

cut, see how instantaneously the spinal column is rendered almost straight; I instantly turn the knife upon its side, withdraw it, and close the wound with my thumb, having pressed out a few drops of blood. I now dress the wound with adhesive plaster and a firmly-adjusted roller.

The patient states that the operation has given him but trifling pain, and that he feels very comfortable.

You all must observe the wonderful change in his form. The spinal column has become almost straight, the only distortion existing being at the angles of the ribs upon the right side, and this has existed so long that it may possibly be permanent.

We can now take the man down from the sling, and, as he lies

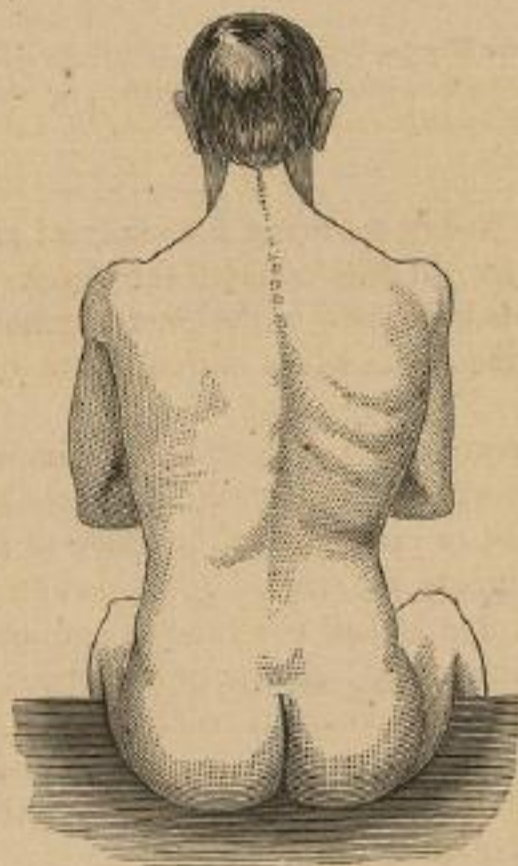


FIG. 235.

upon the table, he expresses himself as being free from pain. He will be put to bed, with a broad band passed around the upper portion of the trunk, secured by an India-rubber strap to a fixture upon one side of the bed, and a similar band around the pelvis, secured in a similar way to the opposite side of the bed. Between

these two elastic forces the body will be retained in the straight position, and we will show you the result at our next clinic.

By reference to Fig. 235, engraved from a photograph taken twelve days after the operation, can be seen the present condition of the patient while sitting unsupported on the side of his cot.

## LECTURE XXVII.

## ANCHYLOSIS.

Derivation and Use of the Word.—True and False Anchylosis.—Position of Limb when Anchylosis becomes a Necessity.—Mode of determining which Form of Anchylosis is present.—*Brisement forcé*.—Mode of dressing the Limb after the Operation.—Cases.

GENTLEMEN: To-day we begin the study of anchylosis.

Anchylosis is a word derived from the Greek (*ἀγκύλος*, *crooked* or *hooked*), and has been used to designate immobility of a joint, because most of the joints when stiffened are deformed in this crooked manner.

Although the true pathology is stiffness, immobility, or consolidation, no matter whether in a straight or crooked position, yet the term anchylosis, or crookedness, has been so long used by the profession to designate the pathological condition of which we are now speaking, that I shall continue to employ it.

Anchylosis is either true, osseous, or complete; or false, fibrous, or incomplete. True or complete anchylosis signifies the fixed and absolutely motionless state of a joint. False, fibrous, or incomplete anchylosis denotes a limited motion in the joint, no matter how slight that motion may be.

Anchylosis is more common in the ginglymoid articulations than in others, but may occur in every description of joint. In general, only one joint is anchylosed in the same individual; but I have seen one case, in a gentleman under thirty years of age, from Providence, Rhode Island, in which both hips, one knee, and both ankles, were apparently completely anchylosed, as the result of rheumatic inflammation. I have seen one other case, in a young

lad of fifteen, from Kentucky, who had disease of his right hip-joint, and, for the purpose of procuring rest of that joint, was put by his attending surgeon into a fixed apparatus, embracing the trunk, pelvis, and both lower extremities, and so retained for several months. At the end of this time, the diseased hip was cured by ankylosis, and the knee and ankle of the diseased limb, as well as the hip, knee, and ankle of the opposite one, were completely ankylosed, and still remain in the same condition.

In this case there had been no inflammatory action in any of the joints, except the right hip, and he had never complained of or suffered pain in any of them. This case is of great importance, showing as it does that ankylosis can take place even in a young person, in a perfectly healthy joint, by long-continued rest.

In old age, ankylosis, in certain parts of the skeleton, is a natural change; and in this period of life it is common to find the heads of the ribs ankylosed to the bodies of the vertebrae, or the tubercles to the transverse processes, the vertebrae to one another, the ensiform cartilage to the sternum, etc.

Ankylosis is not a disease of itself, but may be the result of any disease, affection, or injury, which interferes with the normal functions and motions of a joint.

Ankylosis may be the most favorable termination that can occur in many diseases and accidents of the joints. In such cases it is of the most vital importance that the surgeon should select the most favorable position for the future usefulness of the limb thus involved. As, for instance, the elbow is more useful when ankylosed at a right angle than if made straight, whereas the knee would be entirely useless if ankylosed in the same manner; its future usefulness and security being better obtained by having it ankylosed perfectly straight, or as nearly so as may be.

It has been customary among surgeons, when ankylosis was the best result that could be obtained in any given case, to secure it with the leg flexed upon the thigh at an angle of  $30^{\circ}$  to  $45^{\circ}$ . From this I dissent, and recommend that you should secure ankylosis at the knee-joint with the limb in a *straight* position.

My reason for preferring this position is this: it gives a more secure position and one that is not liable to give the patient trouble at some future date.

If left to ankylose at an angle, the ankylosis is very insecure, and sometimes, as the man steps down an unexpected distance

or slips, bringing his weight suddenly to bear upon the limb bent at this angle, it may yield sufficiently to give him very serious trouble.

It was only yesterday, as I was riding down Broadway, that I saw a gentleman about fifty years of age who, in getting out of an omnibus, just opposite the Metropolitan Hotel, slipped, and fractured his ankylosed knee that had been in a condition, as he supposed, of firm bony ankylosis for eleven years, and had never given him any trouble whatever.

