The Classic

An Account of a Case of Fracture and Distortion of the Pelvis, Combined with an Unusual Form of Dislocation of the Femur

Charles Hewitt Moore FRCS

Abstract This Classic Article is a reprint of the original work by C.H. Moore, An account of a Case of Fracture and Distortion of the Pelvis, combined with an unusual form of Dislocation of the Femur. An accompanying biographical sketch of C.H. Moore is available at DOI [10.1007/s11999-012-2424-2](https://doi.org/10.1007/s11999-012-2424-2). The Classic Article is © 1851 and is reprinted from Moore CH. An account of a Case of Fracture and Distortion of the Pelvis, combined with an unusual form of

Dislocation of the Femur. *Med Chir Trans.* 1851;34:107–119.

© The Association of Bone and Joint Surgeons® 2012

Richard A. Brand MD (✉)
Clinical Orthopaedics and Related Research,
1600 Spruce Street, Philadelphia, PA 19103, USA
e-mail: dick.brand@clinorthop.org

The subject of Deformities of the Pelvis is one which has met with very full and satisfactory investigation. The causes from which they arise, and the mode in which each cause produces its proper consequent deformity, have been so well ascertained, that it can be at once determined by some salient characters whether any particular specimen be an instance of congenital malformation, or of deformity from disease, or from injury. When, for instance, one of the lateral masses of the sacrum is wanting, and its central portion is articulated, or rather ankylosed, with the adjoining ilium, we can clearly trace in that congenital fault in the formation of the sacrum, the cause of the approximation of one acetabulum to the promontory, and of the whole os innominatum to the mesial line, as well as of the straightening of the ilio-pectineal line, the altered axis, the diminished capacity, and all the other one-sided distortions of Nägele's oblique pelvis. The deformity in cases of fracture of the pelvic bones, is usually limited to that occasioned by the displacement of the fragments and the presence of the reparative callus. That remarkable compression of the pelvis, which is sometimes so extreme that the promontory of the sacrum and the base of the acetabulum coalesce, points clearly, through the softening of the bones, to Rickets or Mollities ossium as its cause.

Particular deformities, again, can be traced to causes extraneous to the pelvis itself; sometimes to the extremities below the pelvis, sometimes to the spine above it; and in the latter instance it is interesting to observe the constancy of the relation between particular deformities of the pelvis and particular curvatures of the spine,—a relation that is maintained whether the cause be a curvature of the spine which leads to the distortion of the pelvis, or the deformity commence with the pelvis and extend subsequently to the spine.¹

Examples are exceedingly rare, however, in which more than one cause of deformity exists in the same pelvis; and there is, I believe, no instance in which so many of the principles of deformity are illustrated as in the accompanying specimen. By these reasons, as well as by the extensive nature of the injuries it has sustained, I am induced to lay an account of it before the Society. For the opportunity of doing so I have the pleasure of expressing my obligation to Dr. Seth Thompson.

James Thomas Horsfield, a stone-sawyer, was crushed beneath a heavy piece of timber several years before death. At the age of 60 he died in the Middlesex Hospital, under

¹ Rokitsansky.

the care of Dr. Seth Thompson, of advanced disease of his heart and kidneys; and the following circumstances were noticed at the post-mortem examination, which add to the interest of the disease in his pelvis. For some of these particulars I am indebted to the careful and accurate observation of Mr. Sibley, a pupil of the Hospital, who was present at the examination.

The skull was in few parts less than half an inch in thickness. The processes at its base were blunted, and the crista galli projected upward as a great knob of bone. In the section presented to the Society, the enlargement is seen to be due to the expansion of the whole bone, which, notwithstanding irregular increase in the bulk of the separated fibres and laminae, remains altogether porous, and presents no distinction of compact and diploetic structure. The outer surface is comparatively smooth, though it is unusually porous; the inner is roughened by the deposition of uneven masses of bone upon it, and by the consequent increase in the depth of the grooves for vessels.

The vertebrae were rough and porous; and a few exostoses projected from the margins of their bodies. On making a horizontal section of the intervertebral substances, the concentric circles were seen to be composed of calcareous matter and soft cartilage alternating.

The pelvis and adjoining bones exceed their natural weight by about one half. Like the skull, they are thick and coarse; their processes are bulky, and their crests blunted. The upper part of the left femur is thickened by the deposition of new bone upon its exterior. The right femur was comparatively healthy.

Moreover, extensive disease was discovered in the arterial system. The aortic and other cardiac valves were calcified; and the aorta, from the heart to its bifurcation, was covered with patches of calcareous deposit. The intercal carotid and the basilar arteries were the most diseased; they were so brittle as to break down under the finger.

