operation has also shown that no reason exists why nerve-root crossing should not become a valuable addition to our neural surgical procedures, not only for the relief of paralysis of the bladder and bowels of organic origin, but also for obstinate and distressing enuresis of unknown cause. The operation also has a field in some forms of residual paralysis after poliomyelitis and probably in some monoplegias of central or peripheral origin.

REPORT OF CASE

J. S. G., aged 27, married, was a business man who had always had unusually good health until he met with an accident, July 6, 1911. A large gas tank exploded in a shop in which he was at the time. He was thrown some distance with much violence and was rendered unconscious, remaining

* Read in the Section on Nervous and Mental Diseases of the American Medical Association, at the Sixty-Third Annual Session, held at Atlantic City, June, 1912.

so for five or six hours. He was taken about thirty or forty miles to a hospital.

He had lost power in both lower extremities. Immediately after the accident his feet were very sensitive to pressure, so much so that it was impossible for him to have his stockings put on. His bladder and bowels were paralyzed. He had to be catheterized for four weeks. He gradually improved, especially as regards power in his lower limbs, but certain very positive conditions remained when he was first examined by us. The loss of power in his lower extremities showed itself then simply in an inability to lift himself and stand on his toes and fore part of his feet, the impairment being therefore chiefly in the calf movements.

His bladder continued paralyzed and in consequence of this he had absolute incontinence, and he had also developed some cystitis. His bowels were torpid, although not so bad in this respect as at first. When they were opened by the use of a cathartic he could not fully control the evacuation.

About a week after the accident he suffered much pain in his back. This disappeared; and he had not had any shooting pains or girdling pains along the spinal column. He had no reflex spasms or jerking in the lower extremities.

Several examinations gave the following results: Station and gait were good. In attempting to stand on the toes and fore part of his foot he had evident difficulty, although able to perform these movements. For a long time, as above indicated, he was not able to stand in this way at all. Examination of separate movements of the foot showed that he could abduct, adduct, dorsal flex, plantar flex and perform movements of all possible description on the ankle. The

Figs. 1 and 2.—Areas of impaired sensation on sole and dorsum of left foot.

power to elevate the heel was slightly impaired. Extension and plantar flexion of the great toe and other toes were preserved. All movements of the leg on the thigh and the thigh on the abdomen were preserved and well performed. Knee-jerk on the right was present and normal; on the left it was much impaired and sometimes absent. Both ankle-jerks were absent. His great toes remained in a slightly extended position but no Babinski response was obtained, and indeed no reflex whatever was obtained on both dull and sharp stimulation of the sole. Examinations for touch, pain and extreme heat and cold showed that these forms of sensation were lost over the sole of the left foot except on an area of its inner aspect, the same being true of the dorsum of the foot, except along its inner border (Fig. 1). The areas of impairment reached about as high as the internal malleolus. On the right foot similar areas were impaired, but impairment or loss was more marked over the toes (Fig. 2). Callus on the dorsum of the right foot at the metacarpophalangeal articulation had been present; according to the patient, since he began wearing shoes after the accident. Sensation was lost over the right buttock and thigh, in an approximately saddle-shaped area, which gradually decreased in width to its termination an inch or two above the popliteal space. On the left a somewhat similar area was present but was narrower and shorter, reaching only to a point just below the gluteal fold (Fig. 3). The scrotum was also anesthetic. An impairment of sensation was present in the coccygeal and anal region

A study of the areas of anesthesia indicated that the nerve roots or segments of the cord involved were, for the feet, the fifth lumbar and first sacral, and for the buttock, scrotum and anal region, the second and third sacral, probably the fourth and possibly the fifth.

The patient's greatest distress was by far that which resulted from the paralysis of his bladder, with distention and overflow. He constantly had to wear a urinal. He thought that the power to expel the urine had not improved but the inability had probably increased to some extent, while in other respects he was conscious of much improvement. His sexual powers were practically abolished. His feelings of numbness in the feet, and his weakness in trying to stand on his toes he was sure were decidedly less, continuous improvement having taken place. He expressed himself as being quite able to stand all his other afflictions if he could only get rid in whole or in part of the distressing bladder trouble.

