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TWO CASES OF LAMINECTOMY.

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Case I.—J. R., Alsatian, fireman, aged forty years. Four years and a half ago the patient was forced to jump thirty-five feet from the roof of a burning house. He landed on both feet and fell backward and to the right, remaining conscious until he was carried across the street, when his senses failed him for a few minutes. He had a tingling sensation in the spine and in both limbs continuing several hours with varying intensity, most severe and lasting in the right limb.

The patient was first seen by Dr. W. E. Jeffries, and then by the family attendant, Dr. Guido Bell, who has treated him intermittingly since, and to whom I am indebted for the case and the supervision of the following history:

The first day the patient was very restless and hard to keep in bed. Once he eluded his attendant and walked across the room. He voided urine and fæces voluntarily, without pain or admixture of blood. He had great pain in his spine, markedly in the lumbar region. A severe pain in both hips and inability to walk suggested a lesion about the hip joint. He had much thirst during the first twenty-four hours. On the second day movement of his body elicited intense "whirling" pain about the upper lumbar vertebræ. Light rubbing relieved this for a

time. This pain was constantly present for about a year. The patient rallied slowly, being able to walk only with difficulty and with pain in his back after several weeks. Three months after injury a severe coccygodynia arose, followed by a swelling like a bruise at the lower end of the spine. This pointed like an abscess but finally disappeared, without opening, under soft-soap anointment. Coccygodynia was present afterward whenever the patient got up after sitting awhile. His right limb was noticed to be numb, cold, and weak, and was dragged in walking. For a while he suffered nausea and spit blood. Later this ceased, and he passed blood from the bowels.

I first saw the patient two years after the accident, being consulted by Dr. Bell. The patient suffered acute pain in the coccygeal region. The sacro-coccygeal joint was found tender to the touch, and painful on passive motion. The coccyx was rigidly drawn to the right side. Pressure elicited pain and tenderness in a spot covered by a half-dollar over the upper lumbar vertebræ. An examination under chloroform showed deflection of coccyx relieved, and no evidence of disease about the pelvis or rectum. The dilatation of the sphincter ani muscle gave permanent relief from the coccygeal pain. No more hæmorrhage from the rectum.

Ever since the accident the patient felt unsettled and restless, and seemed changed in his nature. His semblance to health prevailed on his friends to discredit his complaints of suffering and unfitness for work. He was repeatedly induced to take up light work, such as tower watcher and telephone attendant, without ability to endure. He was much afflicted with malaria, and had one attack of grippe. He had repeated attacks of weakness in the knee, and an increase of motor (extensor and adductor) paralysis of the right limb, being unable to bear the weight of his body on this limb. This aggravation of symptoms commonly arose in the springtime. At first it lasted a few weeks at a time; last year about four weeks, and this year has lasted upward of three months uninterruptedly. In walking, the patient employed at first a cane; later, crutches were necessary. Intense occipital pain and pressure, often reaching forward to the right supra-orbital region and includ-

ing the right ear, existed frequently. He often became confused and dazed; this was attended by burning of the eyes and difficulty in articulation. Recently these symptoms increased and he was irritable, querulous, and unjust. Severe pain and hyperæsthesia in the right inguinal region, at times accompanied with difficulty in breathing and nausea. Within the last year the right arm steadily grew weak, cold, and numb, and its painfulness interfered with sleep. *Petit mal* developed, starting with a peculiar sensation in the lumbar region. Usually the patient had time to call his wife before unconsciousness supervened. No twitching in these attacks. Pain in the right hip and limb, and attended with a prickling sensation, was constantly present though varying in degree. The right heel was hypersensitive. The patient was painfully sensitive to the concussion of a door slammed or of a heavy step crossing the room; "it would go right up the back." After retiring at night the right leg often jerked, continuing for an hour. Repeatedly the muscles of the back and abdomen participated. The sexual function remained unimpaired throughout; it effected fecundation twice since the injury. For a while the sexual appetite was increased. Frequently, even when at his best, after sitting quietly for a while, on attempting to get up the patient found himself without the use of the right limb for a period of five minutes; "it felt not like numbness nor like sleeping."