He had been able to walk and stand upon it with perfect ease and apparent security, but, by this accidental slip, an additional weight was thrown upon the joint ankylosed at a slight angle, and the attachments were fractured, and the man rendered helpless. I have known of quite a number of similar instances.

If, on the contrary, the bones are placed in the straight position as nearly as may be, the large, articulating surfaces of the tibia and condyles of the femur give such an immense expanse for attachments to be formed as to render that portion of the limb even more secure against fracture than any other part of it.

When the accident happened to the man in Broadway, it became necessary to carry him some distance before he reached his home, where he could receive surgical attention, thereby endangering an attack of inflammation in a tissue which had formerly been the seat of disease. In other words, he had had his ankylosis broken up, but was in a situation that prevented that immediate treatment which I regard as so important; whereas, when the fracture is made intentionally, treatment is immediately begun, by securing rest, position, pressure, *extension*, control of circulation, all of which are essential to prevent inflammation after forcible rupture.

The man away from home, who accidentally breaks his ankylosed joint, cannot have these advantages, and hence the danger of leaving the knee to ankylose in such a position as will render the patient liable to such accidents.

The straight position has been objected to, upon the ground that it places the patient in a very awkward and inconvenient attitude when sitting. That may be true, but I regard a secure position which will, perhaps, prevent any accident, as being preferable to insecurity, although it be accompanied with a greater degree of comeliness.

It is owing to the neglect of observing this principle of placing a limb in its most favorable position for future usefulness, while consolidation is taking place, that subsequent surgical interference is necessary.

In chronic or long-continued inflammation of any joint, reflex irritation, producing muscular contractions, invariably takes place.

This contraction not only aggravates the disease by causing undue pressure on the parts inflamed, but also distorts the limb in accordance with the action of the most powerful muscles involved, and the distortion can only be prevented by the proper application of an extending and counter-extending force during the treatment of the disease. When this principle has been neglected, the patients frequently recover with such seriously distorted and useless limbs as to render surgical interference necessary.

In such cases it is of the utmost importance to ascertain whether the ankylosis be complete or incomplete, as the plan of treatment in each particular case depends entirely upon the accuracy of this diagnosis. If fibrous, or incomplete, it can be broken up by manual or mechanical force, aided by subcutaneous tenotomy, myotomy, and the section of such fasciæ, fibrous bands, and other adhesions, as have prevented its mobility; whereas, if the ankylosis be true, or bony, the deformity can only be relieved by section of the bone itself with the saw or other instrument. In many cases of simply fibrous or incomplete ankylosis, the adhesions are so firm and so short as to allow of no perceptible motion, even under a very careful inspection. In such cases, if any motion whatever has been made, although so slight as not to be observed at the time, the parts which have been subjected to the violence necessary for the examination will on the following day give evidence, by pain, tenderness, and inflammation, that some motion must have been given to the parts involved. In one case of ankylosis of both hips, with very great distortion, by complete flexion and adduction, in a young girl of nineteen, from long-continued suppuration of both hip-joints, the ankylosis was so complete that, in consultation with all the surgeons at Bellevue Hospital, we all decided that it was a case of osseous fusion, and could only be relieved by section of the bone.

On the following day, when I went to perform the operation, there was so much tenderness about the parts, that I was satisfied some motion had been given to the articulation, although so slight

that none of us had been able to detect it at the time of the examination. I therefore determined to break up the adhesions, instead of sawing out a portion of the bone. The adductors tensor vaginæ femoris, and fascia lata, of both sides were subcutaneously divided, the wounds carefully closed and covered by long strips of adhesive plaster and compresses. A figure-of-8 roller was then carefully applied around each hip, after which the adhesions were forcibly but very freely broken up, and the limbs brought as nearly as possible to their natural position, and retained there, by extension and abduction, by weights and pulleys, which were secured to the limbs, in the usual way, by adhesive plaster and roller. The patient was kept perfectly quiet, the parts kept cool with ice-bags, and at the proper time passive motion was made. The result in this case was perfectly satisfactory, the patient recovering, with good motion of both joints. She has married since, and was delivered, by the late Dr. George T. Elliot, of a living child, who is now a robust boy, of five years of age. Previous to the operation, this woman could only walk upon her hands and feet, the limbs being closely flexed and adducted, and the ankylosis so complete, as before stated, that all who examined her thought it to be osseous. She is now in perfect health, and performs all her household duties without the aid of a servant.

Having made our diagnosis that the ankylosis is fibrous, and not osseous, how shall it be broken up? In former times gradual extension, with steaming and friction, was considered all that was necessary, but the length of time demanded and the great pain induced by this method of treatment, frequently prevented the patient and surgeon from carrying it to the completion of securing perfect motion. The slow and gradual stretching of tissues, long contracted, produces reflex contractions in many instances to such a degree as to compel the treatment to be abandoned, and patients prefer to remain with their limbs in the distorted condition rather than undergo the constant pain of continued extension.

In all such cases, it is infinitely better to proceed to the immediate restoration of the joint to its normal position, with entire freedom and mobility, by manual force under the influence of an anæsthetic combined with tenotomy or myotomy of subcutaneous section of the fascia, if necessary, than to resort to the slow process of gradual extension.

In all such cases, however, it is of the utmost importance that manual force should not be resorted to for breaking up fibrous ankylosis, until all traces of joint-disease have subsided. Then we may resort to *brisement forcé*, and not until then.

How are we to decide whether tenotomy, myotomy, or the section of fascia is requisite? Put the parts upon extreme tension, and, while thus stretched, if point pressure by the finger or thumb, made on the fascia or tendon thus stretched, produces reflex contractions, then that fascia, tendon, or tissue, must be subcutaneously divided or else forcibly ruptured before the limb can be restored to its normal position. If the tissues thus contracted can be reached with the knife without the danger of involving large blood-vessels or nerves, section by the knife is better than forcible rupture. If it is necessary to make this subcutaneous section, it is better to do it three or four days previous to the breaking up of the joint, so that the external wound made by the tenotome may have healed before the latter operation is performed. This tenotomy may be performed under the influence of an anæsthetic, or not, as the surgeon chooses; but when the *brisement* proper is performed an anæsthetic is absolutely essential. In fact, it is due to anæsthesia that *brisement forcé* has gained its reputation, and to it it chiefly owes its success.

