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*Luxations of the Hip and Shoulder
Joints, and the Agents which
oppose their Reduction.*

BY

MOSES GUNN, A. M. M. D.

PROFESSOR OF SURGERY IN THE UNIVERSITY OF MICHIGAN.

Box 8.

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Luxations of the Hip and Shoulder Joints.

THE subject-matter of the following pages is compiled from three different magazine articles, which, at various periods, I have published; and as they are now re-published exclusively for the benefit of my pupils in the University of Michigan, I trust no apology will be deemed necessary for the pamphlet form which the article assumes.

THE object of the present paper is to elucidate more fully certain views relative to luxations of the hip and shoulder joints, which were contained in a short article originally read before the Detroit Medical Society, and subsequently published in the *Peninsular Journal of Medicine*. An article on dislocations of the hip, by Dr. MARKOE, of New York, published in the January No. of the *New York Journal of Medicine*, induced me to re-peruse the article by Dr. REID, of Rochester, published in the Transactions of the State Medical Society of New York; and I was pleased to see how illustrative of the views contained in my former article were two experiments, one made by each of these gentlemen. These, together with further experiment on my own part, led to the preparation of the present paper; in the construction of which

I shall here introduce my former article, published in September, 1853:

The views here advanced I have taught for the past two years to the gentlemen composing the Medical Class in the University; and I shall offer no apology for calling the attention of the Society for a few moments this evening to the subject of Dislocations of the Hip and Shoulder, and more particularly to that form of the accident, which, from the anatomical peculiarities of the joint, is one exceedingly difficult to reduce; and for the reduction of which Dr. REID has recently proposed a novel and efficient mode.

It is not my intention to discuss the question of priority which has been raised in reference to this subject, for there can be no doubt that Dr. REID arrived at his conclusions by a course of reasoning and experiment, and that those conclusions were most essentially novel to a large majority of the Profession. I propose, rather, briefly to consider the prominent peculiarities of the joint, and the relation of the parts in a state of dislocation; the structures which oppose the return of the head of the femur to the acetabulum; the manner in which Dr. REID's manipulations overcome this opposition; and, lastly, the application of the principles involved, to the reduction of some other dislocations.

The encircling ridge which gives depth to the cotyloid cavity, presents upon its outer slope a plane, the inclination of which varies in different parts. At its posterior portion this inclination is very great, and it would seem, in dislocation in this direction, impossible to return the head of the bone to the cavity without lifting it completely over the ridge: upwards and backwards it is more gradual, and would seem to afford a much more easily surmountable obstacle; yet when we examine the relation of the parts in a dislocation in this direction, we find that applied to this surface, we have the anterior and inferior surface of the head and neck of the femur, the rotundity of the head corresponding with the curvature of the slope, while the edge of the acetabulum corresponds with the curvature described by the anterior and inferior surface of the neck. Although thus seemingly locked together, comparatively slight extension in the line of dislocation would cause the head to ride over the edge of the cavity, were it not bound down in this position by the surrounding tissues. Which particular tissue constitutes these bonds is an important question to him who seeks to relax them. Dr. REID, in common with the Profession generally, considers the muscles the agents which thus oppose our efforts at reduction, and his manipulations are conducted with a view to relax them, while the femur, acting as a lever, raises the head of the bone clear of the edge of the cavity. With this same view we have the directions of the books and public teachers to apply extension and counter-extension *slowly* and *uniformly*, in order to *tire out* the rebellious muscles. Blood-letting, antimony,

and the hot bath are also called in to aid in this laudable crusade against these wicked organs.

In this view, I would respectfully differ with Dr. REID, the teachers, books, and Profession, and state my honest belief that the muscles oppose our efforts very little more than they do the progress of our earth in its orbit. This belief I have repeatedly verified by experiments upon the dead subject, and the members of the Medical Class of 1851-2 in the University will remember those conducted before them. A subject was placed upon the table, the lower border of the gluteus maximus was raised, and a scalpel carried through the subjacent muscles, and an opening made in the posterior and superior portion of the capsular ligament. The round ligament was then divided, and the head of the femur luxated upon the dorsum of the ilium. The usual indications of this dislocation were present. The subject was placed in the proper position, a counter-extending band applied to the perinæum, and fixed; the strength of two men exerted now upon the extending band, while endeavor was made to raise the head of the bone clear of the acetabulum with a jack towel was insufficient to reduce the luxation. REID's method of manipulation readily replaced the bone. This experiment was repeated many times, and uniformly with the same result.