For a while the patient felt the muscles of the limb were too short, or as if they were clothed in wet hose; he never had the sensation of a cord around the body. Various doctors and remedies were tried in time. Blistering of the spine, hot mineral bathing, electricity, nerve sedatives, etc., were tried without effect. A jacket of plaster of Paris or leather was worn during the last two years and gave him comfort, though no cure.

The patient was referred to me a second time in May, 1892, by Dr. Bell, who suggested the propriety of surgical treatment. The symptoms were steadily increasing, physically and mentally. Crutches were necessary for locomotion; the right limb could not bear the weight of the body, owing to the extensor paralysis; the limb was dragged in walking. While sitting he

could not cross his right limb over the left without the aid of his hands. Sitting, the patient is most comfortable in an arm-chair and resting on his right side and elbow. His sleep is heavy, dreamful, and unrefreshing. He takes neither alcohol, tea, nor coffee. The appetite is diminished. Pressure on the vertebræ elicits great tenderness over the spine and the articular processes of the second lumbar vertebra, and evokes cries, and contraction of the muscles of the spine and the right limb and arm. The tactile sensation in the right limb is blunted, extending anteriorly and posteriorly down to the foot. The head of a pin is felt like a finger. Temperature is less than in the left limb. The difference of the calves is an inch and a fourth in favor of the left limb. The right thigh is correspondingly less in size, the atrophy including the extensors and adductors. In the right limb the patellar reflex is increased, the palmar reflex diminished; both are normal in the left. There is no coccygodynia. The right arm is atrophied, cold, and weak; patient can exercise no grip power. He stammers, pauses, and enunciates with difficulty. The tongue is movable in all directions. There is no facial paralysis. Pupils are unequal; the right is dilated excessively; this remains unchanged during an observation extending over several weeks; this condition was not noted by the former attendants.

Diagnosis.—Fracture of the lamina and the articular processes of the right side of the second lumbar vertebra; compression of the cauda at this point. The *petit mal* and the other cerebral symptoms are regarded reflex to the compression of the cauda. The progressive ascending spinal symptoms are held to be owing to a unilateral ascending myelitis.

The operation was proposed as being alone available after all other measures had failed, and because the condition had become unbearable and was threatening an early end. Doubts about its efficacy were entertained on the long duration of the spinal compression, four years and a half having elapsed since the injury, and owing to the ascending myelitis. Restitution *ad integrum* seemed improbable, if not impossible.

The patient gladly consented to this proposition, and was operated on at my sanitarium on June 15, 1892.

Dr. Bell administered chloroform and Dr. E. C. Reyer assisted. The patient was placed on Edebohls's laparotomy table with the anterior surface of the hips resting on the end of the table, which was raised as in Trendelenburg's posture, the head of the patient on the forward end of the table and the limbs hanging over the lower end. A rubber bag partially filled with water acted as a cushion between the anterior abdominal wall and the table. This position gave the greatest convexity possible to the lumbar region and proved of great service in exposing parts. I had experimented with this position and found it tenable without great discomfort or any respiratory embarrassment. An incision six inches in length was made directly over the spines of the lumbar vertebræ. The soft tissues were severed with the scalpel, closely hugging the lateral surfaces of the spinous processes on each side, cutting from above downward to sever the tendinous attachments of the upper muscular layers, and from below upward for cutting the deep layers. This I found practical to save unnecessary mutilation of the soft parts; it is suggested by the anatomy of the parts. The right and left laminæ of the second and third and the right of the fourth and part of the right of the fifth lumbar vertebræ were removed. The right lamina and the articular processes of the second vertebra were found thickened from a longitudinal fracture through these parts. Part of the articular processes required removal. The dura mater was found thickened and adherent in this part, and was torn open in removing the cut fragments of bone. A piece of the dura about a fourth by half an inch was removed. The venous bleeding resulting was temporarily frightful, but easily controlled by a gauze packing left in place a few minutes while the work was continued on the opposite side of the spine. Pulsation of the dura was visible. A slight deflection of the third and fourth lumbar spines revealed that these had been broken and reunited by ligamentous union. The right lamina of the third vertebra was contracted and bulged outward (backward) and the articular processes were thickened. The unilateral removal of the lamina of the fourth and fifth vertebræ was done solely to make ample opening. The experience from operations for

