On the Mechanical Treatment of Ununited Fracture of the Neck of the Femur

With Traction Apparatus producing Abduction of the Thigh, and Direct Lateral Pressure over the Trochanter Major.

BY

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WITH TRACTION APPARATUS PRODUCING ABDUCTION OF THE THIGH, AND DIRECT LATERAL PRESSURE OVER THE TROCHANTER MAJOR.*

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On the 16th of December, 1885, I was asked to examine Mr. M. P. G., aged forty-two years, who gave the following history:

Case I.—On the 1st of October, 1885, Mr. G. was thrown from his horse and sustained an intracapsular fracture of the neck of the femur on the left side. The accident occurred a few miles from New York, and the patient was at once brought to his city residence, where he was treated by the "Buck's extension" method under the most favorable conditions by one of our best-known surgeons. At the end of ten weeks an examination proved that the fracture had failed to unite

* Read before the American Orthopædic Association, in Washington, D. C., May 4, 1897.

and the patient was given to understand that he must expect to be lame all his life—the alternative of a surgical operation being positively declined by him. I had known the patient previous to the accident, having prescribed for a weak knee of the right leg. He sent for me to ask if anything could be done from an orthopædic standpoint. At first I was inclined to advise the surgical procedure, but the patient declined to entertain any proposition of this nature. He was possessed of an indomitable will, and he said he would undertake anything which I suggested which would give a chance for recovery, or even relief.

Three cases of ununited fracture of the shaft of the femur—two at about the middle of the femur and one just below the trochanter minor—had come under my observation and treatment, and had been successfully treated by the long traction (hip) splint and an accurately fitted coaptation splint; and two cases of unilateral congenital dislocation of the hip joint had been very much benefited by the same method of treatment; the coaptation splint in the latter cases being a firm belt properly padded, passing around the pelvis, making a direct lateral pressure over the trochanter major. In all these cases the limb had been restored to approximately its normal length by the traction splint, and this length had been maintained for a sufficiently long period. Complete bony union had resulted in the fracture cases, and an improved position with a firm artificial joint had resulted in the dislocation cases. I had long felt that the treatment of recent fracture of the neck of the femur lacked especially a sufficient means to control the fragments and keep them in apposition; but no opportunity to treat any recent cases of this nature had presented itself in my practice.

I explained to Mr. G. the method by which we might hope to secure a union of the fracture, based upon the results just related, but I also informed him that it would be an experiment and that I would not undertake it unless the plan was approved by a formal consultation. The late Dr. Henry B. Sands, who had been familiar with my ununited fracture and congenital dislocation cases, was consulted, and after examining Mr. G. he gave the proposed treatment his fullest sanction.

The thigh and leg were in the characteristic position of fracture of the neck. There had apparently been no attempt at union; a flail-like movement was present at the point of fracture and the limb was two inches and three quarters shorter than its mate. The patient was in excellent health and spirits, and the experimental treatment was commenced under favorable auspices.

On Christmas day, 1885, the long, straight, Taylor hip splint was applied. This was almost to a day twelve weeks after the original injury. In four days the limbs were of equal length. A belt, about three inches and a half wide, made of surcingle material, such as is used by saddlers, was now passed around the pelvis, a crescentic-shaped horsehair pad being placed over the trochanter major. This belt was firmly buckled at the opposite side of the pelvis. The limb was now placed in abduction at an angle of about twenty degrees, the origin of the adductor muscles being used as a fixed point to throw the distal toward the proximal fragment. A lever was thus created where the fulcrum (the origin of the adductors) was between the power (the lower end of the limb) and the resistance (the seat of the fracture). The entire limb was now placed on an inclined plane at an angle of about a hundred and thirty-five degrees.

I felt very sure, as I studied the conditions from day to day, that the traction maintained the length of

the leg, and that the abduction of the thigh approximated the fragments. But I did not feel certain that my "surcingle" was making a sufficient lateral pressure. I felt that the "surcingle" was the weak point of my apparatus. I then further increased the lateral pressure by passing a tourniquet over the padded surcingle, and after that I had at hand the means of absolutely controlling the lateral pressure. When the patient was moved in bed for any purpose, or when the traction was modified in any way, or when the perineal pads were loosened, the tourniquet pressure was carried up to the point of toleration. At other times the tourniquet pressure was modified. This pressure did not give rise to any trouble, nor did it seriously interfere with the circulation.