The patient was admitted to the hospital of the University of Pennsylvania for further investigation. Roentgen-ray examinations were made by Dr. H. K. Pancoast, who reported a fracture of the right half of the first lumbar vertebra.

After much consideration of the subject with the approval of the patient's brother, who was a physician, and with the urgent approval of the patient himself, it was determined to try to anastomose the twelfth thoracic or the first lumbar root to the third and fourth sacral roots. It was recognized that nerve anastomosis offered the only hope for the patient's relief and as this was anatomically impossible outside of the vertebral canal, it was thought that it might be accomplished intradurally.

The operation was performed by Dr. Frazier, Feb. 29, 1912. The following were the notes made by him at the time of the operation and the subsequent hospital records:

Laminectomy — Intradural Anastomosis of the First Lumbar and Third and Fourth Sacral Roots.

Through a curved incision a cutaneous flap was reflected and the spinous processes and laminae of the twelfth thoracic and first and second lumbar vertebrae were removed. Evidently there had been a fracture of the second lumbar vertebra, as several fragments were found quite loose and readily detached. The dural sac seemed unusually distended, and when it was opened a considerable quantity of cerebrospinal fluid escaped (from 1 to 2 ounces), even though the patient was in the reversed Trendelenburg position with the level of the head considerably below that of the pelvis. Inspection of the cord revealed no evidence of injury. There were no adhesions, no areas of softening, in fact no abnormality that could be detected with the naked eye. After consultation with Dr. Mills, I decided to carry out the plan which we had considered carefully before the operation and had submitted to the patient's brother. It was intended to effect an anastomosis between the twelfth thoracic and third and fourth sacral nerves intradurally.

With the assistance of Dr. Edward M. Williams, using a unipolar electrode, the other, a large pad electrode, being closely applied to the shoulder of the same side, the twelfth thoracic and the first lumbar were stimulated within the dural sac, and the one distinguished from the other by the fact that the contractions in the case of the twelfth thoracic were confined altogether to the trunk and abdominal muscles, while in the case of the first lumbar they were associated with contractions of the extensor group of the thigh. Attention was then turned to the conus for the purpose of identifying the third sacral root. What was taken to be the second sacral was first picked up on a blunt hook, and its faradic stimulation

Fig. 3.—Areas of impaired sensation on back of the thighs.

was followed by contractions only of the big toe on the affected side. On the ground that we were dealing with the second sacral, the next two nerves adjacent to it and to the inner side were selected for the anastomosis. As it was found by measurements that the twelfth thoracic, even if divided extradurally from its point of exit from the canal, would not reach the conus, it was decided to use the first lumbar. The latter was divided extradurally at its exit from the spinal canal and brought within the dural sac through a transverse incision in the dura. An end-to-end anastomosis was effected by a single No. 1 Chinese silk suture.

After the nerves had been identified by faradization, pads saturated with a 4 per cent. stovain solution were kept applied to the cord in order to block, if possible, any harmful impulses.

Toward the latter part of the operation the patient's respiration became very shallow and feeble, but on changing his position to his side and resorting to moderate stimulation, normal respiratory function was promptly restored. The dura was closed with a continuous silk suture, and the musculo-aponeurotic layer with buried catgut sutures. The usual cigaret drain, together with a small wick of iodoform gauze, was introduced through a stab wound down to a point of bleeding from the vertebral veins.

The operation was necessarily long and tedious, but at no time were any special difficulties encountered, except in one instance when a vein was divided at the time the first lumbar root was cut. This was followed by quite free bleeding, readily controlled, however, by a tampon.

The identification of the various roots was simpler than had been anticipated. The anastomosis was effected on the left side only, where the sensory evidence indicated less injury to the cord or nerve roots.