the relief of compression of the spine calls for free opening. The analogy between the skull and the spine makes this rule applicable to spinal surgery (Chipault).

Drainage was procured with rubber tubes and a skein of silkworm ligatures on each side of the spines. Silkworm was used for suturing the wound. The wound was covered with sterilized gauze and cotton, held in place by adhesive strips. The anæsthesia in the described position was well borne, the operation lasting over two hours. The temperature before the operation was 97° F.; pulse, 62: on leaving the table the temperature was 96·8° F.; pulse, 64. Little nausea and no vomiting followed the anæsthetic. Feeding was resumed on the second day. The considerable oozing of sero-sanguinolent fluid during the next three days required frequent changes of the dressing. The rubber drainage tubes were removed on the second day, the stitches on the seventh day, when the parts were healed, except above and below, where the drain openings still existed.

The temperature during the first week reached 100° F., probably owing to an absorptive fever in consequence of the contusion by the retraction of the tissues during the operation. During the attacks of pain it ran up 0·5° to 1° F. After the first week it was normal or even a few tenths subnormal. The pulse varied between sixty and seventy beats to a minute all the time except during pain, which ran it up ten to twenty beats. The urine was voluntarily and easily voided from the start. A slight irritability of the bladder developed on the second day and lasted two days, during which time the urine was voided at intervals of one to two hours. Otherwise vesical symptoms did not obtain. The bowels moved normally. Numbness in the right limb was less on the morning after the operation. The limb was normally sensitive within another day, and on the fourth day and until three weeks had passed it was hypersensitive to the touch, markedly about the knee joint, on the inner side of the thigh, and the upper half of the outer side of the thigh. The right inguinal region was no longer sensitive to pressure after the ninth day. Great pain in the afflicted side (limb, inguinal region, arm, and occiput) within twenty-four

hours after the operation. It was variably present for four days; then it recurred on sundry occasions in single regions, and was quite absent after two weeks. There was pain in both eyes on the fourth day. The pupils were noted to be equal on the sixteenth day, unequal on the twentieth day, and lastingly equal after the twenty-first day. The patient, who is naturally excitable, was restless following the operation and quite hysterical. Morphine, one quarter grain twice daily, was given two days, then bromide of sodium was substituted. No natural sleep occurred until after two weeks. On the fifth day the patient was able to cross the right limb over the left without the aid of his hands. The right hand had regained its grip within the first four days. On the twenty-seventh day a leather jacket was applied, and the attempt to sit up and walk was first made, and it succeeded. The right limb bore the weight of the body without strain, and the patient sat up ten minutes. On the next day this attempt was repeated. A tingling sensation in the right knee occurred on standing up. On the twenty-ninth day the patient was up most of the day. On the thirtieth day he walked down a flight of stairs, crossed the street to a barber's shop and returned, without assistance or crutches. One week later the patient was presented to the Indianapolis Surgical Society. Since then he has remained well with one exception. Six months after the operation, incidental to financial grievances and complicated with malaria, the patient developed fever and a delirium of one day's duration. This was unattended by any return of the former symptoms, and may hardly be connected with the former disease.

This recalls an attack of hysterical delirium which he developed on the nineteenth day after the operation. He had clandestinely made a half-hearted attempt to walk and failed. This evoked wild grief and fears. I did not know of this venture, and could not construe the cause of the hysteria; neither could Dr. Bell, whom I called in at this time. Patient did not give me this information until some time after his recovery was assured.