The pelvis is broken into several fragments; and in such a manner that its anterior portion is completely separated from the posterior. The fracture on the left side passes through the acetabulum, that on the right side just in front of it; and the ischio-pubal ramus is broken on both sides.

On the *left* side the innominatum is broken into three fragments, which correspond almost precisely with the segments of which the bone is composed in early life. For the lines of fracture, as they traverse the acetabulum, divide it in the proportions of rather more than two fifths, which are severed with the ischium, and rather less than two fifths with the ilium, whilst the other fifth remains with the pubes.

The head of the femur has been driven between the fragments of the innominatum, and lies entirely within the pelvis. It is driven so far inward that the great trochanter no

longer projects beyond the crest, but touches the outer surface, of the ilium; it has even worn away, by its friction, the prominent upper margin of the acetabulum, and formed a shallow excavation on the outer surface of the ilium, into which it fits. The attenuated articular edge of the ilium rests upon the top of the neck of the femur close to the trochanter. The body of the ischium is displaced inwards, and encroaches on the cavity of the pelvis.

Although the fragments of the innominatum are enlarged by considerable quantities of callus, yet no osseous union of the fractures has been accomplished. An incomplete new socket has been formed by the articular portions of the ischium and pubes, which expand into broad cup-shaped plates around the displaced head of the bone. A large gap, however, exists at the upper and inner part of the new socket, in which the head appears and partly projects; and the ischium and pubes do not meet below the neck at all. So firmly, nevertheless, was the femur bound in its new position, that it could not have been dislodged without the division of the thick fibro-cartilaginous substance which united the fragments together.

The proper structures of the joint were nearly destroyed. The whole of the cartilage had disappeared; and the articular surfaces of the macerated fragments are everywhere rough and porous and present only on the ischium any of the characters of an articulating bony surface.

The *right* os innominatum is broken into two fragments by two fractures, which extend into the thyroid foramen. The upper fracture is situated just in front of the acetabulum; its extremities are much enlarged by a deposition of callus, but have not united, and they meet by a ball-and-socket shaped surface,—the broad and hollowed pubic fragment embracing the convex and enlarged portion next the acetabulum. The surfaces being very rough, and having been held together by fibro-cartilage, were capable of very little motion over one another.

The fracture of the ramus of this (the right) bone severs the ischium from the pubes precisely at the line of their original junction; that of the left innominatum was broken nearer the ischium. Though their broken surfaces are rounded off and covered with compact bone, yet neither on the right nor on the left side has the fracture of the ramus been effectually repaired.

Thus, on the right side the innominatum is broken *in front* of the acetabulum, and has not reunited, but the hip-joint is uninjured: on the left side the fracture breaks *through* the acetabulum, and has also not been repaired; while the articulation is constituted by the ilium and the top of the shaft of the femur, that is, by the highest and innermost part of the old acetabulum, and the lowest and outermost part of the upper end of the femur. These injuries have, of course, given rise to considerable changes of shape and relative position, which differ on the two sides; and

Plate I Front view of the Pelvis and left Femur, described in Mr. Moore's paper.

they have been increased in degree by the softness, which has been brought on by disease, of the bones.

On the *left* side no material change has taken place in the ilium, which was the only part concerned in locomotion on that side. For, though the weight of the body was conveyed to the left lower extremity through the shaft, instead of the head and neck of the femur, yet it was conveyed, as it naturally is, by the posterior thickened portion of the ilium. The left ischium is merely displaced, and not altered in shape.

On the *right* side, however, other changes have taken place subsequently to the occurrence of the fractures. Two of these changes are principal or fundamental ones, upon which the production of the rest has depended.

The os innominatum having been fractured just in front of the acetabulum, and across its ischio-pubal ramus, and neither of its fractures having reunited, it has missed the support which it usually obtains from the inflexibility of the osseous pelvic circle, and has gradually been bent by the weight it had to transmit from the spine to the hip-joint; it has yielded just external to the sacro-iliac synchondrosis. The acetabulum, therefore, is elevated towards the promontory of the sacrum; and the ischial ramus (the other anterior extremity of the fragment) is raised an inch above the corresponding ramus of the pubes. Hence the

antero-posterior dimensions of the whole right side of the pelvis, of the inlet, the outlet, and the right sacro-sciatic notch, are diminished to the extent to which the acetabulum and ischium are raised; and the ilio-pectineal line being unnaturally bent at its posterior part, is straighter than natural in front, and thrusts the symphysis pubis to the left of the mesial line. This last deviation is less than it would be, were not the line bent again at an angle in the contrary direction to its posterior curvature. For, from the part where the body of the pubes is broken, the linea ileo-pectinea runs forward nearly parallel to the opposite pubes, instead of forward and inward, to the crest. And yet, as both pubes form nearly a right angle at their spines, the crest is, as usual, a continuous transverse line. But all these distortions are exaggerated by a second fundamental change, which affects the sacrum. The right limb, having a sound hip-joint, must necessarily have been more used than the left; while, at the same time, it was removed further off from the centre of gravity than the left limb, by the whole length of the neck and head of the femur. The spinal column, therefore, in transmitting more weight to a greater distance, has acquired a curvature forward and to the right in the lower lumbar and upper sacral regions. But the inordinate pressure on the right side has been felt in the pelvis as well as in the spine, and has not only increased the bending of

