

presumably infected areas creates not only unique professional problems, but offers opportunities for medical research into their special localized diseases as perfect as if actually staged for the purpose. These have been promptly recognized by Dr. Karl F. Meyer, director of the Hooper Foundation for Medical Research, and he has offered to the military authorities the full resources of his institution for the scientific investigation of these and other appropriate medical problems that may arise. This aid has been accepted by Colonel C. J. Manly, chief surgeon of the Ninth Corps Area and in charge of all medical administrative phases, and plans for full and effective cooperation are now being worked out. At the present time, one or more field parties to carry out local research on the ground, together with coordinating investigation at the Foundation itself, are contemplated.

It is reasonable to hope that valuable additions to our present limited knowledge as to the nature, virulence, and prevention of these serious diseases may result from the introduction of a vast number of susceptibles into the infected areas and the scientific study of the resultant pathology. Chief Surgeon Manly is now preparing a medical directive for his field force of army surgeons which will cover our present knowledge of these little known infections. But in spite of this precautionary effort, cases of such diseases may be expected to occur; and the present spot-map of their endemicity will doubtless be proportionately expanded, and local physicians be better forewarned as to possibilities of diagnosis when some of these little known diseases occur.

One of the major features of the reclamation work is to construct new roads and trails by which present inaccessible areas in the forest reserves will be opened to summer campers and sportsmen. The result will, naturally, be a considerable influx of vacationists into these infected areas in the future, so that any scientific facts gained as a result of the operations of the Citizens Conservation Corps will have a permanent and increasing medical value.

Hooper Foundation, University of California.

SPINAL CURVATURES—VISCERAL DISTURBANCES IN RELATION THERETO*

By NEVILLE T. USSHER, M. D.
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DISCUSSION by William J. Kerr, M. D., San Francisco; F. M. Pottenger, M. D., Monrovia; Lewis Gunther, M. D., Los Angeles.

IT has long been recognized that scolioses and other curvatures of the spine, with the attendant pathologic changes in and about the spine, have produced cutaneous pain along nerve pathways directly related to this curvature. So-called "intercostal neuritis," for example, has often been ascribed to a dorsal scoliosis of the spine. Cutaneous pain and sensory changes of the abdominal wall have also been recognized as being due in

some cases to spinal misalignments, and a number of writers have described the effect of pathologic changes in the spine itself as producing radiation pain. For the most part, they stress the cutaneous nature of the pain. Mayer¹ describes certain sensory and motor radiation phenomena due to spinal nerve root inflammation (Dejerine's² radicular syndrome) and differentiates the symptomatology from that produced by peripheral neuritis. Irritation of the spinal nerves as they leave the cord, whether within the confines of the bony canal or just outside of it, is shown to produce somatic disturbances in the levels enervated by these nerves. The term "radicular syndrome" rather than "radiculitis" is preferred by Nielsen³ in describing this condition, since he recognizes the fact, as few apparently do, that the symptoms may arise from changes in the spinal configuration, or from a myositis relatively distant from the spinal roots. He does not deal with the sympathetic relationship, however. His emphasis on the correction of scolioses in this type of case is a definite step forward.

Gunther and Kerr⁴ in recent papers have recorded very complete observations on the effect of osteo-arthritis on the spinal roots. They describe the result of this spinal-root irritation in the various segmental areas of the body. It was shown that the symptomatology was entirely dependent on the vertebral levels affected. Cervical involvement was associated with headache, "sore neck," and pain in the shoulders and arms. Precordial pain, often thought by the patient to be due to the heart, was found to be due to an osteo-arthritis of the upper dorsal spine. Pain in the gall-bladder and epigastric areas was noted when the mid-dorsal area was involved. Appendicitis and pelvic disease were elements in differential diagnosis when the lower dorsal vertebrae were affected.

