CLINICAL LECTURE ON COLLES'S FRACTURE OF THE RADIUS.

DELIVERED AT

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GENTLEMEN,—Here is an elderly female who has just been admitted into my clinical wards, and who has sustained an injury of the left forearm. She tells us that her feet slipped on "a slide", and that she fell backwards and towards the left side, putting her hand down obliquely behind her. She fell with violence, the "hilt" of her hand coming into contact with the ground; and her hand was violently extended and bent backwards on the forearm. She was much shaken. She was conscious that something had snapped in her forearm, and she found that she had lost the use of it. She also suffered much pain.

You will observe how she nurses the injured arm with her right one, and holds it across her body; how she inclines her body to the left side; how her pained limb is held between pronation and supination; and how, when I ask her to supinate it, she turns the whole extremity from the shoulder, and that evidently with pain. We will make her sit down and place her arm on her knee, so as to examine it more carefully and with less inconvenience to her. The fingers are bent; the wrist-joint is round (as you see by comparing it with its fellow); the back of the hand and wrist rise up unnaturally in a rounded mass, and no longer retain, as on the other hand, the level of the back of the forearm. This projection passes higher than the level of the carpus, and then suddenly subsides into a hollow, which is manifestly more marked towards the radial margin of the forearm. Then, again, at a level with the joint, but on the anterior surface of the limb, there is a deep and well-marked sulcus with a projection on its proximal side; which projection, however, shades off insensibly into the anterior surface of the forearm. Then the styloid process of the ulna is very prominent. If we turn the forearm on its ulnar side and hold it up, you see how there is a concavity on the radial margin, and the projection of the styloid process of the ulna on the other side becomes also very evident. Observe, too, the curious twist of the hand, which seems to be made up by a drawing of the carpus towards the radial side, and of the bent fingers in the opposite direction. She tells us the pain is very acute, and that chiefly at a limited spot near the wrist on the shaft of the radius, and also below the styloid process of the ulna.

Now, looking at the whole picture here before you, I am sure your impression would have been, if I had not before pointed out the meaning of the signs, that we were dealing with a dislocation of the carpus. The great deformity, the kind of violence, the fixity of the parts, all irresistibly suggest dislocation; and this is the common error into which practitioners fall regarding this injury.

This is the fifth accident of this nature that has lately presented itself in my wards, and that has arisen from the slippery state of the streets during the last few weeks. The local newspapers mentioned the other day that a bone-setter in the neighbourhood had occasion to treat between twenty and thirty "dislocations" and fractures of the forearm during the same period. Is it not curious that here we have never seen a dislocation of the carpus?

In one of our other patients, you remember there was no deformity at all. It was only by manipulation that the existence of a fracture of the radius was made out. In that case, the injury was occasioned by direct violence; which, however, very rarely gives rise to a fracture of the radius alone—the ulna escaping.

Let us, however, "set" the fragments which have been displaced in the fracture before us, and apply what apparatus is required; and I will afterwards tell you something more about the nature of the injury.

(The patient was then put under chloroform, the exact seat of fracture defined, and the fragments replaced in their normal relationship by traction over the surgeon's knee, while the forearm was steadied by an assistant. The patient's hand was, in the first place, held between supination and pronation; the wrist-joint flexed; and the thumb of the surgeon's right hand pressed steadily on the displaced lower fragment, so as to push it downwards and forwards. The patient's hand was sometimes drawn towards the ulnar side; and the forearm was also for

a time supinated, so as to assist the replacement of the lower fragment. No crepitation was felt; but the removal of deformity showed that the end aimed at had been accomplished. The patient was now allowed to recover from the chloroform; the surgeon, however, firmly holding the fragments of the radius in place till he had applied the poroplastic splints afterwards described. The arm was then placed in a sling, and the patient, after resting in the ward for a few hours, was made an outdoor attendant. When she was seen before leaving, she expressed herself as quite relieved from the pain she had before suffered.)