On March 4, 1912, the patient complained of deep-seated pain in his thigh, making him gasp. His ankle felt stiff and sore. He thought also he could feel urine accumulating in the bladder.

On March 11, 1912, Dr. Mills examined the patient without moving him from a recumbent position. Flexion, extension and other movements of the thighs were good and all the movements of the feet and toes were present, these having been tested in detail; the only weakness shown was in dorsal flexion and abduction of the right foot, this being only a partial loss. The knee-jerks were absent and there was no Babinski response on either side. Slight plantar flexion of the toes occurred on plantar stimulation.

Tactile sensation, tested by light touch of the finger, was everywhere preserved on the feet and legs below the knees. Pain sense tested by pricking was defective in definite similar areas on both sides. It was lost on the soles of the feet except the inner side about the hollow of the foot half way between the roots of the toes and the heel. On the dorsum it was lost entirely on the inside over all the toes. In a linear area from the metatarsophalangeal articulation three or four inches toward the instep, about the instep and toward the internal malleolus, this area of retained sensation was enlarged. On the outside of the foot a tongue of analgesia extended an inch or two above the ankle. As we were unwilling to move the patient at this time he was not examined over the buttocks, thighs, etc.

On March 27, 1912, the patient was discharged. He felt distention of the bladder on the introduction of 10 ounces of boric solution but he did not feel less amounts of boric solution or of urine.

As stated at the beginning of the article, eight months after the operation the patient could dispense with the urinal, which he had hitherto worn constantly, for a period of twelve hours, and with the assistance of pressure over the suprapubic region, partial evacuation of the bladder was possible.¹

NERVE SUPPLY OF THE BLADDER

According to Frankl-Hochwart,² whose monograph on the "Nervous Diseases of the Bladder" is among the

1. The patient has reported once since the presentation of the paper—in June—that he is now able to retain urine for two and a half hours at a time and that the expulsive power of the bladder seems a little greater than at the last report.

2. Frankl-Hochwart, V., and Zuckerkandl: Die nervösen Erkrankungen der Harnblase, Wien, 1906.

most reliable and most recent (1906), the bladder has two or three sources of supply. In the first place it has a supply through the sympathetic nervous system. Efferent nerves pass by way of the rami communicantes from the upper lumbar segments of the cord according to Langley and Anderson (at least in the cat). These take their course through the lumbar sympathetic to the inferior mesenteric ganglia. From these inferior mesenteric ganglia three gray hypogastric nerves penetrate the muscles of the bladder. Another sympathetic supply is from the upper sacral segments and roots. These nervi erigentes go to the hypogastric plexus. From this plexus, according to Griffith, the fibers pass in three layers, one to the fundus, another to the anterior part of the bladder and around the neck, and the third to the vesical part of the urethra.

In the human being, according to Frankl-Hochwart and Russian and other authorities with whom he agrees, the somatic nerves to the bladder are from the third and fourth sacral segments and roots.

Kilvington³ has published the only article on nerve crossing within the spinal canal with which we have become acquainted. In this article he first briefly discusses the fact that regeneration does not take place within the spinal cord, referring to the well-known fact that it seems to be necessary for the primitive sheath to be present in order that such regenerative processes may proceed. He then affirms that such regeneration may occur when nerves are united either intradurally or extradurally within the vertebral canal.

Experiments were made on several dogs in order to test the possibility of bringing about restoration of the functions of the bladder and rectum through nerve crossing and subsequent regeneration. Attention is called to the facts shown by various physiologists, as Langley and Anderson and Sherrington (cited by Schäfer⁴) that in the dog the nerve-supply to the bladder and rectum is chiefly from the second and third sacral and sometimes from the first sacral and even the seventh lumbar. According to Kilvington the second and third sacral nerves always give bladder contraction sufficient to expel the contents, although the first sacral in a few cases gave bladder contraction, but not enough to cause micturition.

Kilvington's instructive experiments on three large dogs and their results are recorded by him in detail. In his summary of these experiments he concludes that it is shown that the last lumbar, when joined to the second and third sacral roots, on electrical stimulation can produce all the effects which the latter give on the untouched side.