The difficulty and risk of an operation on the spine call for a thorough consideration of its indications. Quite a

number of recent writers on this subject, among them authors of standard text-books, condemn all spinal operations without condition. This serves to emphasize the importance of accuracy in diagnosis. Unfortunately, the symptomatology of injury and of disease of the nerve tissues is intricate and variable, and involves great uncertainty in locating the seat and nature of the lesion. It is often quite impossible to discriminate between lesion of the cord following injury, and lesion of its membranous or osseous envelopment. It is often impossible to determine immediately after an accident causing fracture and dislocation of the vertebræ and attended by paraplegia, whether the cord is compressed only, or crushed beyond restitution; much less to make finer distinctions.

The case reported here is illustrative of the difficulty attending diagnostic precision, and affords an uncommonly interesting material for clinical study and practical deduction. I wish briefly only to allude to this here, because belonging more properly to the domain and decision of the neurologist than to the general surgeon. The operation developed the existence of more fractures of bone than previously were diagnosticated. Indeed, before the operation there was little evidence of fracture having occurred. In fact, the right lamina of the second and third lumbar vertebræ, and the spines of the third and fourth, were found to have suffered fracture. This demonstrates the difficulty of recognizing this form of lesion. The heavy muscular coating and the deep seat of the vertebræ serve well to cloud fracture in this locality. No doubt fractures of the vertebræ are a much more frequent accident than commonly accepted, both after force directly and indirectly spent. It is safe to say in a given case, when dislocation, crepitus, undue mobility, etc., are present, that there is a fracture. Hardly may we ever definitely assert in the

absence of such symptoms that there is no fracture of the vertebræ.

By the lesson of this case we may feel justified in suspecting many cases of so-called traumatic hysteria, traumatic neurasthenia, traumatic lumbago, concussion of the spine, spinal irritation or anæmia, hæmorrhagic pachymeningitis, chronic leptomeningitis, to develop their symptoms on the basis of a vertebral fracture, with or without injury of the membranes, and making pressure on the cord. The presence of deformity, ever so slight, must needs suggest the possibility of its causative relation to the spinal disease, and call for the consideration of surgical measures when other means have failed. The history of many cases shows that a deflection and deformity of the spine have been noted—cases that were unyielding to other treatment, and whose symptomatology suggested a similar pathology as in Rubin's case. This condition in individual cases may yield the indication for operative procedure.

Traumatic lumbago, or railway back, seemed a justifiable diagnosis from the pain in the back, increased on motion, and on transmitted shock; the reflex spasm of the spinal muscles, the rigidity of the vertebral column, following the pain; muscular tenderness in the affected region, and from the absence of apparent fracture of the vertebræ.

A unilateral ascending and descending myelitis, and a peripheral neuritis, in the accepted obscure definition of inflammatory conditions of the cord and nerves, as a development consequent or subsequent to injury, might have been accepted to exist here. Much contained in the current literature under the head of traumatic nervous diseases may be construed to be similar in origin with this case.

Modern pathological researches have clearly settled and defined the separate nature of traumatic insult and inflam-

matory agent. Barring self-infection, which is rare and ordinarily pertains only to individuals of a weakened and diseased constitution, compression or injury of the cord is not followed by inflammatory action. The writings and laborious investigation of Page, Watson, and others have done much to explode the notion, long held and yet not fully abandoned, that nervous tissue marked an exception to the rule by inflaming after injury, irrespective of infection. Compression myelitis is a term still in honor, yet in conflict with rational nomenclature and pathology. Knapp makes a just accusation when he says: "Among the sources of confusion in regard to traumatic nervous affections we must certainly recognize the mistakes in nomenclature, etc."

It is reasonable to say, looking back on the case under consideration, that from *a priori* reasoning, as well as from the immediate and complete resumption of functional activity, there had existed in this case no inflammatory disease, no myelitis, nor peripheral neuritis.