The fracture with which we have been dealing, as you know, is commonly known in this country as "Colles's fracture"; and about it probably more has been written than any other fracture in the body. This is due to its great frequency and to the difficulties which have surrounded its successful treatment. Many an anxious moment has it occasioned to surgeons, and much unmerited blame has it caused. We have ample proof in the cases admitted here that it is very far from being well understood even now, and that errors of diagnosis and treatment often occur regarding it.

It is said—and I do not deny the statement—to occur chiefly to elderly females. Of the last thirty-two cases which have been treated in my wards (and these are the only ones of which I have at the moment careful records), only ten were females, and only nine of the whole number were over fifty years of age. Nine were below twenty years of age. Five patients suffered from a similar fracture in both arms. No conclusions can, of course, be drawn from so small a number. The usual explanation given for the fracture occurring at that part and in the old, is the interstitial changes which take place in the bones in advanced life; the preponderance of cancellous bone; and the existence of a slight bend in the radius at the place—about an inch or a little more from its lower end—where this bone gives way. It takes no great violence, applied in the special manner I will directly describe, to break the radius in an elderly person; but it also gives way in strong adults when the force is adequate to overcome the resistance.

Further, the violence which commonly occasions this accident is, as I have said, usually applied indirectly; *i.e.*, to the hand when, in falling, the "hilt", as this woman called it, comes into contact with the ground. The hand is then strongly extended, and the weight and momentum of the body come down on the arm. In most of the cases I have seen, the hand is put obliquely backwards and to the side, as this woman did. It is said that occasionally the hand is bent forwards, and then that the displacement of the lower fragment is in the opposite direction to that usually found. I will show you at college a dissection by the demonstrator, Dr. Allan, in which that displacement is well seen.

The usual explanation of the fracture is that it occurs by *contre-coup*, as Goyrand called it. The hand rests on the ground, while the radius is crushed between its resistance and the weight of the body in falling. The radius, being the only bone which directly articulates with the carpus, of course receives the whole shock. I will show you at college an arm in which this fracture was produced artificially by a method described by Nélaton. After separating the forearm at the elbow-joint, and sawing off the head of the ulna, so as to make it and the radius of the same length, it was held almost upright; the hand being extended, and the first row of carpal bones firmly pressed on a table. A heavy mallet was applied twice with considerable force to the head of the bones of the forearm, however, before the radius gave way, which it then did at the exact place where we usually meet with Colles's fracture.

Several years ago, a young man was brought to me at the infirmary suffering from this fracture, which had been very shortly before produced by an older and stronger man, with whom he had been trying to contend in a common test of strength by placing the elbows on a table, interlocking the fingers, and then trying to press back each other's forearm. The younger lad would not confess his discomfort till his hand was very violently extended. He then felt something give way, a sharp pain arose in his radius, and his forearm assumed a deformed appearance, and he found he could not use it. He had a well marked Colles's fracture. This case caused me to try some experiments on the dead, and I have now in my class-room a well defined "Colles's fracture" produced lately at the City parish mortuary by imitating this mode of applying the violence. With the aid of my friends Drs. Robertson, Moffat, and others, I had the cadaver of an elderly woman placed standing by the side of a table, while the right hand was held firmly, so that the hilt rested on the edge of the table and the fingers projected. I interlocked my fingers into those of the subject, and bent its hand backwards on the forearm, *i.e.*, extended the hand quickly. The radius broke very easily and with but little force applied, just an inch below its lower end, and the characteristic deformity of Colles's fracture appeared.

I next repeated an experiment which, I think, was suggested by Bonnet. Separating and placing the forearm as in the first experiment, but cutting the radius at its upper end considerably shorter than the ulna, so that the mallet could not strike it, I found that, after several violent blows on the ulna, the radius broke as before. Neither in this nor in Nélaton's experiment was the bone easily broken, and in neither was the hand extended to the same degree as in the experiment I have before described by extension alone.