Carnett^{5,6} in 1927 investigated the follow-up reports of operations for chronic appendicitis and gall-bladder disease done by a large group of capable surgeons and found that a fairly high percentage of patients was not relieved by the operation. He stresses the importance of distinguishing between abdominal pain due to intercostal neuralgia and that caused by the appendix or gall-bladder. A brief mention is made of a girl whose "chronic appendix" and later whose apparently normal right ovary were removed with a return of right-sided symptoms after the operations. It was then found that she had a lateral curvature of the spine and shortening of one leg. When this condition was remedied her pain ceased and had not returned during the following six years. Carnett emphasizes the cutaneous disturbances, as most of the recent writers have done. However, he does not lay much stress on the intercostal neuralgias as being the direct result of spinal curvatures.

LITERATURE LACKING IN GENERAL RECOGNITION

Search of the literature apparently does not reveal a general recognition of the effect of spinal curvatures and their concomitants on the viscera. Rather, visceral pathology has been studied first and theories have been propounded to explain the

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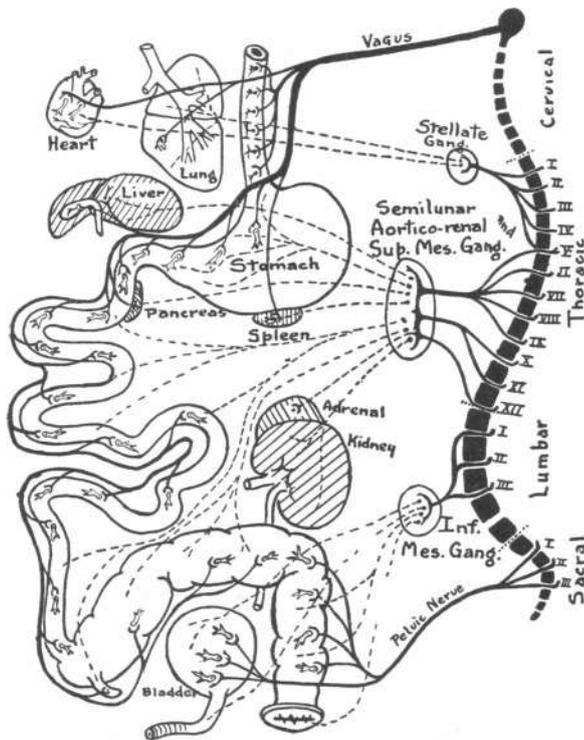


Fig. 1.—Showing the relationship of the visceral organs to the chief ganglionic groups and spinal segments. The sympathetic nerves are represented by broken lines, the parasympathetics by heavy solid lines. (From Pottenger: Symptoms of Visceral Disease.)

mechanics of pain in areas related to the visceral disturbance. For example, production of pain and tenderness at the site of an inflamed appendix and in the superimposed abdominal wall occurs, although it is generally conceded that the sympathetic fibers to the inflamed viscus do not carry pain sensations. Mackenzie,⁷ in his explanation of such a phenomenon, suggested the now well-known theory of the "irritable focus" in the spinal cord. According to his view, physiologic or pathologic changes in a viscus cause a perpetual bombardment of the spinal-cord segment traversed by its splanchnic nerves. This bombardment results in an irritable condition of the cord at this point, and when ordinary afferent impulses from the skin, muscles, and peripheral structures enter this segment a sensation of pain is experienced. This pain then appears to the patient as coming directly from these superficial structures. This is called the "viscerocutaneous reflex" theory. Morley,⁸ however, proposes a simpler theory—that of the "peritoneocutaneous reflex" in which direct irritation of the parietal peritoneum over an inflamed viscus causes reflex pain in adjacent skin areas without the splanchnic nerves being involved. One is led to believe, however, that a combination of Mackenzie's and Morley's theories hold true in most cases. Morley,⁸ Weiss and Davis⁹ have shown in addition that infiltration with a local anesthetic of cutaneous areas of pain has in many instances caused a complete loss of pain sensation related to the underlying viscus such as the gall-bladder, stomach, or appendix.