This brings up the consideration of what was the pathology? It is certain a compression of the cauda existed. Did this give rise to an ascending and descending degeneration, or to neurasthenia along certain courses? Was it owing to an irritation, transmitted upward, downward, or toward the periphery? Was it an atrophy, or a functional disturbance by defective transmission, or reflex excitation? However the answer may read, it is interesting and important to note that four years and a half had passed from the time of the injury to the date of the operation. It appears from this that an inference on the remediable character of the affliction can not be drawn from the duration of the disease. The ilio-inguinal neuralgia can have meant no neuritis, though clinically it might have been accepted to exist. (Knapp.)

The insidious nature and the slow development of the symptoms are commonly indicative of the spinal cord being exempt. Excepting where acute paraplegia, local paralysis, and anæsthesia exist, the cord may be regarded non-injured.

Whether this case tended to death may be questioned, but this seemed probable. The point bears interestingly on the question whether so-called traumatic neurosis can produce death.

The case is interesting by the presence of obstinate cerebral symptoms, which yielded more or less immediately after the operation. They might have been judged to be an independent cerebral affection. They probably were reflexes. It is of interest, by comparison, to quote Starr, in the *American Journal of the Medical Sciences*, July, 1892, who, speaking on the diagnosis of lesions of the cord, says: "In spinal affections we always have the face as a convenient surface with which to make comparisons; and in diseases of the lower region of the cord, to which attention is directed in this paper, we have the arms and trunk as a standard of normal feeling."

The absence of vesical and rectal symptoms indicated that the lower sacral region was free of disease (Starr). The sacral nerves showed increased excitability, expressed in pain, sphincter spasm (constipation), bleeding from the rectum, muscular rigidity, pain (coccygodynia), and increased sexual appetite. The hæmorrhages, in the absence of rectal disease, were owing, probably, to vaso-motor reflexes. The motor and sensory disturbances pointed to the upper lumbar regions being the seat of the trouble (Starr).

Knapp (*American Journal of the Medical Sciences*, December, 1892), in an article entitled Traumatic Nervous Affections, reviews this subject in the light of ninety cases observed by him. I quote from him: "The chief complaint is of weakness and stiffness in the legs and of pain

in the back, the latter being often due to traumatic lumbago. The knee-jerks are somewhat exaggerated and sometimes there is ankle clonus. One or both legs may show some muscular atrophy, usually without electrical changes. There is often some pain in the legs and various perversions of sensibility, but anæsthesia is rare. Disturbances of micturition are not often uncommon; the demand is often imperative, and if it be not immediately gratified there may be a little incontinence; sometimes, too, it is hard to start the stream, or it stops before the bladder is fully emptied. Constipation is common, and sometimes the anal sphincter in moments of imperative need yields involuntarily. In these cases the clinical picture resembles somewhat that of spastic paralysis, and autopsies and experiments on animals have shown the most marked changes in the lateral columns. Cerebral symptoms are absent and everything points to a spinal origin."

Knapp reports four such cases, and says while some writers deny the possibility of such cases, he will critically examine their arguments by a more elaborate study of such cases. Rubin's case is interesting in affording a remarkably similar symptomatology, and by the results of the operations justifies conclusions quite opposite to those drawn by Knapp. The symptoms do suggest spinal-cord lesion, and still it did not exist.

The possibility of its purely hysterical nature, psychical origin, should be considered yet. The French school will probably at once decide it to be such. This seems hardly justifiable after finding positive evidence of spinal compression. Then, too, the previous plans of treatment (stretching the sphincter under chloroform, plaster-of-Paris jacket, blistering, etc.) were undertaken with expressed confidence of a cure, and were designed to take psychical effect more than the slim hopes held out to the patient by an operation. He

was informed that this might kill or fail of all results, even leaving him worse than before. Even after the symptoms had yielded in great part, but before the patient was allowed to get up, he was told that possibly on the resumption of the upright position all the former troubles would return, and, in consequence of the changes in the parts by the operation, greater weakness and worse symptoms might ap pear. This was done to avert the otherwise crushing despondency after a failure.