Now the apparent explanation of the mechanism of the fracture we are considering is that it is produced by the sudden and violent wrench on the strong anterior radio-carpal ligament, and that it is the extreme extension of the hand which causes this wrench. The case I mentioned to you, which presented itself to me some years ago, would seem to confirm that explanation. That it can be produced easily by violent extension of the hand, there is no reason to doubt. If the arm of a strong adult be so treated, I am, however, far from sure that the same effect would follow. In that case, the anterior carpo-radial ligament is torn; but it is, in my experience, almost impossible to cause Colles's fracture experimentally in such subjects by any method we can adopt. But if you try it on the arm of an elderly subject, you will be surprised how easily it is accomplished.

In Colles's fracture, the lower fragment is displaced upwards and backwards, and it makes a sort of rotation on its long axis, so that the articulating surface is inclined backwards. The oblique direction thus assumed by this fragment allows the lower end of the shaft to penetrate and occasionally become impacted or fixed in the posterior surface of that lower fragment. The lower fragment, too, is occasionally split into pieces (as in a specimen in my possession) by this wedge-like action of the shaft, and then the implication of the articulation is such as to give but a faint chance of restoring its function. The epiphysis is very rarely separated without carrying a portion of the shaft with it, and there are no distinctive signs by which a separation of it can be differentiated from an ordinary "Colles". There can be no doubt that the styloid process of the ulna is often separated when the radius is broken, and that by the wrench which it receives from the triangular ligament; but its frequency has been, I think, exaggerated by Nélaton and others. When Colles's fracture is compound, the ulnar styloid process is often exposed. If there be no wound, it is not always easy to be sure of the condition of that apophysis.

The degree of deformity present in any case is, I think, chiefly determined by the amount of violence applied, and not by muscular contraction. It was at one time supposed that the interosseous membrane influenced the displacement; but no such structure exists where this fracture is situated, and its fibres, where it does exist, run downwards from the radius towards the ulna—an arrangement which serves in a very essential way to deaden impressions coming from the carpus. It has been to the extensors of the wrist and thumb that most activity has been ascribed in producing displacement; but it has always appeared to me impossible so to explain the result. The upper fragment is, however, strongly pronated by the rotators after the continuity of the bone is broken; that is, if the pronator quadratus retain a connection with the upper fragment alone, and do not (from the position of the fracture) have a hold on the lower fragment also.

To overcome these displacements, then, when they are considerable, we require to use manipulation under chloroform. In not a few cases, as was before said, no displacement exists at all. The periosteum is probably not torn, and all we require for the treatment is such apparatus as will keep the fragments in juxtaposition till they unite. To replace the lower fragment in other cases like our present patient, various movements must be employed. The surgeon's knee makes a capital fulcrum on which to rest the ulnar side of the wrist. Taking good hold of the patient's hand, and alternately flexing, extending, and drawing it to the ulnar side, while the thumb of the surgeon's disengaged hand (the patient's forearm above the seat of fracture being fixed by an assistant) is made to press the lower fragment directly into its place and proper axis, is the manoeuvre which is usually required. Sédillot, from his dissections and observations, holds that it is in supination alone that the fragments are properly adjusted, and he has shown us the advantage of so placing the forearm, at least during "setting".

Having reduced the fracture, we next wish to apply such apparatus as may retain the normal relationship of the fragments; and this should be done at once, care being taken to adjust the splints before we let go the part, as displacement readily recurs. As to position during treatment, on the whole, that between pronation and supination suits best. It is the most comfortable and least inconvenient; and if the other points in the management of the case to which I am going to allude are carried out, there need be no anxiety as to that position causing any complication. Dr. Gordon of Belfast, whose splint is here, places the hand in a prone position; while Sédillot advocates supination as the only one which