The intimate relationship of the viscera with the corresponding segmental distribution of nerves is

well brought out by Pottenger.¹⁰ He states that "the segmental relationship which exists between an afferent visceral neuron and an efferent somatic neuron probably also exists between an afferent somatic and an efferent visceral neuron," and assumes "a continuous flow of stimuli from the surface of the body inward to the viscera and from the viscera outward to the skeletal tissues." The schematic diagram of the relationship of the visceral organs to the chief ganglionic clusters and thence to the spinal levels is well shown in Fig. 1.

COMMENT

If, then, there is such a close relationship between the viscus and the cutaneous nerves, why not a reversal of the process, namely, intra-abdominal pain and disturbances in the viscera as a result of irritation in the spinal region and not of primary disease in the organs affected. In other words, instead of starting with a pathologic viscus and tracing the path of its reflex pain, we start with an abnormality of the spinal configuration and designate it as the primary cause of the visceral disturbance.

Of course there are innumerable cases where an individual has had some type of spinal curvature, even from birth, without developing radiation pain or symptoms of visceral pathology. It is my thesis, however, that in certain instances an irritation is set up about the spinal nerve roots or sympathetic ganglia near the spine. This irritation may be due to a local myositis, osteo-arthritis (Dejerine,² Mayer,¹ Gunther and Kerr⁴), bony malformation at the nerve canals, or possibly direct pressure on these nerves due to the angle of curvature. In turn, because of the intimate relationship of the sympathetic network with that of the somatic nervous system, (1) a motor reaction may occur in the innervated viscus, such as spasm, and hypercontractility of the organ, or (2) a sensory reaction may occur such as colicky pain, sense of fullness, inability to draw a full breath, etc. Theoretically, both the motor and the sensory phenomenon should often be found together.

From the above considerations it would seem possible, then, that symptoms of gall-bladder disease, appendicitis, stomach ulcer or gastritis, partial ureteral obstruction, colitis, spastic constipation, and other forms of visceral irritation may be produced directly or indirectly from a spinal curvature. It is my belief that a large group of individuals who have been treated or even operated for apparent visceral disease without definite relief may fall under this classification. These patients have usually "made the rounds" and the spinal curvature has often remained undiagnosed in spite of an otherwise complete medical examination. Roentgenograms of parts thought to be affected have usually been found negative, although occasionally some spasticity of the gastrointestinal tract or of a ureter may appear. These patients in general are frequently diagnosed "malingers" or "neurotics" at best.

A study was made of twenty cases that I or my associates examined, with especial reference

to this "viscero spinal syndrome." These were believed to be representative of this syndrome and also to be definite clinical entities. The difference in their symptomatology was found to depend mainly on the segmental area involved, and care was taken to rule out actual visceral pathology tending to manifest similar radiation phenomena. A number of other cases were considered representative, but were not followed long enough or did not offer sufficient data to be included.

Summaries of five case reports are herewith offered as typical examples of the syndrome.

REPORT OF CASES

CASE 1.—A professional man, white, age thirty-one, under observation since 1927. Complained of attacks of pain radiating along the third and fourth ribs on the right. His back felt "tired most of the time," and he disliked riding in a car for any long distances because of this discomfort. Lying down would tend to relieve him. This patient was seen in Providence, Rhode Island, by an excellent orthopedist, who fitted him with a lumbar spinal brace. The attacks of intercostal pain continued, however, and the patient began to have vague upper abdominal distress. At times the symptoms became acute and colicky in nature. He vomited (this was almost projectile, without much previous nausea) and complained of feeling the effect of "gas caught in the intestines near the stomach." He was forced to go to bed for several weeks at a time because of the pain. X-rays of the spine, gall-bladder, and gastro-intestinal system were negative except for a five-hour retention of the barium meal in the stomach. All laboratory findings at this time were negative. In quest of relief he came to California and was seen at the clinic, where a diagnosis of dorsal scoliosis was made with intercostal neuritis related to the fourth dorsal vertebra. The curvature was partially corrected by a total one-quarter inch raise of the right heel, physiotherapy, and muscle training. The upper abdominal symptoms cleared up within two weeks, and most of the intercostal pain had disappeared within a month (although relief was noted much earlier). One year later there was a moderate recurrence of symptoms and it was found that the curvature had partially returned. The addition of another one-quarter inch to the right heel and more vigorous muscle training again relieved the symptoms very satisfactorily, and the patient has remained well up to the present writing.