The patient being thoroughly anæsthetized, the limb is seized by the hands of assistants, holding it with firmness, between the joint involved and the trunk, while the surgeon takes the farther extremity of the limb and forcibly flexes it upon itself, which is frequently attended with sharp snaps and cracks that are sometimes quite audible and that are very distinctly *felt* by the surgeon's hand while making the rupture. Having flexed it sufficiently to begin to allow of moderate movements, he then reverses the movement, and forcibly extends it; and in this way, by forcible flexion and extension, continues until he has gained perfect and free motion of the joint involved in all its normal movements. If the knee is the joint involved, care must be first taken to fracture off the patella from its attachments to the femur, which is sometimes the most difficult part of the operation to be performed. In many instances the surgeon can aid himself by covering the handle of the key with buckskin, and by its use give himself a firmer leverage against the edge of the patella than he can get with his naked thumb. Having thus obtained perfect exten-

sion, and flexion, in fact, the complete movements of whatever joint involved, these movements are repeated with great freedom and with great frequency until all the adhesions are thoroughly and completely broken up.

One of the commonest causes of failure in the treatment of *fibrous ankylosis* by *brisement forcé* is, that the surgeon, succeeding in getting a moderate motion, and becoming alarmed at the audible fractures that occur, contents himself with that slight motion for the present operation, intending to complete the cure by subsequent operations, and thus, by making frequent attempts to increase these slight movements, sets up a new inflammation in the parts involved, preventing any further interference, and frequently resulting in a more firm consolidation of the joint than before; whereas, by breaking up the adhesions thoroughly and completely at the time of operation, and then by proper dressings of the parts and the prevention of inflammation, he may confidently expect that he will have a much more satisfactory result.

How are these dressings to be applied? and how is this inflammation to be prevented? This I look upon as the most important part in the treatment of an ankylosed joint. For many years past I have always adopted the following plan: If, for instance, it be the knee which I have broken up for *angular fibrous ankylosis*, I first strap the toes with strips of adhesive plaster if it be a small subject, or, if an adult with long toes, pad the toes with cotton and bind with bandage, carrying the roller over the foot strongly and firmly, padding the malleoli and tendo-Achillis with cotton; the roller is carried snugly over them; two strips of adhesive plaster having been placed on either side of the leg for extension, the roller is passed over them, leaving the lower extremities of the adhesive plaster exposed for the future attachment of weight and pulley, and is carried up as far as the top of the tibia. The popliteal space is then padded and firmly strapped with strips of adhesive plaster, each one shingling over the other until the entire knee is covered. The roller is then continued over the knee smoothly and very firmly until you come to the junction of the middle and lower third of the femur, when a piece of sponge an inch or two in length, or about the size of your thumb, first being wet in cold water, is placed over the track of the femoral artery, and the roller carried on over this sponge for the purpose of making partial compression of this artery, so as to diminish its

calibre and thus prevent the full supply of blood to the parts below. Great caution is necessary, in the application of this pressure upon the artery, not to obstruct the circulation so as to produce gangrene; we must here *use* pressure without *abusing* it.

This piece of sponge should be kept soft and elastic by wetting it occasionally with cold water through the bandages. If permitted to get dry, it will be like a hard foreign body, and the pressure made upon it will be much more liable to cause sloughing.

The limb is then secured in an absolutely immovable position, either by a wooden splint well padded placed behind the leg, gutta-percha, sole-leather, plaster of Paris, iron bars on either side of it, or in any way that the surgeon may deem best for the purpose of preventing the slightest possible movement. The patient is then placed in bed, the lower extremity of which is raised ten or twelve inches higher than the head of the bed, so that the body may act as a counter-extending force, and the weight and pulley applied over the foot of the bed to the strips of adhesive plaster at the ankle-joint before described. Ice-bags are then placed around the knee, and such constitutional treatment in the way of narcotics, cathartics, etc., as may be required is judiciously used. At the end of six or seven days the dressings are removed, the sponge taken from over the femoral artery, the adhesive straps cut from over the knee, and the parts carefully examined, and a very slight movement given to the joint for the purpose of preventing solidification, when the dressings are reapplied with the sponge left off from over the femoral artery. At this dressing the surgeon will often be surprised to find ecchymosis to some extent, both above and below the joint, from extravasated blood caused by the rupture of vessels at the time of the operation; but, by following the plan that I have here laid down, I have never seen a case that went on to suppuration since I have adopted this method of treatment, now numbering nearly one hundred cases. The extension is still continued and the elevated position of the limb is preserved for some days, until all danger of inflammation is past; the surgeon exercising his judgment whether the application of ice is still to be kept up or not. At the end of a few days the dressings are again removed, and more free motion is given to the part. It may be necessary at the time of making this movement, and the three or four subsequent movements, to

administer an anæsthetic; these movements should be made quite free when an anæsthetic is used, the surgeon being careful not to carry them to the point of exciting new inflammation. After some days the passive movements can be made daily, accompanied with friction, and shampooing should be very liberally done. These movements may be increased in frequency as the case advances, until finally an instrument can be so adjusted to the limb that the patient can cause the movements many times in the day without the attendance of his physician. (See Fig. 236.) So soon

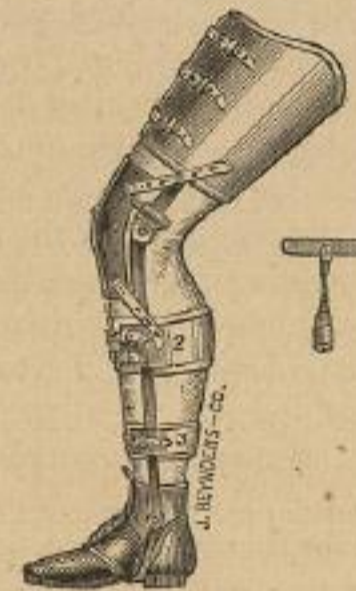


FIG. 236.

as the parts can be pressed together by bearing the weight of the body upon the foot without tenderness, the extension can be omitted, and the movements daily increased.

These are the general principles which should guide you in the management of all cases of fibrous ankylosis, whether occurring at the hip, knee, elbow, or other joints.

When the hip-joint is operated upon by *brisement forcé*, I usually secure the patient at once in the wire cuirass. The wire cuirass is also an exceedingly convenient instrument to be used when the knee-joint has been broken up, especially in children.

The circulation of the hip can be controlled by placing a bag of shot over the external iliac artery.