should be employed. Both of these methods demand special and expensive apparatus, and it is always desirable to avoid all appliances which are not easily procured and cheap. This splint ("the pistol") was introduced by Dupuytren to carry out the lateral traction by which he supposed the displacement was best overcome; and it is an apparatus still in much use. Its weight and clumsiness are serious objections to it; and the pressure it exerts, as well as the fixing of the fingers, are still more open to cavil. For some years, I used this splint, in which

there is a ledge on which the ulna rests, and a hollowed out portion (C), which allowed the hand to be well drawn downwards. It gave better results than the common "pistol"; but it is so heavy, expensive, and inconvenient, that I have abandoned it. The traction, also, to the ulnar side, which it effects, I believe to be both unnecessary and often hurtful. Here, again, are Gordon's splints for each hand (shown). They are very ingenious, and are good in practice; but they are expensive, and very difficult to procure. A different splint, also, is required for each hand, which is a serious objection; and various sizes, also, are needed to fit accurately different sized arms. I will not take up your time by showing you the appliances of Nélaton and others, but draw your attention to the very simple apparatus you saw me apply to our present patient's arm. It is made of poroplastic, but of course any material which possesses strength and is capable of being accurately moulded to the part might be employed. Two pieces are used. The anterior splint is rather less in breadth than the forearm, and is long enough to extend from the cushion of muscle at the base of the hand (on which its lower end must rest) to half way up the forearm. The posterior splint of this shape (see figure) is applied, so that C D rests on the knuckles, D E

on the ulnar edge of the forearm, while A B is folded (while the poroplastic is soft) over the radial margin of the arm, and meets the edge of the anterior splint. The projection at A lies above (higher up the arm than) the part where the muscles of the thumb begin to rise, i.e., at the lower end of the styloid process of the radius. As the folding edge (A B) can be bent either way, this little splint can be applied to either arm. When it is to be employed, the hand (not the fingers) should be bandaged with a common roller (figure-of-8 of the carpus); and, after the "setting" has been carefully accomplished in the way before described, the splints, softened by being held to the fire or by being soaked in boiling water, are applied before and behind, and firmly held in place by the surgeon till they become hard, when of course they will retain an accurate mould of the part. The edge A B is adjusted at this time over the margin of the radius. The moulds are then removed (the surgeon the while holding the bone in place), and a thin layer of cotton-wool is put within each splint. When replaced, the lower part of the forearm is all enclosed, except the ulnar margin, where no pressure should be applied to the styloid process. A roller is next put outside of the splints, as far as they reach (half way) up the forearm. It will be observed that no bandage is applied next the skin above the wrist. The patient is told to begin at once to move the fingers freely, and to return in a week to have the apparatus looked to. These splints are small, light, easily concealed in the coat or muff, cause very little annoyance at night, and are very effective, as you have had opportunities of seeing in cases already treated. They cost a mere trifle, are prepared in a moment, fit anyone, are adapted for either arm, and allow motion in the fingers from the outset. This matter of early movement I consider a very important one. The fingers and wrist stiffen very quickly, and require early and decided looking after. I examine all my patients in a week. I remove the splints, and, holding the fragments of the radius firmly at rest with one hand, I communicate movements with my other hand to the patient's wrist and fingers; and, if much pain be thereby produced, and the patient be nervous and weak, I do not hesitate to employ chloroform, so as to enable me to do this effectively. The splints are re-applied, and in another week I myself repeat the movement of the wrist, and now cut off the part of the posterior splint which extends from the wrist-joint to the knuckles, and inculcate movement of the wrist-joint as well as of the fingers; and I see that this is done. In three weeks from the accident, under ordinary circumstances, and four weeks at most, I dispense with splints altogether, and apply only a light flannel bandage. Now, you will be able to observe for yourselves how successful this is

in restoring the shape, firmness, and function of the part, and how satisfactory a mode of treatment it is. I quite admit that in the case of delicate feeble women, who recover badly from any accident, and who have suffered, probably seriously, from the shock of the fall, and who do nothing to help themselves or carry out your instructions, the results are not always so rapid or so satisfactory as I have shown you in the patients with whom we have had to do lately; but these bad cases are the exception, and will, I think, if you strenuously carry out the early and effective setting and passive motion, become very rare in practice. The loss of their patient's confidence, which surgeons frequently sustain in dealing with Colles's fracture, is due chiefly to hesitation in recognising its true nature, the failure to reduce the fragments properly, and the too long fixture and consequent rigidity of fingers and wrist, which result from the commonly followed mode of treatment.