After Kilvington had determined by investigation on the cadaver the feasibility of intraspinal root anastomosis in man, Mr. Bird at his suggestion attempted the operation in one case; this operation proved unsuccessful because of conditions found after the laminectomy.

In his experiments on dogs Kilvington in two instances anastomosed both motor and sensory roots (a mixed nerve in effect) to motor and sensory roots below. In another experiment he crossed the anterior or motor root above with both sensory and motor roots below. In the case recorded in this paper we anastomosed a motor root above with a motor and sensory root below.

Certain disadvantages might arise from mixed anastomoses. It is doubtful whether in the surgical procedure the motor root above could be properly apposed to the motor portion of the mixed nerve below. Again,

3. Kilvington, Basil: An Investigation on the Regeneration of Nerves, with Regard to Surgical Treatment of Certain Paralysis, Brit. Med. Jour., 1907, 1, 988.

4. Schäfer: Physiology, II, 342.

if an anterior root, as in one of Kilvington's experiments, were crossed with both sensory and motor roots below, the only physiologic result, if the procedure were successful, would be the transfer of motor impulses. A motor root of one distribution might physiologically as well as anatomically unite with a motor root belonging to another segment of the cord, but it is doubtful whether a motor root would physiologically combine with a sensory root even if they were brought into physical union.

A sensory root may be combined anatomically and physiologically with a sensory root of its own sort, but it may be questionable whether a somatic sensory root will serve to take the place of a destroyed visceral sensory nerve.

Our idea in this operation was to perform an experiment in anastomosis for the relief of the paralysis of the walls or sphincter of the bladder, or of both, similar to that which has been performed extravertebally in cases of poliomyelitis, traumatic severance of peripheral nerves and other paralyses. The bladder is a muscular organ with a motor nerve-supply, which in large part at least is similar to that of muscles everywhere in the body, although it does in part, as has been shown, receive

identify the first lumbar root which leaves the vertebral canal in the foramen between the bodies of the first and second lumbar vertebrae. Therefore the identification of the third or the fourth sacral root would alone remain, and this could be done with any degree of scientific accuracy only by the use of the electrode, as the massed roots composing the conus could not otherwise be distinguished one from the other. It was suggested by Dr. E. M. Williams at the time of the operation that with the bladder filled with boric solution and a small manometer connected with the catheter, stimulation of the third and fourth sacral roots would be followed by an expulsive effort on the part of the extrusor muscles of the bladder which would readily be recorded on the manometer. This is an excellent practical suggestion and will be taken advantage of at the next operation. No difficulty should therefore be experienced in the future, in promptly recognizing the roots to be used in the anastomosis, and needless to say the anastomosis should be effected on both sides and not on one only, as in the case reported.

The principles involved in suturing the divided roots in no wise differ from those which have been laid down for anastomosis of peripheral nerves; it should always

VENTRAL ROOT ANASTOMOSES

Cervical	Above			Below				Opposite		
	Cervical	Dorsal	Lumbar	Cervical	Dorsal	Lumbar	Sacral	Dorsal	Lumbar	Sacral
5	5			6*						
6	6			7‡						
7	7			8§	1†					
8	8									
Dorsal										
1	7*, 8			2				1*		
2	8†			3				1‡, 2, 3*		
3		1, 2		4				1, 2, 3, 4		
4		1, 2, 3		5				1*, 2, 3, 4, 5		
5		2, 3, 4		6				2, 3, 4, 5, 6*		
6		3, 4, 5		7				3, 4, 5, 6, 7*		
7		3, 4, 5, 6						4, 5, 6, 7		
8		5*, 6, 7						6, 7, 8		
9		6*, 7, 8						7, 8, 9		
10		8, 9						8, 9, 10		
11		9*, 9, 10		12				8, 9, 10, 11		
12		8‡, 9, 10, 11						9, 10, 11, 12		
Lumbar										
1		8, 9, 10, 11, 12				2, 3, 4		10, 11, 12	1, 2, 3, 4, 5	1, 2
2		11, 12				3, 4, 5	1, 2, 3	11, 12	1, 2, 3, 4, 5	1, 2
3		11, 12				4, 5	1, 2, 3	11, 12	1, 2, 3, 4, 5	1, 2, 3
4		10, 11, 12	1, 2, 3			5	1, 2, 3	10, 11, 12	1, 2, 3, 4, 5	1, 2, 3
5*		9*, 10, 11, 12	1, 2, 3, 4				1, 2, 3	10, 11, 12	1, 2, 3, 4, 5	1, 2, 3