As *muscular action* could not have opposed our efforts and prevented success in this case, the question naturally presents itself, What structure stood between effort and success?* I answer, *The untorn portion of the capsular ligament*. In support of this view, let us consider for a moment the position of the limb at the instant of the escape of the head from the socket during the process of dislocation. To do this, we must bear in mind that force applied to the knee or foot while the limb is in a state of adduction, constitutes the most frequent cause of this dislocation. Force thus applied adducts the limb still more powerfully before dislocation takes place, and at the moment of the escape of the head of the bone from the socket, the limb is in a direction which crosses the thigh of the opposite side. Immediately that the head of the bone has cleared the edge of the acetabulum, it settles into its position upon the dorsum of the ilium, and the limb assumes the position and direction indicative of the accident. During the dislodgement of the bone, the superior and posterior portion of the capsular ligament is ruptured, through which the head protrudes; while from the position of the limb at the instant of protrusion, the anterior and inferior portion is very much relaxed, thus allowing the head to rise easily over the acetabulum. As soon as the head settles into its position upon the dorsum of the ilium, the direction of the limb is changed, and the untorn portion of the ligament becomes more tense, and for this reason the head of the bone can not be readily returned to its place till the limb is again placed in a position

* Dr. REID would answer, *passive muscular fibres*.

to relax it. Dr. REID's method does this most effectually; and I conceive that any other plan which does not accomplish this, as for instance extension and counter-extension by the pulley, or JARVIS's apparatus, in the usual direction, succeeds only by lacerating much more extensively, if not by actually tearing the ligament completely asunder, before the head of the bone will ride over the edge of the cavity.

The principle, then, I would seek to establish, is this—*That in luxations of the hip and shoulder the untorn portion of the capsular ligament, by binding down the head of the dislocated bone, prevents its ready return over the edge of the cavity to its place in the socket; and that this return can be easily effected by putting the limb in such a position as will effectually approximate the two points of attachment of that portion of the ligament which remains untorn.*

This principle can be successfully applied to the reduction of the backward luxation of the femur into the ischiatic notch, and also to the several luxations of the shoulder. It has several times been my guide in the reduction of the downward dislocation of the humerus into the axilla. The patient is seated upon the floor; an assistant slowly raises the arm to an angle of forty-five degrees to the plane upon which the patient is sitting; and now while the assistant makes extension in this direction, the surgeon makes pressure with the hand upon the top of the shoulder, the bone readily returns to its place, and the arm is dropped to the side and secured in a sling.

WHITE's method of reducing this luxation, which is figured in "Druitt," is essentially the same, the only difference being in the position of the patient. According to his plan, the patient lies upon his back, the scapula is fixed by a counter-extending band applied to the top of the shoulder, or by the hand of an assistant, while "the arm is raised from the side, and drawn straight up by the head, till the bone is thus elevated into the socket." In either method it will be seen that the upper and untorn portion of the capsular ligament, by the elevation of the arm, is very much relaxed, thus giving a latitude of motion to the head which greatly facilitates its return, and which could not be obtained by any manipulation in which this relaxation was less perfect. Nine-tenths of the force spent in extension and counter-extension may be spared, in the reduction of all those dislocations in which, by alteration of the position of the limb, such relaxation is effected; and in the several luxations above specified, this end is undoubtedly attainable.

Further thought and experiment upon this subject have convinced me that dislocations of the hip joint *can not occur*, except in certain positions, and these are positions of *very great distortion*. In support of this view, I would

call attention to the great security against this accident provided by nature in the anatomy of the joint. The great depth of the acetabulum, surrounding on all sides the head of the femur, renders its escape nearly, if not absolutely, a physical impossibility, so long as the legs are parallel to each other, and on a line with the body. Fracture of some of the bony structures of the joint would be the result of great violence, in this position of the limbs, but dislocation without fracture, I apprehend, never. Before dislocation can take place, the limb must be so distorted that the walls of the acetabulum will afford no longer protection against the escape of the head of the femur, the dislocating force throwing the head, in this changed direction, against some portion of the capsule of the joint, which gives way before it, permitting the rupture of the round ligament, and the escape of the bone. It is evident that while the changed direction of the limb throws the head wholly against some portion of the capsule, the opposite side of this capsule must be relaxed, and by its relaxation facilitate the riding of the head over the edge of the cotyloid cavity. Taking, for example, the upward and backward form of luxation, in my experiments, I have found it impossible, by my own strength, to produce luxation, even when the direction of the limb was changed to that which distinguishes this form of the accident *after* it has occurred, although the upper and posterior portion of the capsule, and the round ligament, were divided.