Among the objections urged by some of my critics and friends in Mr. G.'s case was one which especially appealed to me. The knee joint had already been immobilized about twelve weeks, and it was justly feared, if the fixation of this joint was prolonged during a further period of, perhaps, months, that it might become seriously damaged. Before applying the straight traction splint, I had therefore carefully measured the patient for an apparatus which combines all the advantages of the straight traction splint with an arrangement at the knee by which motion could be secured at this articulation whenever necessary.

On January 3, 1886, I applied this splint. I will briefly describe it.* It has the conventional pelvic

* Further experience proves that this complicated form of apparatus is not necessary. A simple, long traction hip splint, based upon the Davis-Taylor principle, and which can be obtained from any instrument maker, answers every indication in both acute and chronic cases.

band, which is strong and solid, with the ordinary perineal pads. It has an abduction screw, by which the shaft of the apparatus can be placed in any desired lateral position, and it has a mechanism at the knee by which motion can be made whenever desired at this joint. It also has two traction rods, one at the thigh part and one at the leg part, each with separate adhesive-plaster attachments. By this arrangement, traction can be made upon the thigh, while that at the leg is removed or modified. During the treatment, after the first two weeks, the patient was drawn down to the foot of the bed, until the knee joint was opposite this point. The leg traction was then modified, and the thigh traction increased. We were thus able to flex the leg without disturbing the thigh traction. While this was being executed, the tourniquet pressure was greatly increased. The knee was thus "exercised" every second day without trouble and without pain and without any detriment to the fracture.

On the 19th of January, 1886, Mr. G. was successfully removed to Lakewood, New Jersey. On the 28th of January he was placed on his feet with the use of crutches, a high shoe (two inches) being placed under the foot of the sound limb. He commenced at this time to walk on crutches, until he daily walked half a mile or more out of doors. He was allowed to stand up or to walk at will, but he was never permitted to sit down, or to try to sit down. His health remained good in every way, and on April 11th, about four months after treatment was commenced, Dr. Sands saw the patient with me and found a solid bony union. It was deemed best, however, not to discontinue the protection of the traction apparatus. A modified (perineal support) treatment was kept up until June 5th, when he was discharged cured.

At the final examination the limb was found to be three fourths of an inch shorter than its mate. The patient could walk well. He did not need a high sole to compensate for the difference in the length of his legs. All the motions of the hip were somewhat modi-

fied. Flexion was almost complete; abduction and adduction were slightly less than normal; extension of the thigh was resisted somewhat, while rotation in and rotation out were somewhat limited.

I saw Mr. G. in London last summer. No one would notice that he had anything more than a peculiar gait. He is not lame. He walks long distances, hunts and rides on horseback, plays tennis, etc., as well and as actively as if his hip had never been injured.

Case II.—On the 9th of October, 1889, I saw Miss X., aged forty years. Eighteen months previously she had received an injury in Europe, and had sustained a fracture of the neck of the femur. The limb was three fourths of an inch shorter than its mate and a distinct "telescoping" could be demonstrated, as well as a distinct crepitus, at the point of fracture. In consultation with Dr. Charles McBurney on October 15th the diagnosis of intracapsular fracture was confirmed. I submitted to Dr. McBurney a plan of treatment similar to that which had proved successful in Mr. G.'s case, and he expressed himself as fully approving the effort. The patient was informed that the issue would be doubtful, and that the length of time which had elapsed since the injury made the treatment an experiment. After due deliberation she decided to make the attempt.