When the elbow and wrist joints are operated upon, the sponge is placed over the brachial artery for partial compression and control of the circulation, the same as already described when

speaking of the femoral artery in reference to the prevention of inflammation of the knee. After the roller-bandage and arterial compression have been properly applied, the joints are to be secured against the possibility of the *slightest motion* for a few days. After all danger of producing inflammation has passed, then the same general principles laid down to you in the treatment of ankylosis of the knee-joint are to govern you, such as friction, shampooing, passive motion, etc., being careful never to carry your treatment to the extent of reëxciting inflammation.

By the plan of treatment here given I have never had a single case of constitutional fever or suppuration following *brisement forcé* of any of the joints; and, as before stated, I have performed the operation, including the different joints, more than one hundred times. I therefore feel that I cannot urge upon you too strongly the necessity of carrying out all the details of the after-treatment I have laid down, for I have seen a number of cases in which *brisement forcé* has been performed by competent surgeons, but they neglected to apply extension, and the result was that reflex muscular contraction followed, which prevented a successful termination of the operation; or, they allowed a little time to elapse after the operation before the dressings were applied, and a reaction came on which prevented their application, and disastrous inflammation followed. I regard *every* detail of the plan of treatment as essential, and cannot urge you too strongly to observe them all.

CASE. *Ankylosis of Knee; Brisement Forcé; Result perfect; from Bellevue Hospital Records.*—R. D. S., June 29, 1869, aged twenty-two; Kentucky. On the 11th of December last, patient accidentally shot himself with a Colt's revolver, the ball entering the right thigh, on its anterior aspect, midway between the groin and the knee.

"It lodged in the tissues, on the outer side of the patella. The next day the ball was removed. Patient says that his knee then began to inflame, getting swollen, red, and painful.

"There was much discharge through the opening made by removing the ball, and patient was confined to his bed for two months.

"During this time his knee became ankylosed, almost in a straight line.

"On admission to hospital, the right thigh and leg were smaller

than left, the following measurements being taken: Right thigh, fifteen and three-eighths inches in circumference; left thigh, seventeen and one-eighth inches in circumference; right leg and calf, ten and a half inches in circumference; left leg and calf, twelve and a quarter inches in circumference.

"There is barely any motion of the joint. The patella is slightly movable.

"Patient's general condition good. He gives no history of hereditary disease; the limb gives him no pain.

"June 30th.—To-day the patient was etherized, and Dr. Sayre broke up the adhesions with little trouble, so that the leg could be completely extended, and flexed at an acute angle upon the thigh. The toes were strapped, the foot and leg bandaged, a large sponge strapped into the popliteal space, and another placed over the femoral artery, so as to compress it moderately. A long splint of leather was then adapted to the back of the thigh and leg, and bandaged firmly. 7 P. M.—Patient doing well; has some pain; ordered liq. morphiae sulph. (U. S. P.), ʒ iij.

"July 1st.—Slept well last night, and has no pain in knee. 7 P. M.—Foot rebandaged.

"6th.—Since last note patient has been doing well. To-day Dr. Sayre took off the splint and bandage, and made passive motion, which was very painful. Patient was then anæsthetized, free passive motion made, and dressing reapplied.

"7th.—Joint was moved again.

"9th.—Splint removed to-day. Patient out of bed.

"14th.—Joint moved to-day under chloroform. From this time the motions were made more frequently, and an instrument adjusted, so that the patient could flex and extend the limb at his pleasure. He was advised to do this frequently every day. The result was, that he recovered with perfect motion in less than three months."

CASE. *Necrosis of Lower End of Femur, complicated with Fibrous Ankylosis of Knee-Joint; Brisement Forcé; Recovery with Motion.*—G. W. O., of Bloomingdale, aged twenty-four years; fell, when he was ten years old, from a height of ten feet, striking upon his right limb, followed by a periostitis of the lower end of the femur, ending in necrosis of femur and ankylosis of the knee-joint. When he was fifteen years of age (after

<sup>1</sup> I saw Mr. S. in January last, and his limb was as perfect as the other.

a lapse of five years), one of the sinuses on the outer portion of the thigh was dilated, and a piece of bone two and a half inches in length, and about two-thirds of the circumference of the femur, was removed. A sinus existed at the same time on the inner aspect of the thigh connecting with the external one. A perforated India-rubber tube was passed through its track and worn for some time, until all dead bone had come away. His leg at that time was flexed at an acute angle with the knee.

The wounds of the thigh healed after a few months, when, under the influence of chloroform, by *brisement forcé*, his limb was made perfectly straight, dressed in my usual way with a partial compress over the femoral artery, binding the knee, retaining splint, extension by weight and pulley, ice-bags to the knee-joint. No constitutional or other irritation followed the operation. At the end of seven days the dressings were removed. Considerable ecchymosis appeared around the neighborhood of the knee from the rupture of blood-vessels at the time of the operation, but no excessive heat or other evidence of inflammatory action. The limb was very slightly moved and again redressed as before, with the exception of the sponge compress upon the femoral artery. In two days it was again redressed and more free movements given it.

From this time on, the dressings and motions were made daily for about a fortnight, when the passive movements were advised to be made several times within the twenty-four hours. These movements were constantly increased, until, at the end of three months, the cure was perfect and complete, with the entire mobility of the joint, complete extension and perfect flexion, as is now seen in the case before you. (See Figs. 237 and 238, showing flexion and extension; the depressions on either side of the limb are the cicatrices whence the bone was removed.)

CASE. *Fibrous Anchylosis of Knee; Brisement Forcé; Recovery with Motion.*—Joseph S., aged seven years, was brought to me October 30, 1873. The following scanty history of the case was all that could be elicited:

When two years old he had rheumatism. The joint chiefly affected was the left knee. The father says, "His physician called it '*bony anchylosis*' and '*white swelling*.'" It was treated with iodine externally; no extension. The limb was always crooked, but he could walk upon it until the summer of 1872,

since which time the present distortion has existed. There is fibrous anchylosis of the knee. The tibia is luxated backward.

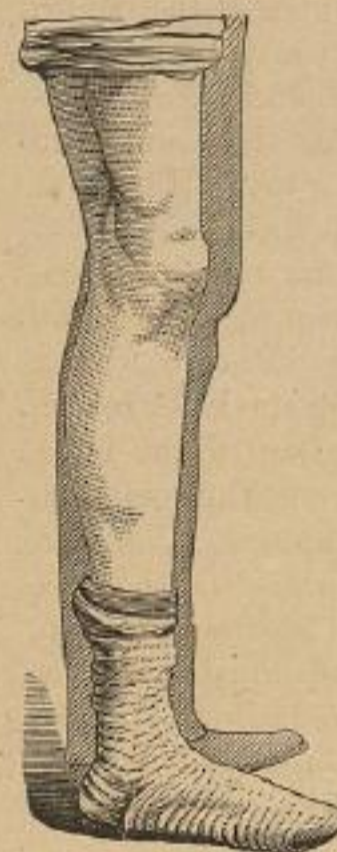


FIG. 237.