* Barely.
† Easily.
‡ Just.

§ Readily.
** 11 cm. in length.

its innervation through the sympathetic nervous system. By uniting a motor root which is a part of a healthy reflex arc with the motor root of a destroyed sensorimotor region of the cord, both the sensory and the motor portions of the intact arc are utilized. In addition the muscles supplied by the first lumbar nerves in the human subject probably have some accessory value in bladder function.

PRACTICAL SUGGESTIONS

We have discussed the physiologic problems involved in the reestablishment of innervation to the muscles of the bladder, and the operation as performed has been described. Such features as apply only to matters of technic remain to be considered. There is little doubt as to the advisability of a bilateral laminectomy when the identification of roots requires ample exposure and when, as in future cases, we would expect to effect anastomoses between the roots on both sides. It is often difficult to determine the exact position of an individual vertebra, so that in the future we would make sure of this before the operation by having a radiograph taken with a lead strip over what was believed to be the first lumbar vertebra. This would enable the operator at once to be able without the use of the electrode to

be borne in mind that extreme gentleness, the avoidance of trauma, the employment of proper suture material, absolute hemostasis, and the absence of infection are essential to success.

It would be out of place here to discuss in detail the technic of the preliminary laminectomy. It will be sufficient to emphasize two points which we regard as of importance in minimizing the risks of operation. In the first place, we have found the method of administering the anesthetic by intratracheal insufflation to possess great advantages over the drop method not only for safety but also for convenience. We place the patient in these operations in the prone position with the table elevated to an angle of 45 degrees from the waist to the foot, and with the trunk and head in the reversed Trendelenburg position. This position is convenient for the operator and at the same time through the influence of gravity prevents the continuous outflow of cerebrospinal fluid. It is a well-known fact that in prolonged operations when the patient is in the prone position (face down), the respiratory apparatus seems to wear out more readily, and under ether anesthesia proper oxygenation of the blood is interfered with. The use of intratracheal insufflation entirely overcomes this diffi-

culty and an even state of anesthesia is preserved, with adequate oxygenation whether or not the respiratory function becomes fatigued.

The second point to which we refer has to do with the harmful influence of the manipulation of the roots incidental to their identification, isolation, division and suture. There is no doubt that the mere manipulation of the roots originates afferent impulses which of themselves have a harmful influence on the vasomotor system. To break this influence and thereby prevent shock-producing tendencies, we have been in the habit of establishing a block by applying 4 per cent. stovain solution to the cord just above the site of our manipulations. These two points we feel assured are worthy of consideration in rendering an operation, which we believe should be without fatality, free from any immediate depressing influences.

Leaving aside these essentially practical considerations, we may enter for a moment into the purely speculative field. That physical union between the first lumbar and third sacral roots may be effected within the dural sac has been demonstrated on the living subject, and its application to residual paralyses of the bladder following cord lesions discussed. The question at once suggests itself as to whether or not this operation may not be applicable to paralyses of other groups of muscles and we have determined from observations on the cadaver that those anastomoses may be considered possibilities which are indicated in the accompanying tabulation.