It was decided to pursue the treatment for three months, and then, if there was no evidence of union, the effort was to be abandoned. Accordingly, on October 30th, the long traction splint was applied with the abduction screw, the surcingle, and the tourniquet, and the same treatment outlined in the previous case was very carefully carried out. The patient was seen by Dr. McBurney on November 15th, and again on December 6th. On February 1, 1890, three months after the first application of the traction splint, the apparatus was removed, and Dr. McBurney and myself made careful and thorough tests of the fracture. The telescoping had disappeared, and the crepitus could not be detected. There seemed to be a pretty firm

union of some sort, though whether it was ligamentous or osseous we could not decide. The patient could not raise the limb from the couch with the knee extended, though she could rotate it through quite a considerable arc. It seemed that there was enough to encourage us to make a further effort. Before doing anything further, however, we decided to remove the apparatus for a couple of weeks to see if any shortening took place. After nineteen days no shortening had occurred. The traction apparatus had brought the limb down half an inch, or within a quarter of an inch of its normal length, and for nearly three weeks, without any apparatus, except the surcingle during the day, this length had been maintained. The patient went about on crutches. During the interval, Dr. W. T. Bull also saw the patient and examined the conditions present. Both he and Dr. McBurney deemed the evidence, while not positively indicating bony union, as affording a hope that this result might occur. On February 25th the treatment was again commenced and it was steadily maintained until the 6th of May, when Dr. Bull again saw the patient. The conditions again seemed favorable, but not positively indicating bony union. There was no telescoping; no crepitus; no shortening under severe manual tests. Indeed, there was some sort of union. It was hoped that it might prove to be bony union. Up to July 1st, when I went away on my vacation, the limb had not shortened. No direct evidence of fracture could be elicited, and yet there was an expressive disability about the limb which pointed to an uncertain result. It was proposed at this juncture to apply a perineal walking support, so as to maintain the advantage gained by the prolonged treatment, but the patient had had a previous very unpleasant experience with an apparatus of this kind, and positively refused to have one adjusted. After I went away the patient came under the care of Dr. Bull. The patient was instructed to use the limb with the protection of crutches and to gradually bring the weight of

the body upon the fracture. During the summer, under these conditions, the old condition gradually returned. The telescoping reappeared, the crepitus came back, and the thigh slipped back to its old position of three fourths of an inch shortening. The result was a failure after all.

It would seem, however, even in this case, where treatment was commenced eighteen months after the fracture occurred, that Nature made an effort to secure union. It was a pretty firm union too, and one which, for a while, resisted all ordinary tests. It may even be that had the treatment been absolutely uninterrupted, and had it been persisted in for a longer period, with a perineal support after actual treatment was stopped, a serviceable union might have resulted.

I do not propose on this occasion to review the various methods which have been devised for the treatment of fracture of the neck of the femur. Both of these cases were ununited fractures and they came under my care because the conventional method had failed. The means used were the result of some thought and study upon the subject, and when I treated Mr. G. there was nothing that I could find in medical literature to guide or aid me.

Since my first case, Dr. Nicholas Senn has published an able essay on The Treatment of Fracture of the Neck of the Femur by Immediate Reduction and Permanent Fixation. This essay is published in the *Journal of the American Medical Association* for August 13, 1889, and it presents a comprehensive review of the subject, and the author reaches conclusions which I think the medical profession must approve as applied to recent cases of this class of fractures.

Dr. Senn depends, however, upon manual traction for the first reduction of the fracture, and then adds a comprehensive gypsum splint with a screw pressure over the trochanter major. No attempt is made to throw the fractured ends together by abducting the limb, and he depends upon the fixing power of the plaster-of-Paris splint to maintain the traction induced by the first manual effort.

What I deem to be the essential element in the treatment, both of cases of recent and ununited fracture, could not be successfully carried out by the use of the gypsum splint alone, viz., the permanent abduction of the thigh. The gypsum splint would not have sufficient resistance to hold the limb against the unremitting action of the adductor muscles. A constant and easily adjusted form of traction is needed to secure this result, and if this traction is successfully kept up the lateral pressure upon the trochanter may be very materially reduced.

A few words in closing: My experience leads me to say that the tourniquet pressure over the trochanter major will not produce any excoriation or any serious interference with the circulation. In neither of my cases did it produce anything more than inconvenience. Indeed, I was surprised to find how little pressure was needed to maintain the fragments in apposition with the conjoined rack and pinion traction and abduction. Still further: The long traction splint (Taylor's), such as is used in the treatment of hip-joint disease, with an abduction screw at the junction of the traction rod with the pelvic band, and with the surcingle and tourniquet, makes a complete apparatus for the treatment of recent cases of intracapsular

fracture. It meets all the indications, and certainly, if good results can be obtained in cases of non-union of long duration, its use is strongly indicated in acute cases. The ease with which the patient can be placed upon a bedpan, etc., the certainty that the fractured ends can always be kept in apposition, the readiness with which the patient adapts himself to the treatment, the rapidity with which he gains confidence and walks about with the high shoe and crutches, and finally the absence of a complicated technique, all commend this method.