FIG. 238.

There is very slight motion of the joint; the patella is probably movable. (See Fig. 239, from photograph.)

December 6, 1873.—At the college clinic I divided the hamstring tendons of the left limb subcutaneously without loss of blood. The patella was then forcibly separated from the end of the femur, and the limb drawn down to the position of complete extension, and retained by a weight-and-pulley dressing. The limb was dressed in my usual manner, viz.: the instep and ankle were well padded with cotton, the roller neatly applied over this and up the leg. The popliteal space is protected by a large soft sponge. The inequalities of the knee being carefully padded, strips of strong adhesive plaster are snugly drawn over the sponge and pad, and the whole covered by carrying the roller up over the knee and lower part of the thigh. A small piece of sponge is then placed over the course of the femoral artery, above the junction of the middle and upper third of the thigh, and the roller carried farther up and completed by a spica. The

boy was taken directly to lodgings, put to bed, and a dose of morphia given him.

11th.—Dressing removed and reapplied. Most excellent condition in every way.

20th.—Came to clinic with extension-brace, which was applied yesterday. Motion good; passive motion ordered. Returned to his home in Yorkville.

January 12, 1874.—Has for a week past complained of pain, particularly for the past three days. Compression in axis of limb gives pain. Extension gives relief. Knee-extension instrument ordered.

April 1st.—Boy walked into my office without crutches. Instrument readjusted. Suffers none from knee, but has symptoms of "chills and fever." Lives near the "Vanderbilt improvement,"<sup>1</sup> Ninetieth Street. Ordered quinine and iron.



FIG. 239.



FIG. 240.

June 1st.—General condition good; still tender over lower insertions of lateral ligaments. Instrument readjusted.

<sup>1</sup> The "Vanderbilt improvement" has reference to the sinking of the Fourth Avenue Railroad.

23d.—Boy doing well. Instrument not removed, but bandage reapplied.

August 1st.—Instrument removed; walks well, with good motion, about one-third normal freedom. (See Fig. 240.)

CASE. *Fibrous Anchylosis; Knee sub-luxated; Brisement; Recovery with Motion; Death from Typhoid Fever Three Months after the Operation.*—William M., aged nine years, from Auburn, New York, came to me November 5, 1868, and gave the following history: About June, 1864, the father noticed that the lad began to drag his left foot. He complained of no pain, and appeared to have nearly perfect power over the limb. Five or six months later the knee began to swell, and appeared to be "filled with water." This condition continued for about two years. Gradually the swelling disappeared. He was treated at intervals during the continuance of the trouble by various physicians. About two years since, the child was ordered to go upon crutches, no attention being paid to the contraction. The limb was then nearly straight, but since that time the contraction has gradually increased. For the last eighteen months the limb has been nearly as "tough and sound" as the healthy one, saving the contraction.

The position of the limb is as follows: The leg is sub-luxated backward and outward slightly. There is slight motion at this new joint. The patella is apparently adherent by bone.

6th.—Drs. Hamilton and Krackowizer saw the patient with me. While examining the patella, Dr. Hamilton thought he detected motion. This was rendered certain by the following-manceuvre: Dr. Hamilton placed his finger upon the groove between the patella and external condyle, so that the sharp edges of the two bones could be at the same time felt. I then made firm pressure upon the inner edge of the patella, and the two edges of bone before mentioned were felt to approximate, the patella slightly overriding the condyle. The opinion of the consultation was, that an attempt should be made to restore the normal position of the limb; that, under anaesthesia, as much as possible should be done, and the limb retained in the position gained, by a splint, or by extension, according as might be best in practice.

9th.—The boy was chloroformed, and the limb forcibly straightened as far as possible. While the limb was firmly held in proper position, a weight-and-pulley extension was applied.

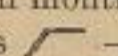


The vessels were protected by a sponge in the popliteal space. The supply of blood to the joint was diminished by the pressure of a small sponge placed over the femoral artery and confined by the bandages.

27th.—Made a second operation. At this sitting the limb was brought nearly straight, the hamstrings were probably broken. The limb was fixed by a posterior leather splint. No reaction of importance followed.

December 19th.—The limb is nearly in perfect line. Passive movements have been employed for two or three weeks. Put on an instrument for angular motion of the knee. The boy left for home; treatment to be continued under direction of his family physician.

February, 1869.—The father writes: "The knee had improved very much, when the boy was seized with typhoid fever and died."

CASE. *Fibrous Anchylosis of Left Knee.*—Catharine B. was admitted to Bellevue Hospital June 3, 1868, when she gave the following history (copied from hospital register): "She was confined April 1, 1868, and remained in bed but two days after. On the 13th of April she first noticed pain in the left leg and knee. Very soon the parts became much swollen, red, and very tender; at the same time she had chills, fever, and sweat. She was compelled to keep the bed for four weeks. Since her admission to the hospital, the knee has been blistered, compressed with sponges, and extended. All these plans seemed to be of some benefit. Passive motion, showering with alternate hot and cold water, have been employed with little effect upon the anchylosis. For several months the joint has been ankylosed, the angle being about thus  —135°." There is at present but little pain in the knee, though she says "it is worse in damp weather."

At clinic, January 6, 1869, I made the following comment on the case, previous to operating: The hectic sweats, etc., lead to the belief that this was a case of pyarthrosis, but the liquid has since been nearly all absorbed, and it was probably all synovia. The anchylosis is at too great an angle, and I shall therefore try by *brisement* to place it in a better position. The patella seems to be movable. There is some danger of reëxcitation of inflammation by the *brisement*, since hitherto all attempts at establishing motion have been attended with considerable reaction. There is

one point, below and outside of the patella, which is still tender. "I do not hope in this case to get motion." I applied the preparatory dressings as usual. The patella was started off by bending the limb backward, and then straightening it. Free motion was given to the joint. The knee had become slightly inverted; this was straightened by pressure. The usual dressings of sponges and plaster and roller, with a posterior splint, were applied. Directed absolute rest for ten or twelve days.