In referring to the patient's past history, the following points may be suggestive. In 1923 an appendectomy was performed and an essentially normal appendix was removed. The symptoms and signs of appendicitis at this time were not typical, although there was some hyperesthesia of the skin in the right lower quadrant and the patient complained of cramping pain in the right side. Two years later, in 1925, the patient developed symptoms of mild ureteral colic on the right side. These symptoms persisted off and on for three weeks, and the ureters were catheterized. A moderate angulation of the right ureter was found a few centimeters below the right kidney. Following this, no further renal colic developed, although a tired sensation was frequently noted in the right flank (a sensation which was intensely reproduced by the filling of the renal pelvis with sodium iodid).

In short, then, this patient was known to have had some type of pain in his right side dating from 1923, when an innocuous appendix was removed, to 1930 when he obtained relief of intercostal pain and upper abdominal colic after orthopedic treatment of a spinal curvature.

Note: Gastro-intestinal series studied after the treatment of the scoliosis did not show abnormal retention of barium meal in the stomach.

CASE 2.—A Jewish grocery clerk, age forty-two, under observation since 1921. At this time he complained of feeling tired and weak even after sleeping well at night. A year later, 1922, he was in bed three days with pain in the right lower quadrant and marked sensitivity in this region. He did not vomit. The temperature was not recorded. In 1924 he developed an intermittent "growling pain" in the right side. This became severe and seemed to localize in the right lower quadrant and the diagnosis of chronic appendicitis was made by a local surgeon, although no operation was performed. The attack was not accompanied by vomiting. He was seen again seven years later, 1931, complaining of "cramp-like pains in right abdomen" and backache. No nausea or vomiting. Bowels regular. Roentgenograms of the gastro-intestinal tract taken at this time were negative. Referred to the orthopedic department, the patient was found to have radiation pain from a left dorsolumbar curvature, and right leg one-quarter inch short. This was corrected with rapid relief of back pain and abdominal symptoms. Up to the present study, relief has continued.

Laboratory examination of the blood and urine during the attacks of abdominal pain were essentially negative. The stools showed considerable undigested starch particles and vegetable fibers. The blood Wassermann test was negative at all times.

CASE 3.—A draughtsman, white, age twenty-three, was first seen in November, 1930, complaining of a feeling of "emptiness in stomach," nausea, and epigastric pain. At times the pain seemed to occur as colic in the right abdomen. Appetite was good, but could not eat much because of distress in "stomach." When the pain was severe it was often accompanied by nausea. Complained of griping in intestines due to "gas." All his symptoms seemed to be aggravated in the late afternoon and evening, and had been noted for several months. He stated that much of his work was carried on while bending over a draughting board.

His chief illnesses previously consisted of a siege of "double" pneumonia in infancy and a severe attack of influenza in 1918. Otherwise he had been in rather good health up to the time of admission to the clinic.

A complete physical examination revealed no noteworthy pathologic condition except a dorsolumbar curvature and left leg one-half inch short. Laboratory reports were negative. No roentgenograms were taken.

Orthopedic relief of the curvature was instituted with almost immediate relief of upper abdominal symptoms. Two years after this correction the patient continues in good health and there has been no recurrence of pain.

CASE 4.—A woman teacher, white, age thirty-seven. She complained of pain and tenderness in the left lower quadrant and back which had persisted for a number of years. She had been told by physicians that the pain was caused by the left ovary. The discomfort became continuous about a month before being examined at the clinic. A thorough pelvic examination revealed no pathology to account for the pain. The patient was then referred to the orthopedic department, where a left lumbar-right dorsal spinal curvature was found. Correction of the curvature brought total relief within three days. This relief has continued to the present writing, four months later.

This case does not necessarily represent the "viscero-spinal syndrome," for no differentiation was made between cutaneous sensation and that of the underlying organs. However, it is offered as a typical example of how pain in the pelvic region focuses the attention on the pelvic organs and not on external factors which may be the primary causes.