I do not find that starch, paraffin, or plaster bandages are desirable in managing this fracture, seeing that they require both time and trouble to remove them. As the poroplastic moulds itself very accurately to the part, no undue pressure is caused, and so no pain.

Many surgeons would object to the application of such manipulation as that which I employ when there is any impaction of the fragments, fearing the evil effects of the disjunction of the fragments. I have never found any harm to result, and I cannot recall at present any case in which replacement was impossible. I am aware that such cases have, however, been recorded. I have heard of instances in which, even after the soft parts were removed, the lower fragment could not be got into place; and in one specimen to be seen in the Royal Infirmary Museum, a detached fragment is said to have occasioned this. If I found a tendon so placed and so tense as to appear the cause of the difficulty, I would consider the propriety of dividing it subcutaneously. Without complete replacement of the fragments, deformity cannot be removed, and function quickly and satisfactorily restored.

But, to draw these remarks to a close, I may say that the three injuries with which Colles's fracture may be confounded are sprain and dislocation of the carpus, and transverse fracture low down of the bones of the forearm, with displacement backwards of the carpus and lower fragments.

As to the confusion with sprain, it is when neither deformity, crepitation, nor unnatural mobility are apparent, and a certain amount of power remains, that fracture is supposed not to have occurred. As, too, in such cases, the head of the radius may rotate when the hand is acted on, it is concluded that the continuity of that bone remains intact. If the pain be concentrated near the lower end of the radius, and below the styloid process of the ulna, and be not diffused over the articulation; and if on making decided extension of the hand, we find unnatural mobility—a hollow and a motion—a little way above the lower end of the radius, then it is fracture, and not sprain. It is, however, to be remembered that indirect violence does not readily break the bone of a strong adult; and that in such persons the ligament of the joint may be thus seriously stretched or ruptured. Still, the test by extension will clear up the question of fracture. In no case can we depend on detecting crepitation—in fact, it is the rare exception to find it, unless much and unjustifiable force is used.

As regards dislocation, you may dismiss it altogether from your minds. If such an accident ever occur (and it is extremely doubtful if it does without a wound, and, in fact, without complete disorganisation of the articulation), it is so seldom, that many of the most experienced hospital surgeons have never met with it. Men of limited experience see it, as they suppose, frequently; and most practitioners in the early part of their career constantly come across it. I have myself seen three cases within the last month which were said by medical men of considerable experience to have been dislocations. They were all well-marked examples of Colles's fracture, with great displacement. It is mainly to Dupuytren that we owe the recognition of this important clinical fact. Up to a certain period of his career, he believed in dislocation of the carpus like others; and, at the end of his unique experience, he denied its occurrence altogether. Malgaigne, an authority hardly, if at all, less weighty, almost goes the same length. What Dupuytren never saw, you are not likely to meet with; so do not suppose that, because there are projections and hollows before and behind, and fixture and distortion, therefore it is a dislocation. I cannot describe to you the appearances of dislocation of the carpus from personal observation, as I never saw it; but I would imagine that the shape and size and relative position of the projections (the articular surfaces) behind and in front would be very different, and occasion a very much more marked deformity in dislocation than we ever have it in Colles's fracture, and the styloid process of the radius would continue to project lower than that of the ulna, in place of being shortened so as to become of the same length, or even lie higher up the arm than the styloid process of the ulna, as it is in fracture. In fracture, moreover, the margins of the arm

are deformed as well as the anterior and posterior surfaces, as they cannot be in dislocation, and the radius can be shown by measurement to be shortened along its posterior surface. The twist of the hand, the unnatural mobility at a point of the radius when the hand is much extended and the chief seat of pain, will all conjoin to show you what is the real nature of the injury. In dislocation, there must be considerable shortening of the whole forearm (both bones), if we measure from the knuckle of the middle finger to the olecranon.