13th.—No reaction took place. Everything proceeding perfectly well. Patient has had no pain after the first thirty-six hours succeeding the operation.

20th.—Extension no longer giving relief, was removed as unnecessary.

February 13th.—Has continued to do well.

May 1st.—Has continued to improve; is walking with the aid of a stick.

14th.—Having left the hospital on a pass, and overstaid her time, she was discharged to-day."

CASE. *Anchylosis—Hip; Recovery with Good Motion.*—Miss —, of Hudson, N. Y., was brought to me by Dr. P., of Claverack, N. Y., November 27, 1867, giving the following history:

When three years old, she caught her foot in a hole and fell. She was able to walk home, but complained of severe pain, and was confined to the bed for two years from that time. During this time the right lower limb became strongly flexed on the pelvis, and adducted across the upper portion of the opposite thigh. Previous to the injury she had been perfectly healthy.

Since she was five years old she has been able to go round on crutches, and for the last six or seven years has been able to *flex* the thigh upon the pelvis and extend it slightly, but cannot *abduct* it at all.

General health perfect, and tolerably robust. Right limb five inches shorter than the other; that is, the foot cannot be brought within five inches of the floor (when the sound limb is straight), and it is very strongly adducted.

A line drawn from the right tuberosity of the ischium around the hip, to the anterior superior spinous process of the ilium of the same side, passed nearly *three inches below* the top of the trochanter major, which could be distinctly felt on flexion and exten-

sion of the thigh upon the pelvis, showing that a *new joint* had been made upon the dorsum of the ilium, but, on account of the adduction of the limb, she could bear no weight upon it without falling on the right side.

I put her under chloroform, and, by moderate force with my hands, very slowly and gradually abducted the limb, Dr. Phillips holding the pelvis quiet, when, suddenly, the tendon of the adductor longus snapped off with quite a loud noise. After a few minutes I was able to *abduct* the thigh to nearly a right angle with the body, the pelvis being held still and the other limb being straight, showing that the motion was in the new hip-joint and not in the lumbar region. The recovery from chloroform was slow, but at the end of two hours she could rise and walk with the limb straight under her. She could *voluntarily* abduct the limb six inches from the central line of the body. It was now only two inches shorter than its fellow, and could nearly support the weight of the body.

The patient returned to Hudson on the same day in a sleeping-car, without experiencing any trouble, having been carefully bandaged on a well-padded board, and, on reaching home, was put to bed and fomented.

*December 1st.*—I saw her in Hudson; found her perfectly comfortable, and she had suffered no pain since the operation. There was a slight discoloration upon the inside of the thigh. She is able to *flex, extend, and abduct* the limb, and to bear her entire weight upon it without pain, if she has gentle support to prevent her falling, the muscles not being strong enough to sustain or steady her body.

I directed that the limb should be rubbed, shampooed, and that faradism should be applied to it.

*12th.*—Dr. P. reports, "Case still improving."

*September, 1868.*—Miss — called upon me. The limbs are parallel. The limb formerly ankylosed can now be moved voluntarily in every direction, and over quite a large arc. The knee of the diseased side is considerably above that of the sound side. The right limb, measuring from the top of the trochanter major to the external *malleolus*, is one inch shorter than the left. This shortening is increased by the position of the head of the femur, so that, measuring from the anterior superior spinous process to the internal malleolus, the shortening is two and a half

inches. The discrepancy is made up by a thick cork-sole, and she walks well with the assistance of a cane.

*CASE. Fibrous Anchylosis of Hip; Tenotomy; Brisement; Recovery, with Motion.*—G. W. S., aged fourteen years, consulted me for the first time, September 17, 1872, and gave the history of his case as follows:

Nearly ten years before, he was attacked with hip-disease on the left side, as the result of a fall. The trouble continued for five years, during which time the disease progressed to the third stage, abscesses formed, were opened and discharged, small pieces of bone coming away from time to time. No large pieces have ever been discharged.

About five years from the beginning of his trouble, while running, he caught and twisted his foot in a rope. For several weeks afterward he was unable to move without the greatest suffering. He subsequently improved, and became quite sound and strong.

Health good. Wears, in walking, *four and a half inches lift* upon the left shoe. He is not easily fatigued in walking, and does not complain of pain. When his trunk and the sound limb are in normal position, the affected limb is flexed and *adducted*, the left foot falling upon the outside of the right knee. (See Fig. 241, from drawing by Dr. Yale.) It is brought down to



FIG. 241.

a position permitting walking by strong tilting of the pelvis. It is possible that the second accident, above mentioned, may have increased the motions of the joint.

*September 28th.*—Under chloroform, I divided subcutaneously the tendons of the adductors (pectineus, adductor-longus, gracilis) and the tensor vaginae femoris; dressed the usual way, and placed in the wire-breeches.

*October 12th.*—No inconvenience has been experienced by the patient. He was removed to-day from the wire-breeches.

*19th.*—Was allowed to ride out.

December 6th.—Has had a two-inch lower-heeled shoe constructed; called to-day to show it. Walks very well with it; the