CASE 5.—Housewife, white, age twenty-eight, first seen on August, 1930. She complained at this time of tickling in her throat and chest, cough, and difficult

breathing. This had been present for nine years. Raised a slight amount of whitish sputum. No blood. She also complained of constipation, the bowels moving with difficulty every two to three days. Patient states that she had always had a curvature of her spine and frequently suffered considerable backache. The ache was not constant and did not always remain in one spot. When it was worse her respiratory symptoms seemed to be aggravated. Her past history was essentially negative except for a miscarriage at two weeks in 1927 and a tonsillectomy prior to that. Menstrual periods were every thirty days, preceded by a week or more of "heaviness in the pelvis and dragging sensations." Urination about twelve times a day and once at night.

Examination of the lungs was negative. The heart showed no abnormality although a soft systolic blow was audible at the apex. Pelvic examination showed a mild endocervicitis. The Rubin test for patency of the tubes was negative.

Nothing was done at this time for the spinal curvature.

The patient's symptoms continued unabated for a year when an orthopedic examination was advised (December, 1931), and a right dorsal and left lumbar scoliosis was charted. The right leg was also found to be one-half inch short. This was corrected and exercises were instituted to further relieve the spinal curvature (Fig. 2).

The patient noted a definite improvement within a few weeks after the onset of treatment. Interviewed four months later she volunteered the information that her cough had practically disappeared, her bowels moved twice daily (instead of every two or three days), and the premenstrual heaviness in the pelvis was gone. She urinated about four times instead of twelve.

It is interesting to note here that this patient did not have cutaneous radiation pain. However, the improvement of the visceral symptomatology coincided with the postural improvement.

COMMENT

We find, then, regardless of any theories offered or to be offered, that the above patients with complaints of visceral disturbances and definite spinal curvatures have been apparently relieved after some correction of the spinal curvatures. It may be argued that these patients fall under the grouping of the psychalgias as described by Pratt et al.¹¹ The latter have shown that if painful areas of skin are of hysterical origin they may be permanently relieved by infiltrating the skin with procain. If the pain is due to a true viscerocutaneous condition, relief may persist only as long as the anesthetic is present. These experiments have not been carried out in our patients. However, our treatment (*i. e.*, orthopedic relief of spinal curvature) has been so different and apparently so far from the seat of trouble, from the patient's point of view, that we believe psychotherapy is not a large factor. Furthermore, if most of our patients had suffered from pure psychalgias they should have benefited by local and symptomatic treatment. This was not found to be true. For example, Case 1 had been told at the time of operation that the appendix was the probable causative factor. To all appearances, he was satisfied with this explanation, but the right-sided pain returned in spite of the appendectomy, and continued in one form or another until its disappearance on correction of the spinal curvature.

It is my belief that psychalgia may be a complicating factor, but certainly not the main element in the twenty cases studied.

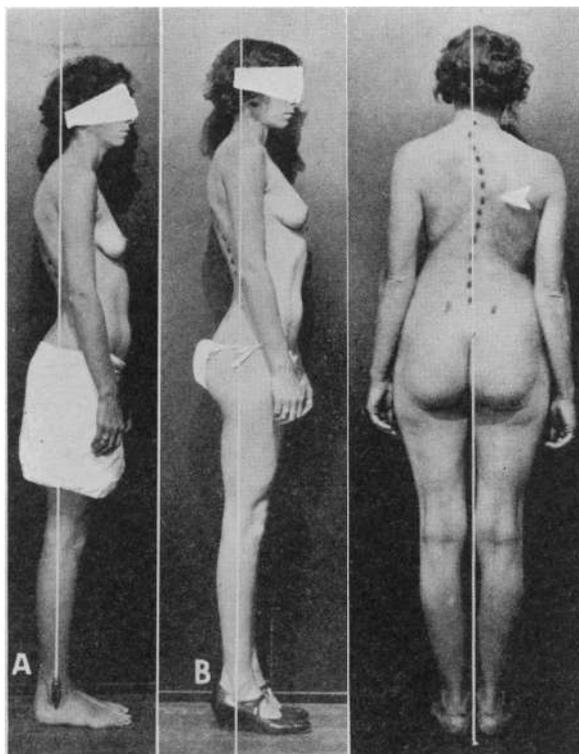


Fig. 2

Fig. 3

Fig. 2.—Showing the posture of a patient (Case 5). (a) At onset of treatment when visceral disturbances were marked. (b) After orthopedic correction of the spinal curvature had progressed for three months and the visceral symptomatology had become negligible.