From this table it is readily seen that in the roots which go to make up the brachial plexus it would be possible to effect an anastomosis only between the root immediately above and the root immediately below either the fifth, sixth, seventh or eighth cervical. In the case of the first thoracic root, an anastomosis could be effected with the seventh or eighth cervical above and the first thoracic on the opposite side, and in the case of the second thoracic with the eighth cervical and first thoracic above and with the first, second and third thoracic on the opposite side. In cases of injury to the cord involving the seventh or eighth cervical segments with resulting paralyses it would be possible to innervate the roots from these segments with the first thoracic.

The farther down the cord one goes the longer is the distance from the point the root is given off the cord to its point of exit from the canal, and the more the roots overlap one another. When we come to the lumbosacral region we find that the ventral roots lend themselves to innumerable possibilities of anastomosis with roots above or below and even with roots on the opposite side. It would seem quite within the range of possibility in a case of unilateral infantile palsy of the lower extremity to be able to innervate the root of the paralyzed group with a root that might be spared from the same or the opposite side, as has been suggested earlier in the paper.

In the paralyses of the bladder and rectum following trauma, however, we have perhaps the most important indication for this intradural operation, not only because of the patient's otherwise hopeless condition, but because those so afflicted are utterly miserable and their lives are shortened by the infection of the kidneys which sooner or later follows the inevitable cystitis. If this new plan of procedure had no other application than for the relief of the vesical palsy it would still have a wide and important field. That it is based on a reasonable hypothesis has been proved by experimental observations on the lower animals; that it is a justifiable risk no one will

gainsay; that it gives promise of attaining its object has been demonstrated by the fact that our patient has already gained some control of the bladder. Owing to the comparatively short time which has elapsed between the time of the operation and the present, this contribution takes on the nature of a preliminary report. We therefore submit it as such for consideration and discussion.

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PREDEMENTIA PRÆCOX *

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When, in 1907, Jelliffe published his admirable paper on "The Signs of Predementia Præcox: Their Significance and Pedagogic Prophylaxis,"¹ he was not directing attention to a newly discovered mental condition. We were all familiar with the fact that dementia præcox frequently developed in a soil which had apparently been prepared to receive it. The chief merit in his paper lay in the great hopefulness with which he treated the subject and I know that he instilled in me a less pessimistic view of early cases of dementia præcox.

It is generally admitted, I think, that dementia præcox may occur in an individual who is predisposed by defective development, or, it may occur in a normal, or even exceptionally brilliant, person after some physical stress, such as typhoid. To denote these conditions De Sanctis has proposed the terms "comitans" and "subsequens." In Dr. Jelliffe's paper the impression is given that for those predisposed to dementia præcox the education must be especially planned to develop, by means of industrial occupation, the senses rather than the intellect, yet this should not be overdone in such a way that the child does not receive what may be termed a normal education.

In a more recent paper² he states that when a patient shows an inability to bring himself in touch with the physical world, with a constitutional aversion to dates and a glorification of vague abstractions, it is justifiable to regard the child or youth as a patient, to advance his level and to train him to be interested in his small demands so that he may be saved the necessity of meeting greater demands than his capacity will bear. He also characterizes these patients as being brilliant and interested in inward rather than in outward fields. They lack all manual dexterity; they lack the adaptability to uncongenial environment, not the environment of personal comfort, but the environment of common minds. Fits of abstraction are very common.

Space does not permit further quotation from this excellent paper.

Expressing the same fact in other words we may say that predementia præcox is an early stage of dementia præcox, and it is the time when the possibility of arrest of the disease is greatest.

Usually an "outbreak" of some sort directs the attention of the family to the fact that there is something wrong with the patient and, after a period of care by the family physician, who, as a rule, lacks the necessary

* Read in the Section on Nervous and Mental Diseases of the American Medical Association, at the Sixty-Third Annual Session, held at Atlantic City, June, 1912.

1. Jelliffe: *Am. Jour. Med. Sc.*, 1907, cxxxiv, 157.

2. Jelliffe: *Predementia Præcox: The Hereditary and Constitutional Features of the Dementia Præcox Make-Up*, *Jour. Nerv. and Ment. Dis.*, January, 1911.