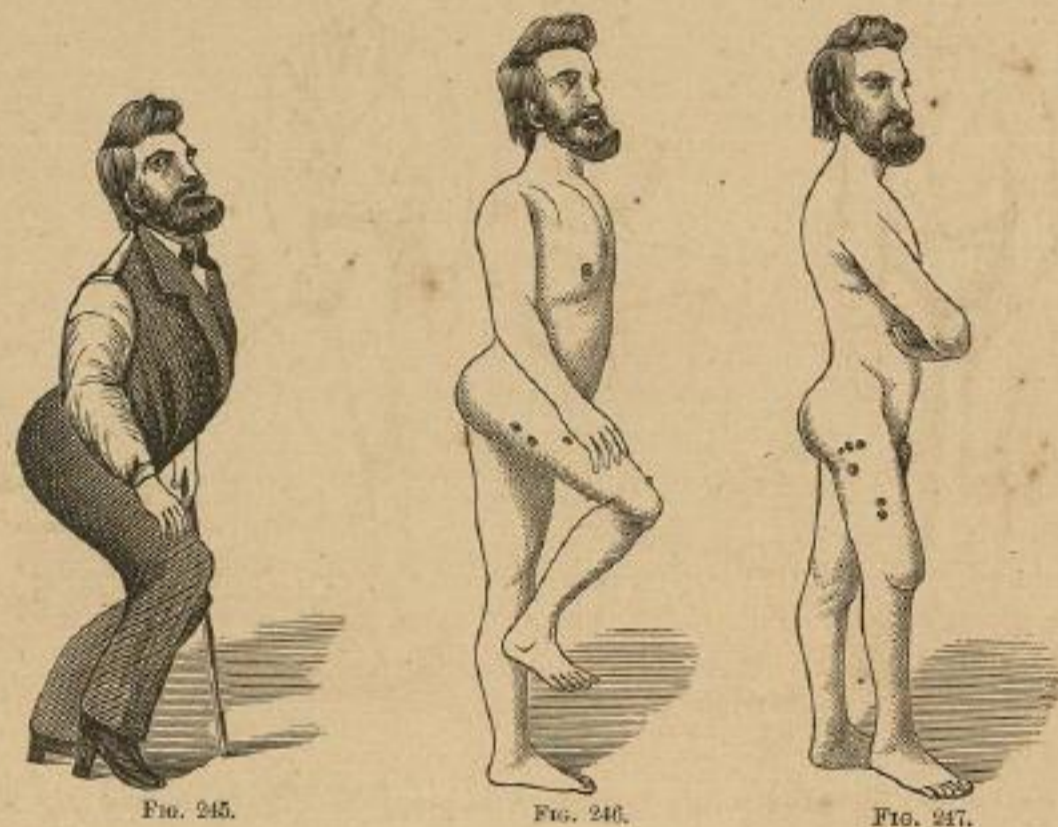


limbs are parallel when walking, as seen in Fig. 242, and he is able to flex the thigh upon the pelvis to a right angle (as seen in Fig. 243), and also abduct it (as seen in Fig. 244), from photographs.

*CASE. Anchylosis of Hip-Joint from Rheumatic Inflammation of Seven Years' Standing successfully treated by Tenotomy and Brisement Forcé.*—H. H. R., aged twenty-eight, was brought to me for treatment in June, 1861.

In April, 1854, when twenty-one years of age, he caught cold by sleeping on damp ground in California while engaged in mining. He was confined to bed about a year with acute rheumatism, which involved nearly all the joints in the body, but at last settled in his hip, which became contracted and finally ankylosed (as seen in Figs. 245 and 246, from photographs). Fig. 245 shows his mode of walking, with a very high heel on his boot, and even with this assistance he has to bend his spine and other knee to such an extent as to compel him to use a crutch in order to sustain himself. Fig. 246 shows his position when attempting to stand erect. It will

be seen by the curve in the lumbar region that the femur is at right angles to the pelvis, and his foot is elevated just thirteen inches from the ground by actual measurement. A number of cicatrices are on the outside of the thigh, and the tissues beneath



them are attached to the bone. The limb is very firmly ankylosed in position, as seen in the figures, and has been so for the past seven years.

The man is remarkably muscular and robust, but complains bitterly of the strain upon him in walking in his bent posture, and is anxious to have relief, even if his limb has to be amputated. If his joint cannot be broken up, he thinks cutting off his limb high up would remove the strain upon his back and enable him to walk much better on one leg than he can now do on two, and is therefore very anxious to have me perform amputation in case I cannot give motion.

June 10, 1861, I divided the tensor vaginae femoris and fascia, rectus femoris, and adductor longus, and with considerable difficulty at last broke up the adhesions around the joint and got the limb in a very good position.

The adhesions must have been mostly by osteophytes, and ex-

terior to the joint, as there were a number of fractures with a snapping sound. When the osteophytes were broken, the extremity could be at once extended and rotated without restraint.

The limb was extended by weight and pulley, and the hip covered with a large bag of pounded ice; different thicknesses of flannel were placed between the ice and his skin according to his comfort. Very slight reaction followed the operation. The extension was kept up by weight and pulley in bed for four weeks; after that the hip-splint was worn, which enabled him to exercise in the open air with only the assistance of a cane. Four months after the operation he could walk well without any assistance. The motions of his joint were quite free and almost natural, and the limb was of its normal length, as seen in Fig. 247, from photograph, showing that there could not have been any destructive inflammation or loss of substance in the bones.

CASE. *Reflex Contractions of Flexor and Adductor Muscles of Left Thigh, producing Deformity, simulating Luxation in Ischiatic Notch, and complicated with Fibrous Anchylosis, successfully treated by Subcutaneous Tenotomy and Brisement Forcé.*—C. R., aged twenty-four, single, native of New York; teamster for hardware-store; admitted to Bellevue Hospital, January 4, 1872, with the following history:

About the middle of January, 1871, while attempting to lift a barrel of nails into his wagon, he felt something give way low down his back, and at the same time a severe pain inside both hip-joints and groins, but most severe on the left side. This was followed in a few weeks by a bubo or swelling in each groin, and, as he had a slight urethral discharge at this time, it was suspected they were sympathetic with this difficulty, as no mention was made to his then attending physician of the previous muscular strain.

He was sent to the Strangers' Hospital, March 10, 1871, and I am indebted to my friend Dr. F. N. Otis, one of the physicians of the above hospital, for the following notes copied from their case-book: "On admission, the patient was a strong, healthy man. In both groins a decided induration exists, slight fluctuation on left side with tension. March 12th, abscess in left groin opened; very little pus and some blood discharged. March 13th, opening was enlarged to prevent burrowing, and bubo stuffed with *cotton* [my italics]. March 15th, tenderness in scrotum on left side, with

hard swelling extending from external abdominal ring to the outer side of the *vas deferens*, and just over the left crus of the penis; very painful to the touch, but giving no impulse when coughing, and slightly movable. March 31st, explorative operation performed by Dr. Otis, Drs. Bumstead, Sands, and Sabine, present. A straight incision was made through the scrotum on the left side, and the mass fairly exposed. It was found to be closely connected with a hernia above, from which it was detached by the scalpel; the mass was hard, and at the same time very friable; the finger penetrated it without much resistance, and on so doing a little pus escaped. A piece of the mass an inch long was reserved for examination and found to be non-malignant. The wound was stuffed with lint." The daily record of the case is very interesting, but too tedious to be inserted here. I can only sum it up by saying that he had excessive suppuration, hectic fever, and great prostration, followed in a few weeks by severe muscular contractions, and on the 25th of April the notes state that "the thigh is drawn up at right angles to the body; he is unable to relieve it; motion in knee perfect." Extension was applied at various times with different weights, but could not be borne on account of pain produced. June 1st, the notes state "sinus has healed; his condition is pitiful, being unable to extend the left thigh and leg, which is still bent at an angle of 100° with the body, and also adducted so that the knee points out to the right side." An extensive slough formed over the left trochanter major owing to the extreme pressure of it against the soft parts, from the strong adduction of the thigh. October 17th, "sinus has finally healed; patient as strong as ever. There is great deformity of the left lower extremity; whole pelvis is oblique, left side being the highest; the thigh still flexed, but not so much as previously, and is drawn over to the opposite side. There is tonic contraction of the adductors, flexor and hamstring muscles, much more marked in the former. Discharged."