Fig. 3.—Showing a typical curvature of the spine, representing a common factor in the viscerospinal syndrome. The arrow points to the apex of the curvature in the middorsal region, often associated with radiation phenomena in the gall-bladder and epigastric regions. The patient above complained of colicky pains in the upper abdomen, indigestion, and a sense of epigastric pressure after eating. Visceral pathology was not found by clinical or x-ray examination. A partial correction of the spinal curvature resulted in complete relief of symptoms.

Certain additional factors have been noted in the viscerospinal syndrome: (1) Visceral disturbances seem to occur in direct relation to the apex of the concavity of the curvature of the spine, the concavity facing the side affected (Fig. 3). (2) The apex of the curvature often changes as the patient becomes older, and the patient's history suggests that the visceral symptoms change according to the new segmental enervation. There also seems to be some temporary correlation between any new changes in the spinal contour produced by altering or correcting the existing curvature. For example, in two cases where scolioses were treated by heel-raises the patients complained of fatigue in the lumbosacral region and constipation shortly after the correction. This constipation was of the spastic type and seemed to be felt only in the rectum and sigmoid. The spasticity, however, disappeared within a few weeks when the lower back became "strong again" and apparent adjustment had been made to the new spinal contour. (3) Fatigue seems to be an important factor in bringing on attacks of pain and visceral disturbances, and its explanation may be simple: fatigue is often accompanied by lack of muscle tone, especially noticeable in the long muscles of the back;

there may be a slumping of the figure, the patient does not stand or sit erectly; consequently any spinal curvature already present is then aggravated and may initiate the viscerospinal syndrome. This perhaps explains why certain active individuals under study remained relatively free of symptoms for varying periods of time, in spite of no treatment. When they became sedentary, lost sleep, or were overworked, their muscle tone diminished and symptoms reappeared. (4) The age factor is also of some importance. Youth compensates fairly well in spite of scolioses, kyphoses, etc. As he gets older, however, there is less ability to compensate and here again the curvature is aggravated. Arthritic changes may take place and possibly fibrotic thickening about the sympathetic fibers resulting in the physiologic disturbances already described.

CONCLUSIONS

In conclusion, it would appear necessary to be on the watch for extraneous conditions which may cause such diseases as "chronic appendicitis," "cystic ovary," "spastic colitis," and the like. It is my belief that many instances of mistaken diagnoses in this group occur either because (a) the relationship of visceral disturbances to the spinal curvatures is not recognized or (b) the curvature itself is not seen because of faulty examination methods. An examination of the body in a natural standing position is as important as the palpation of the abdomen with the patient lying relaxed on the examining table.

SUMMARY

1. Inflammation of the spinal nerve roots and adjacent nerve structures has been described as producing cutaneous radiation pain simulating visceral disease.

2. Little consideration has been given to actual physiologic changes in the viscera due to such radiation phenomena.

3. The term "viscerospinal syndrome" is suggested to describe the result produced by spinal root and sympathetic nerve irritations at various segmental levels.

4. It is herein maintained that certain spinal curvatures such as scolioses, kyphoses, lordoses, etc., may produce definite visceral symptomatology and that this is not generally recognized by the medical profession.

5. Typical examples, selected from a group of twenty, are presented. In these patients symptoms of appendicitis, gall-bladder disease, ureteral colic, and other manifestations of visceral disease were apparently relieved by some correction of the spinal curvatures.