To sum up, the lessons of this case would seem to be—

1. To emphasize the obscurity of spinal disease.

2. The uncertainty of ascertaining the nature and regional extent of the lesion.

3. The impossibility of determining beforehand the degree of destruction and its relation to the power of regeneration.

4. The possibility of compression so closely resembling other lesions as to represent them all.

5. The uncertainty of diagnosis where it is coupled with failure of therapeutical effort otherwise should call for the earnest consideration of an operative venture.

6. The position during operation afforded advantages that may induce further adoption of it.

The recovery from the spinal and cerebral symptoms in Rubin's case was and remains complete at this writing, thirteen months after operation. A stiffness of the lumbar region is present, and it is owing to an ankylosis resulting from the operation and prolonged splinting. It can only be conducive to support and protect weakened parts. It disables the patient as regards lifting anything heavy when his body is bent forward. The jacket was worn two months after the operation and then dispensed with entirely.

Case II.—W. R. McG., American, fireman, aged forty years. In March, 1890, the patient stood on a burning roof, which

suddenly gave way at a height of about thirty feet. He was found standing up, stunned and dazed. He showed great excitement, and, on being taken home, grew hysterical. He was inordinately joyous; claimed to suffer no injury or pain. He reported for duty the next day. Soon it was observed that his memory failed him and that his speech often was incoherent. His limbs twitched, and on getting up he would stagger a little before he could walk. He complained of backache and rheumatic pains in his limbs; was irritable, in contrast to his former calmness and cheerfulness of manner. His speech was muffled and by an effort varying in degree. These symptoms were noted by his fellows in the fire department, who tolerated his condition and assumed his duties to enable him, nominally, to be enlisted for duty. Constipation existed before the accident, but was greater after it. He sobbed and cried in his sleep. He scratched his head sore back of the right ear and picked his nose much. He was stupid a great deal of the time; would sit musing and laugh to himself. While walking at times his right knee would yield under him; every time he got wet there would follow pain and weakness in the right limb. In walking, the patient hung forward and to the left. He was cheerful about his condition, thought little about it, and always expressed himself confident that he would get well again. In July, 1891, the patient was knocked over by a hose, and fell with his back on a projecting board. Since then he complained much more of backache, and his limbs pained him, especially the left. Rubbing them would temporarily relieve this pain. He felt much better when sitting down, and was much relieved in the morning after a night's rest. He was off duty since the last accident. In February, 1892, the patient was suddenly seized with a profound stupor. He was dazed, could not talk, nor would he answer to questions. He had great pain in the head and body, and was restless and sleepless. The next day his gait was staggering and his speech more difficult and unintelligible. Two more such attacks occurred within six months. Of late the patient is less excitable. His appetite is always good, digestion perfect. Sexual desire lessened gradually until lately, when impotency prevailed. I saw the patient Novem-

ber 3, 1892, two years and a half after the first accident. The right limb bears the weight of the body unsteadily. The right thigh measures nineteen inches and three quarters, the left thigh twenty inches and a half. The right limb is not full on the inner side like the left. The knee reflexes are diminished, more on the right side. There is no disturbance of sensation to touch, prick of pin, to heat or cold. A blunted sensation only exists in the upper and back part of the right thigh and part of the leg. In standing, the patient always favors the right limb, and in walking he leans and shifts to the left side. In the right limb the extensors and adductors show weakness. There is difficulty in passing urine now and then, more so of late. The right hand is less strong than the left. The spine is sensitive to pressure at the lower lumbar vertebræ; the spine of the fourth is deflected three eighths of an inch to the right side. The dorsal spines are tender and deflected to one side. The right pupil is dilated and stationary; this condition is ascribed to an injury to the eye many years ago, since when it is unchanged.