When he presented himself at Bellevue Hospital, he was carefully sketched by Dr. Leroy M. Yale, from which the engraving was made. (See Fig. 248.) His limb could be drawn nearly parallel with the other, but it was done by rotating the entire pelvis on the opposite acetabulum, and raising the crest of the left ilium nearly four inches higher than the opposite side.

January 10, 1872.—I operated in the amphitheatre of Bellevue,

in the presence of a large class, and a number of physicians of the city, among them Drs. J. C. Nott, McIlvaine, Henry, and others. My house-surgeon, Dr. Cushing, had previously fitted to the *right* side of his body a plaster-of-Paris model, extending from his axilla to the foot for the purpose of counter-extension, when the abduction should be applied after the operation.

Ether was administered by Dr. Yale, when I divided the gracilis and the adductors subcutaneously, closed the wound with adhesive plaster, and applied a figure-of-8 roller. Then, laying him on his back and placing my knees on either ilium to hold his pelvis, I forcibly broke up the remaining adhesions and succeeded in bringing the limb into position. Adhesive plaster for extension was secured to the whole limb by roller, and the plaster-of-Paris mould fastened to the right side of the body and leg by another roller. The patient was then secured in bed, and extension

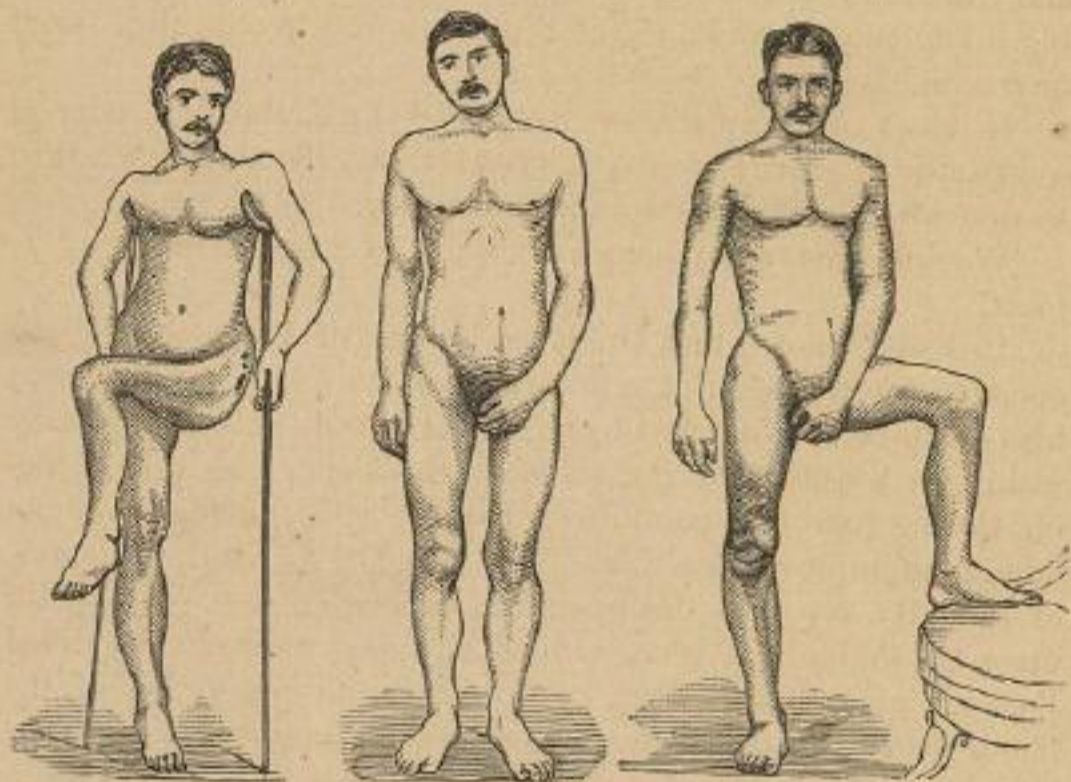


FIG. 248.

FIG. 249.

FIG. 250.

and abduction kept up by weight and pulley. Ice-bags were applied around the hip.

The wound healed without any suppuration, and no unpleasant symptoms followed the operation.

February 22, 1872.—Patient walked from my office to the

photographer's, and had Figs. 249 and 250 taken, which show his present position, as well as his power of motion, particularly his ability to *flex* and *abduct*.

## LECTURE XXVIII.

## ANCHYLOSIS (CONTINUED).


Bony or True Anchylosis.—Operation when present at the Hip-Joint.—Cases.—Bony Anchylosis at the Knee-Joint.—At the Elbow-Joint.—Case.

GENTLEMEN: At my last lecture I gave you the symptoms and treatment of false, or fibrous, anchylosis. I will this morning invite your attention to the symptoms and treatment of bony, or true anchylosis.

In cases of complete, or bony anchylosis, the deformity is sometimes so great as to require correction. To accomplish this, section with the saw is absolutely necessary.

We will first study bony anchylosis as it occurs at the *hip-joint*.

It is well known that Dr. Rhea Barton, of Philadelphia, first operated for the relief of a deformity of this kind in 1826, and his operation was followed by a perfect result. He operated by making a V-section in the shaft of the bone, and thus bringing the leg from that point down parallel with the other, and obtaining an improved position. The late Dr. J. Kearney Rogers, of this city, repeated this operation in another case, only higher up on the shaft of the bone, with equally good results. I modified Barton's operation in 1862, by making a curved section of the femur above the trochanter minor, and a straight section a few lines below the first curved cut, thus removing a block of bone.

My object was to go above the trochanter minor, so as to retain the insertion of the psoas magnus and iliacus internus muscles attached to the lower fragment for the purpose of flexion; and by cutting out a *semicircular* piece thus, , with its concavity downward, and then rounding off the upper end of the lower section, I would more nearly imitate the natural joint, and