Transverse fracture of both bones low down, with displacement of the carpus and lower fragments, might have (and I believe has) been mistaken for dislocation; but it could hardly be taken for Colles's fracture or Colles for it. The lost relationship of the styloid processes to the carpus, the measurement from the knuckle to the upper part of the posterior projection and to the olecranon, the ease of reduction and redispacement, the crepitation, and also in most cases the kind of violence applied, will readily distinguish them.

Finally, it may be put thus for practical purposes: that if a person—especially an elderly individual—fall with violence on the hilt of the hand, and pain low down in the radius come on and continue—if the function be embarrassed, and if, on extending the hand and placing the finger over the radius about an inch from its lower end, we find the bone notably sink and the pain augmented—we may conclude it is a Colles's fracture we have to deal with, even though there should be no marked deformity and no crepitation. In any case of insuperable doubt between fracture and sprain, treat it as a fracture.

SUCCESSFUL CASE OF BATTEY'S OPERATION, OR OÖPHORECTOMY.

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IN the case of a young operation such as Battey's, it is due to him whose enterprise initiated its performance, as well as to the profession, and to those whose suffering we hope to relieve, that each case should be fully and accurately reported, in order that we may arrive at a right conclusion as to its indications, its safety, and its justifiability.

In the following case I will give, as briefly as possible, a sketch of the former history and treatment; then, more fully, an account of the operation, with a description of the ovaries themselves; and afterwards will conclude with such remarks as the case and the operation suggest.

A. B., aged 40, was admitted into the Hospital for Women, February 10th, 1879. She first became an in-patient on March 20th, 1874. The catamenia began at the age of thirteen, and were regular till three years before her admission; they were scanty and painful. For one year, she had suffered from constant retching, with a dull aching pain in the right groin; there had been profuse leucorrhœa for the past three months. On vaginal examination, the uterus was found to be natural in direction; the uterine sound passed two and a half inches, with pain at the fundus. There was hyperæmia of the cervical canal. A seton was inserted above the pubes; the general treatment consisted of tonics, morphia, Indian hemp, iodine externally, and as a vaginal plug. She left the hospital on June 6th, slightly relieved, but the dysmenorrhœa still persistent.

In Dec. 1874, she became an out-patient, and had a galvanic stem introduced with some temporary relief.

In 1875, A. B. was again admitted to the Hospital on March 4th, and remained in till May 1st. She suffered from severe pain in the right inguinal region, which was much increased at the periods, and especially for one week before each appearance; there was also severe pain during defæcation. There was tenderness on deep pressure over the ovary, and the pain was increased on the least exertion. During her stay in the hospital, a fissure of the rectum was operated upon by Mr. Reeves. The chief treatment was liniment of belladonna and chloroform, which gave some relief, tonics, pulsatilla, belladonna, and arsenic. The cervix uteri was scarified and leeched, and Graily Hewitt's cradle pessary was worn for a time with benefit.

In 1877, she was admitted on Oct. 22nd, under the care of Mr. Reeves, for a fissure of the right anterior aspect of the anus, which he divided. A vaginal examination was made on Nov. 13th. The os uteri was directed towards the perineum. The uterine sound passed two inches and three quarters. The right ovary could be got between the fingers in the conjoined examination; pressure on it produced pain, which was referred to the upper part of the sacro-iliac synchondrosis.

Nov. 27th. The cervix was incised high up with the hysterotome, and Dr. Wynn Williams' stem and shield were inserted. She was discharged Nov. 28th.