6. It is believed that psychalgias (as described by Pratt et al.) do not fill any important rôle in these patients.

7. Fatigue, age, activity, and the apex of the spinal curvature are shown to be chief factors in the production of the viscerospinal syndrome.

8. A plea is made for the general recognition of the rôle of spinal curvatures in the production of visceral disturbances.

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DISCUSSION

WILLIAM J. KERR, M. D. (University of California Medical School, San Francisco).—I have read Doctor Ussher's paper with a great deal of interest and pleasure. His contribution will again serve to warn the profession of the dangers of faulty examination of the spine and central nervous system in suspected visceral disease. The effects of scoliosis and faulty posture on the nerve roots may be quite as important a factor in producing visceral symptoms as is hypertrophic arthritis or tabes dorsalis. The reversal of the usual viscerospinal somatic reflex may be almost as frequently seen as the well-known type if we are on the watch for it.

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F. M. POTTENGER, M. D. (Monrovia).—Doctor Ussher's paper touches upon the very interesting problem of the relationship between the nerves on the surface of the body and those which involve internal viscera.

Precedent to the discussion of this subject it is necessary to understand the afferent (so-called "sensory") nervous system. It is often stated that there are no sensory nerves belonging to the sympathetic system. This is strictly correct in that there are no sensory sympathetic fibers; but there is an afferent (sensory) system of nerves which courses with the sympathetic system, but which belongs to the somatic sensory system which takes its origin in the nerve cells in the posterior horn of the cord. The afferent nerves divide within the cord and give off many branches, running up and down, which form many synapses with other neurons in the cord. In this way each afferent nerve may form synaptic junction with many efferent neurons. These efferent neurons belong both to the visceral and the somatic systems. So we must conceive of a continuous stream of impulses coming to the cord from the somatic structures, which express themselves reflexly both in other somatic structures and in visceral structures. We likewise must conceive of afferent fibers from the viscera transmitting stimuli to the cord which again form synapses with other visceral efferent fibers and also with fibers going to skeletal structures. In this way the action of the entire organism is integrated. In this integration through the nervous system there is a correlative effect during states of physiologic health which makes all systems of the body act as a united whole.

The same system which provides for this physiologic integration provides for pathologic disturbance in structures which may be adjacent or widely separated in conditions of disease. There is no doubt that afferent impulses from the surface of the body may

be transmitted to internal viscera, and if sufficiently strong produce pathologic function. On this basis the relief of a nerve irritation caused by scoliosis, as discussed in Doctor Ussher's paper, may be a means of relieving pathologic function in internal viscera.

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LEWIS GUNTHER, M. D. (913 Pacific Mutual Building, Los Angeles).—In 1928 Dr. William J. Kerr and the writer showed that osteo-arthritis of the spine could be the cause of pain at the periphery which closely simulated visceral disease. Confusion in diagnosis of visceral disease becomes a natural consequence, since the distribution of the pain in osteo-arthritis follows the dermatomes of the roots of the spinal nerves, and the Head zones of visceral pain also occur within the distribution of the roots of the spinal nerves. Methods for the clinical recognition of the pain of nerve root origin were described.

The medical literature has been slowly but increasingly affording recognition of the painful disturbances associated with spinal arthritis. However, as Doctor Ussher has pointed out, the possibility of visceral disturbances being reflexly originated by pathologic processes in the spine has received little or no consideration.

The possible sensory reflex reactions in the viscera, according to Doctor Ussher, would be described by the patient as "colicky pain, a sense of fullness, inability to draw a full breath, gas cramps, etc." He also demonstrated by his thorough studies that such symptomatology was associated with and could be attributed to pylorospasm, spastic states of the colon, or to partial ureteral obstructions also due to spasm of the ureter. It is a striking feature indeed (in all but one of the case histories presented) that although the word pictures painted by his patients were descriptive of symptoms that are more commonly associated in our minds with disease of the hollow viscera the distribution of the subjective painful sensory disturbances was along the dermatomes of the roots of the spinal nerves, and by their distribution they constituted a radiculitis.