The above remarks were submitted to the Surgical Section of the New York Academy of Medicine on June 13, 1892. Since that time the following cases have occurred and are herewith appended to this report. The paper was not published for the reason that it was deemed best to secure additional evidence before finally presenting the matter to the medical profession.

Case III.—Reported by Dr. T. Halsted Myers. J. W. D., aged forty-two years. While driving, the patient was thrown from his carriage and was stepped upon by the horse. Inability to stand and great pain were immediately observed. Nine weeks after the accident, on September 24, 1894, Dr. Myers found five eighths of an inch shortening, bony crepitus, "telescoping" at the neck of the femur, and the characteristic position of fracture at the neck of the femur. On October 3, 1894, the long traction splint was applied and the patient, who was obliged to support himself, went about on crutches, with a high shoe on the sound limb. A pelvic girdle was also applied soon after the treatment was commenced. On January 4, 1895, all pain had ceased and the telescoping and crepitus had disappeared. Although still advised to keep quiet, the patient insisted

upon going about on crutches. On January 25, 1895, a "short splint" was applied, the crutches and surcingle being continued. On May 10, 1895, the evidences of bony union being positive, all apparatus was removed. The patient had no pain and walked well.

At an examination made February 21, 1896, perfectly firm bony union was found with excellent motion at the hip joint. Patient rides horseback, etc., with ease. Shortening, half an inch.

Case IV.—C. M., aged twenty-two years, a Norwegian sailor, applied at the New York Orthopædic Dispensary and Hospital on November 16, 1894, with the following history: On May 24, 1894, he fell several feet aboard ship, injuring his left hip. He was treated in a general hospital in this city for five weeks, with a plaster-of-Paris splint, the patient says, for dislocation of the hip joint. After five weeks he was discharged, walking upon crutches. There was no further treatment, and the condition not improving the patient applied to the dispensary, as above stated.

On examination there was found an inch and a quarter shortening of the affected limb, a distinct crepitation, nearly an inch of "telescoping," and the characteristic position of intracapsular fracture of the neck of the femur. This diagnosis was made and confirmed at subsequent examinations.

As the patient had no home and was living in a sailors' boarding house it seemed useless to attempt to commence treatment. After a time I succeeded in obtaining permission to have the patient enter the Presbyterian Hospital, where, through the courtesy of Dr. Andrew J. McCosh, attending surgeon, the writer was permitted to give the patient his personal attention.

On January 21, 1895, nine months after the accident, with the assistance of the house staff of the hospital and Dr. Hibbs, house surgeon to the Orthopædic Hospital, a long traction hip splint was applied, the surcingle belt was adjusted, the thigh abducted, by making the distal perineal pad of the apparatus tight

before making the traction, and the limb placed on an inclined plane at about a hundred and thirty-five degrees. At this time careful measurement showed an inch and a half of shortening.

Dr. Hibbs assumed the personal care of the patient and saw him regularly.

On May 23, 1895, I examined the patient and found evidence of bony union. It was advised that the same treatment be continued, however, as it did not seem positive that the union was complete.

On July 30, 1895, bony union was complete; the patient could raise the foot from the bed with the knee fully extended. The use of the apparatus was continued, and the patient was directed to get up and move about with crutches and a high sole to the unaffected limb. There was three fourths of an inch shortening.

As the patient had no home he was kept in the hospital by the kind permission of the authorities until December 17, 1895, when he was discharged well, with three fourths of an inch shortening.

On November 17, 1896, when I saw the patient last, he still had three fourths of an inch shortening. At that time his gait was good and he had been at work for some months. The bony union was very firm, and every function of the joint was well performed, except that there was some limitation of motion at the hip in all directions. The knee joint was about normal in its movements.

Other cases of impacted fracture accompanied by pain and great disability have been treated by this method with much success. Dr. Myers reports two and the writer has had three, in all of which rapid improvement followed the use of the traction splint in a few weeks or months. In all these cases crutches with a high sole were used during locomotion.

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