In the course of my instruction during the last winter, I introduced the following experiment: A fresh, whole, and muscular subject was selected, and a circular incision was made around the middle of the thigh and down to the bone; another, from the tuberosity of the ischium, around the inner aspect of the thigh, and over the dorsum of the ilium to the point of commencement, and all

the tissues were cleanly removed from the bone and capsule of the joint. The upper and posterior half of the capsule was then cut away, leaving the anterior and inferior half whole, and the round ligament was divided. In this state it will be seen that *all tissues* were entirely out of the way (and could neither afford protection against dislocation, or impediment to reduction), except the anterior and inferior half of the capsular ligament. I now placed the limb in the position which characterizes the dislocation upon the dorsum, viz., the knee in advance of the other, and the foot inverted; and the pelvis being fixed, I attempted to produce dislocation, but failed to do so; and I believe that no force, however great, applied to the knee, would be sufficient to accomplish the escape of the head of the bone without fracture of the acetabular walls, so long as the limb remains in this direction; for in this position, the head presses *perpendicularly* against the superior and posterior portions of the acetabular walls. But on carrying the limb to a position in which the thigh crossed that of the opposite side, at a point just above its middle, slight pressure was sufficient to dislocate the bone; for the acetabular walls, in this position, presented to the head of the bone an inclined plane, while, from the same reason of position, the undivided portion of the capsule was relaxed, thus permitting the head to slide easily up this inclined plane and ride over the acetabular edge. At the moment, however, during which the head rested upon the edge of the cavity, this undivided portion of the capsule became tense, relaxed again as the head settled down upon the outside of the cavity, and upon dropping the limb down to the position which characterizes this dislocation, it became again tense. Efforts at reduction by extension and counter-extension in this direction were now made, but were unsuccessful, for this tense, undivided portion of the capsule

bound down the head so that it could not ride back over the edge of the acetabulum; but, on carrying the limb across the other, to the position in which it was at the moment of escape, the reduction was easily accomplished.

Upon the limb of the opposite side, the experiment detailed in my former article was repeated, and with the same result.

The following case illustrates also the practical bearing of the principle under consideration: In February of the present year (1855) I was called into the interior of the State to reduce a dislocation of the hip of four days' standing, which had resisted the efforts of two very efficient professional gentlemen. They had extended with JARVIS'S adjuster, and practiced REID'S manipulations, but without success. REID'S method, they informed me, only altered the form of luxation, carrying the head downward and forward upon the obturator ligament. The luxation had been primarily upon the dorsum, but upon examination I found the head of the bone in the ischiatic notch. I placed the patient upon his back, and attempted reduction after REID'S plan, but with the same result that had attended the efforts of the gentlemen in attendance. By inverting the foot, I slipped the head back to its position in the notch, and repeated my efforts, but with like results. I thus four times essayed reduction, but succeeded only in making the head travel from one position to the other. I adopted this plan with confidence, from the fact that the luxation had originally been upon the dorsum, but failing to replace the bone, I applied JARVIS'S adjuster, and made extension after the usual method, and carried it to the extent of bending the extending bar to the form of a very considerable curve, but was not able to reduce the luxation. Opposed, as I was before, to violence, I removed the instrument, and straightening the

extending bar, resolved to adopt BLUNDELL'S obstetric motto, *arte non vi*. After some deliberation, I armed the adjuster with the shoulder fork, flexed the thigh at right angles with the body, and adducted it; and applying the shoulder fork to the pubis and ilium, and attaching the extending bar to the knee, a few turns of the instrument elevated the head into the socket.

Although Doct. REID attributes to the muscles all the difficulties of reduction, he is explicit upon the fact that it is not muscular *activity* which opposes our efforts, and points triumphantly to the ease with which muscular contraction is overcome in fractures of the neck and shaft of the femur. He conceives that the muscular tissues immediately surrounding the joint, are the means of binding down the head of the bone in its new position, thus preventing reduction. He says:

“The true condition of the muscles is this: the six rotator, adductor, and abductor muscles, viz.: the obturator externus, anteriorly; the pyriformis, obturator internus, gemelli, and quadratus, posteriorly; are all in a state of extreme tension, while the other eleven muscles, larger and smaller, are shortened, and, in one sense, contracted, but in another, and in fact, they are relaxed—that is, in a recent dislocation. Now it is evident, on the slightest inspection, that the six muscles that are put upon the stretch, being in antagonism to each other—that is, the short, strong obturator externus anteriorly, being opposed by the other five posteriorly—and all acting at nearly right angles to the axis of the femur, must hug, with great power, the head of the bone upon the dorsum, and by the same force, oppose its ascent over the brim of the acetabulum, in any direct attempt to replace it by traction towards its socket. These six muscles, then, so violently stretched, constitute the real and only impediments to the reduction by the usual mode, and not the shortened and contracted triceps and glutei, as has always been believed and taught by all authors and professors of surgery.”