In our original descriptions of the radicular syndrome are also to be found terms often used by patients in describing symptoms of visceral disease, *viz.*, burning, tingling, heaviness, pressure, stabbing pain, and gas. These we described under the heading of "nerve root paresthesias." These were distributed strictly according to spinal root dermatomes. Their frequency of occurrence, however, showed a much smaller incidence than the symptoms purely descriptive of root pain. In our effort to attain an understanding of the patient's language when telling of his symptoms, we were satisfied at the time to place the group of terms descriptive of visceral disease under the heading of a radiculitis because they followed the typography of the spinal nerve roots. According to our major premise, sensory disturbances which show by their distribution that the primary disease process is in the spinal root and not in the tracts, nuclei of the cord, or in a peripheral nerve trunk, constitute a radiculitis rather than the viscerosensory reflex of visceral disturbances.

Doctor Ussher's work has shown that sensory disturbances at the periphery of a radicular distribution may also be concomitant with spasms of the various hollow abdominal viscera. How is one to differentiate pure nerve root sensory pain and pure visceral disease pain in nerve root areas referred through Head zones from nerve root pain due to spinal disease and associated with spasms within the viscera which also give rise to symptoms?

Our criterion for the differentiation of radicular pain due to disease in the spine from Head zones of referred pain due to a diseased viscus which may also be referred within the same nerve roots as the radicular pain are as follows: Whether one accepts the viscerosensory reflex theory of Mackenzie or the peritoneo-cutaneous reflex theory of Morley, the fact nevertheless remains that pure Head zone pain which is associated with visceral disease rarely involves the entire cutaneous distribution of the nerve root dermatome.

On the other hand, the radicular pain of spinal disease always involves the entire distribution of the spinal dermatome. The Head zones of subjective sensations in visceral disease are poorly defined, whereas the radicular pains of spinal disease are accurately delineated. Memory for the former is poor, and sharp for the latter. The patient can accurately delineate radicular pain even many years after it has subsided. To this differentiation now must be added Doctor Ussher's syndrome. Doctor Ussher's spinovisceral syndrome describes symptoms commonly descriptive of visceral disease and root pain are associated with spinal curvatures and are concomitant with spasms of the hollow viscera. These symptoms depend on the nerve roots that are involved. Doctor Ussher is to be congratulated for calling the attention of the profession to this syndrome.

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DOCTOR USSHER (Closing).—Since compiling the above report of cases, presenting visceral symptomatology related to spinal curvatures, twelve new cases have been observed in our group. These, we believe, conform to the postulates of the "viscerospinal syndrome" and offer still further data, especially in the field of bronchospasm and asthma. This series will be discussed later.

A question was asked by Doctor Gunther as to the differentiation between pure nerve root sensory pain due to spinal disease and pure visceral disease pain referred to corresponding spinal segments. I believe this differentiation may often be made by a careful neurologic examination assisted by roentgenograms of the spine. In any case visceral pathology must be ruled out by the usual methods of differential diagnosis.

PERNICIOUS ANEMIA—MAINTENANCE DOSE OF LIVER EXTRACT NECESSARY*

By HENRY GIBBONS, III, M. D.
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APPROXIMATELY two years ago the value of the treatment of pernicious anemia by intramuscular injections of liver extract became generally recognized.^{1,2} The question arose concerning the maintenance dose in the average case. Is it true, as suggested,³ that one injection a month is sufficient for most cases? Just how intensively should certain cases be treated? It was believed that regular intramuscular injections of liver extract were much less expensive for the patient than liver extract by mouth. This method is certainly less objectionable than eating daily portions of liver.

PROCEDURE USED IN THIS STUDY

In order to evaluate the various new forms of treatment of pernicious anemia, the following course was adopted. In January, 1932, all cases of pernicious anemia being treated in the Lane Out-Patient Medical Clinic were instructed to stop eating liver, kidneys, and sweetbreads and not to take any more liver extract by mouth. Arrangements were then made to have the patients report at frequent intervals for a red blood count and a hemoglobin determination. Whenever the hemoglobin fell below 80 per cent (Sahli), an injection

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