I saw the patient again December 4, 1892. The day before he had had three attacks of sudden weakness. In the last attack he was shaving himself, when a cramp of the right arm and hand occurred. He turned around to tell of this, when he sank down in his knees. Consciousness was retained. The speech was limited to saying Yes and No indistinctly, though he evidently cared to say else. The right limb is perceptibly weaker than before; the right arm is cramped, especially in the little and ring fingers, which, too, are painful. Two doses of bromide of sodium, fifteen grains each, relieved the paralysis of the arm and the speech only. Stupor, or daze, continued worse than before.

The history and the symptoms in this case hardly justified a definite diagnosis. The symptoms probably were of both spinal and cerebral origin. The occurrence of a second accident complicated the interpretation of this case very much. It could not be ascertained whether the deflection in the lumbar spine existed consequent to the first accident. If this had preexisted to the second accident, it would have been right to as-

sume that the symptoms, at least in part, were owing to an injury of this region. From the history as given, the symptoms had increased since the second fall; a clear description could not be given of the chronological succession of events. The case was perplexing in its reading; it was growing steadily worse. The experience in the previous case, recalling great similarity in the nature of the accident, the circumstances attending it, and the symptomatology, naturally suggested the consideration of an operative recourse. An operation afforded no valid promise. The case every way seemed worse and more obscure than Case I. Medical treatment, electricity, stiff jacket, and extension, all had been tried without benefit. The patient had been under the treatment of Dr. William B. Fletcher, who regarded the affection of spinal origin.

The case in its obscurity and prognostic gloom, even by an operation, was fully presented to the family. Operation was not advised, though offered, if requested. The case was under advisement three months, when operation was called for.

Operation at my sanitarium on December 20, 1892. Dr. W. J. Browning gave chloroform; Dr. Bell and Dr. Reyer assisted. The position and procedure as in the former case. The spine of the fourth lumbar vertebra was found fractured and united by ligamentous union; its right lamina was thickened and bulging. The laminæ on both sides of the fourth and fifth lumbar vertebræ were removed. Slight dural adhesions were found. The dura was opened and nothing indicative of caudal disease was found.

The patient bore chloroform well, and no vomiting followed. The temperature after the operation was 98°; pulse, 94. Feeding was well borne. He answered to questions and described his complaints. He was altogether more restful than the former patient at this stage. At 7 P. M. of the second day hiccough developed, and pain in the interior half of the thighs. At midnight the patient grew restless. He wanted to get up, and was restrained with difficulty. Morphine, one fourth grain, was given at two o'clock, and thirty grains of bromide of sodium half an hour later, with the effect to quiet him. The patient perspired freely and his pulse ran up to 140.

At six o'clock that morning the temperature was 100·2°, pulse, 104. At 11.45 A. M. the patient suddenly stopped breathing for about two minutes (nurse's statement), and limbs twitched, more on the right side. When I saw him shortly afterward his temperature was 101°; pulse, 124; respiration, 30. He was in a stupor from which he could not be roused. The face was drawn to the left. Temperature steadily fell, pulse increased, the respiration increased in frequency and became stertorous. Death occurred at 7 P. M., fifty-five hours after the operation. The wound had been dressed twice, was sweet and free of suppuration, swelling, or redness; there was less sero sanguinolent discharge than in the former case.

A post-mortem examination had to be limited to the seat of the operation and developed the parts free of redness, swelling, or pus. The parts were agglutinated, except where the drainage-tubes interfered. The dura and cauda were free of congestion.

It must be regretted that the post-mortem examination did not cover more ground; by the light of it alone might this case have a clear reading. It is likely that diseased conditions higher up on the spine were at fault; and cerebral complications may be accepted to have existed. The final scene must probably be connected with a lesion, an apoplectic seizure, located in the medulla oblongata, and was like in kind to the attacks he had previously suffered. The operation can hardly be accused of more than an exciting cause, added to an explosive condition pre-existing.

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