So forcibly impressed is Dr. W. with the idea that “*these six muscles constitute the real and only impediment,*” that even in an experiment of his own, which he details in his paper, he fails to see the fact which he

actually relates, that there is *another* structure which forms an impediment. His experiment was upon a subject considerably advanced in decomposition, and in the course of its relation he holds the following language:

“After carefully noting the relative position of bone and muscles, we made traction on the femur downward and inward over the sound limb, as we are directed by most authors; but the moment the attempt was made, the muscles already named as being in a state of tension became more tense, although all the muscles about the joint were separated from each other—were loose, without vitality, and almost in a state of decomposition, yet it was with great difficulty that we could bring down the head into its socket; and when we did so, we carried away a part of the capsular ligament.”

It seems hardly probable that muscles “almost in a state of decomposition,” could form the “real and *only* impediment,” particularly, when in accomplishing reduction, he “*carried away a part of the capsular ligament.*” In this connection, I quote from my first article:

Extension and counter-extension by the pully, or JARVIS’S apparatus, in the usual direction, succeeds, only by lacerating much more extensively, if not actually tearing the ligament completely asunder, before the head of the bone will ride over the edge of the cavity.

Dr. MARKOE, who adopts Dr. REID’S views relative to the nature of the impediment, seems to have had a similar illustration in one of his experiments, and, like Dr. R., fails to see that the untorn portion of the capsular ligament forms an “impediment.” His experiment is as follows:

“I removed all the muscles, leaving the capsular ligament only, and then endeavored to dislocate the head of the bone. I first tried adduction, and carried the limb so forcibly over the abdomen that the knee touched the anterior surface of the thorax, but without producing luxation. In making more violent efforts in the same direction, the cervix fractured, or rather cracked across within the capsule, and soon after the ligament itself tore across at its superior and posterior part, just opposite the point of yielding of the cervix. The laceration was directly across the ligament, and occupied about one-half of its circumference.

As soon as this took place the dislocation was easily effected. The neck of the femur and the trochanteric portion of it were now seen to be kept in their place by the untorn portion of the capsular ligament, which acted as a sort of fulcrum, upon which, by using the limb as the long arm, we could make the head, as the short arm, move about in any direction upon the surface of the dorsum of the ilium."

Does the untorn portion of the capsular ligament form an impediment? My own views are, that it constitutes the *chief*, if not the *only* opposition to our efforts at reduction. If it is urged that, in this view, I am exclusive and ultra, I ask only that before such judgment is passed, the experiment of removing all the tissues about the joint, in the manner detailed above, may be made.

Thus much was published in the *Peninsular Journal*; I now would add—

That the practical rule to be drawn from the doctrines here laid down, is one which will apply to all dislocations; but in those of the shoulder, and particularly those of the hip, it is of almost imperative importance. It is this: For the easy reduction of a dislocation, *the dislocated limb should be placed in exactly that position which characterized it at the moment of the escape of the joint end from its normal position in the joint.* For instance, in the upward and backward dislocation of the head of the femur upon the dorsum of the ilium—which almost invariably occurs from force applied either to the foot or knee when the limb is in an adducted position, whereby it is more powerfully adducted and carried across its fellow, until the head forced up the inclined plane which is presented to it by the upperward and backward portion of the acetabular walls, and against the now tense upperward and backward portion of the capsular ligament, rupturing that ligament, and escaping from the acetabulum, while the limb is in this greatly distorted position,—the indication is to carry the limb across its fellow until it attains the position in which it was at the moment

of escape; the pelvis being now firmly held by an assistant, the limb, with a decided rotation inward, is easily lifted into its place.

This internal rotation, at the moment of lifting the limb into its place, is of great importance, and is illustrated by a more recent experiment than those previously detailed. This experiment also shows that though the untorn portion of the ligament constitutes, perhaps, the most important, it is not (as I formerly supposed), the *only* obstacle which we have to overcome in reducing this dislocation. The dense outer portion of the fascia lata, in this distorted position of the limb, is put also greatly upon the stretch, thereby pressing firmly down upon the trochanter major, and causing the head of the bone to hook closely against the acetabular walls. Internal rotation, by depressing the trochanter, relieves this pressure, and thus eludes the last agent opposing our efforts at reduction.

The first experiment illustrating this fact was made in the dissecting rooms of the University during the winter of 1857-8, by a young gentleman who was then a candidate for graduation, and is now Dr. WILLIAM BOVIE. The experiment, which was original with him, does credit to his investigating ability and disposition, and was as follows: A dissection was made, removing the integument and superficial fascia, preserving, however, as far as possible, the fascia lata and all the muscles about the hip. The capsular ligament was completely removed, and the round ligament was divided. A dislocation was now easily effected by carrying the limb across the other, and pushing against the knee. A far less degree of distortion, however, characterized the mal-position of the joint than when the anterior and inferior portion of the ligament is left attached to the bones. Extreme efforts, by extension and counter-extension, in the old way, failed to effect reduction; but both REID'S method, and that practiced by my-

self, readily replaced the dislocated bone. Observation during the several steps of both methods of procedure, detected the fact above stated, that the pressure of the outer portion of the fascia lata upon the trochanter major, by forcing the head of the femur down, and causing it to hook against the acetabular walls, prevented reduction. Internal rotation completely relieved this pressure, and eluded this opposing agent.

During the past winter, my prosector, Dr. WILLIAM LEWITT, made the following dissections for me, to use in my class experiments: The dissection used in former experiments—viz. removing all the tissues about the joint, and also the upper and outer portion of the capsular ligament, and severing the round ligament—was made upon one side; upon the other, an incision was carried through the integument and superficial fascia along the inferior border of the gluteus maximus, and an intermuscular passage to the joint was effected, through which all the capsular ligament was cut away, and the round ligament severed. The wound was then closed with a continued suture. Here, as in Dr. BOVIE'S experiments, there was no capsular or round ligament upon one side, all other tissues remaining intact; while, upon the other, all tissues, except the anterior and inferior portion of that ligament, were removed. Owing to a mal-formation of the joint in the subject upon which this dissection was made, our experiments were not usually satisfactory, yet they were confirmatory of the doctrines which are above expressed. Dislocation could not be effected upon either side, without very marked adduction, though, owing to the peculiar mal-formation of the joint, less than the usual amount of distortion was required to produce dislocation; and also in effecting reduction, it was not necessary to carry the limb across its fellow at so high a point as usual. It was necessary, however, in order to effect

the reduction with facility, to *place the limb in the same position which it occupied at the moment of the escape of the head of the bone from the socket*, thus confirming the general principle above laid down.

Both limbs were also luxated, and an attempt made to place them parallel to one another, on a line with the trunk. The limb upon which the capsular ligament was dissected, was easily placed on a line with the body, owing to the yielding of the muscular tissue; the other, upon which only the anterior and inferior portion of the capsular ligament remained, was brought to a line with the trunk only by tearing the ligament completely asunder.

From these experiments we learn, That if all other tissues are removed, the undissected portion of the capsular ligament will cause the limb, in the luxation upon the dorsum ilii, to assume the direction and position so characteristic of that accident; that if now an attempt be made to place the limb parallel with its fellow, on a line with the trunk, that attempt will be unsuccessful until complete rupture of the remaining untorn portion of the ligament takes place; that an attempt to reduce by the old method of extension and counter-extension will prove ineffectual without the exercise of a terrible power, and the complete laceration of the capsular ligament; that by placing the limb *in the position which it occupied at the instant of escape*, reduction is readily effected.

We learn further, that if the ligaments be cut away, leaving all other tissues, and the head of the bone be dislocated upon the dorsum ilii, and reduction be attempted by either REID'S method or my own, that the outer portion of the fascia lata will, by its pressure on the trochanter major, prevent success until, by internal rotation, that difficulty is avoided. Hence, we establish the following general rule:

In *all* dislocations, place the limb in just *the position*

which characterized it at the moment of escape, and the reduction will then be easily effected.

We further lay down the following special rules:

In the luxation upon the dorsum ilii, the patient lying on his back, carry the limb across its fellow at a point corresponding with the union of the middle with the upper third, rotate inwards, and the pelvis being fixed by an assistant, the head may now be readily be drawn into its place.

In the dislocation into the obturator foramen, when extension is being made in the usual way at the upper part of the thigh, the limb should be *abducted* instead of *adducted*, as universally directed; *abduction* conforms to the general rule laid down above, and relaxes the upper and untorn portion of the ligament.

In the forward dislocation upon the pubis, while extension and counter-extension are being made in the usual manner, the limb should be rotated externally; this relaxes the posterior and untorn portion of the ligament.

In the backward luxation into the sciatic notch, the limb should be carried across the opposite groin, and rotated internally, previous to any extension being made.

In the luxation of the humeral head into the axilla, the arm should be drawn upward by the side of the head, as directed in my first article.

In the forward dislocation upon the thorax, the arm should be rotated externally before extension is attempted.

In the luxation backwards upon the dorsum scapulæ, the arm should be rotated internally before extension is commenced.

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