Plate II View of the same Pelvis from the left side. The left Femur has been removed; and portions of the right Ischium and Pubes are seen through the left Thyroid foramen and the broken Acetabulum. The Pelvis is in the Museum of the Middlesex Hospital.

the ilium and ilio-pectineal line, but so compressed the right lateral mass of the sacrum, as to deprive it of three-quarters of an inch of its natural breadth. The whole right innominatum is, therefore, brought by so much nearer the mesial line, and the deformities of the right side of the pelvis are accordingly increased.

The vertebræ are depressed, as well as displaced laterally, and the third instead of the fifth lumbar is on the level of the nearest part of the crest of the ilium. The lower half of the sacrum and the coccyx, sweeping forward into the perineum, compensate for the excessive inclination of the sacrum backward below the lumbar curve.

The case thus detailed presents points of much interest both to the obstetric and to the surgical practitioner.

- I. The pelvis, in its form, resembles that which is known as the *triangular pelvis*. The *inlet* is shaped like a triangle with its sides pressed in. From the promontory of the sacrum to the right acetabulum, there is a distance of only an inch and a quarter, while on the left side the ischium is no further than half an inch from the

promontory; and the pubic fragment rises over the head of the femur to within an inch and a quarter of the top of the last lumbar vertebra. I presume there will be no difficulty in admitting that such an inlet, in a female, would be impassable. So little, indeed, is it capable of giving passage to the head of a child, that it will not admit the head of its own femur. The capacity of the *pelvis* itself is, proportionally, even more diminished by the approximation of the innominatum and sacrum on the right side, and by the intrusion of the head of the femur and the body of the ischium on the left. The projection of the coccyx forward, and the elevation of the right tuber ischii, considerably narrow the *outlet*, and would contract it to an extreme degree, were it not that the tuberosity of the left, or displaced ischium, is everted.

It is of further importance with reference to Midwifery, as it adds, I believe, a new cause to the list of those from which deformity of the pelvis may be expected. The causes in this pelvis are different on the two sides. Of that which occurred on the left side, viz., a dislocation of the femur through a broken acetabulum, I am aware of two instances;² of that to which the very serious contraction of the *right* side is due, viz., the gradual elevation of an acetabulum unsupported by the pubes in front, I am unacquainted with any previous example. It is interesting, however, to observe that the pelvis partakes of the deformities which are produced by a congenital absence of the lateral mass of the sacrum on the one hand, and on the other by the weakness of the bones which is consequent on rickets and mollities ossium.

- II. In a surgical point of view the case is interesting, as being one of recovery from, perhaps, as severe an injury of the pelvis as any on record. None of the fractures have united indeed, but the man's life was not destroyed; and though he continued lame through life, yet he walked without marked difficulty. I am told that he had only a moderate limp, which is surprising when we consider that one hip-joint was so seriously damaged, and that, as the continuity of the pelvic circle of bones was destroyed, only its posterior part was concerned in locomotion. This, however, is not the only case in which very serious injury of the pelvis has not prevented its use as an organ of locomotion. On opening the body of a boy who had been crushed between the wheel of a dray and a wall, and who afterwards walked into the Hospital Surgery, not appearing seriously injured, and sat up in bed without

² Surgical Essays, by Sir Astley Cooper and Benjamin Travers, vol. i, p. 51; Moreau's 'Icones Obstetricæ,' by J. S. Streeter, Plate XII. The original of this plate is in the Musée Dupuytren. in Paris.

discomfort, I found the pubes much comminuted on both sides above the obturator foramen, and fragments of bone lying between the bladder and the body of the pubes, simple fractures, through the rami of the pubes just below the symphysis, as well as through the tuberosities of the ischium, and both sacro-iliac synchondroses lacerated anteriorly—a small piece of the anterior edge of the sacrum on the right side being detached with the fibro-cartilage.

Another point of great interest to the practical surgeon, is the relation of the lower extremities to a pelvis so injured. And in this respect, again, the condition differs on the two sides, and is, I apprehend, in part unprecedented.

An os innominatum is fractured just in front of the hip-joint; no displacement is perceptible at the time, and perhaps the only proof of the nature of the accident is afforded by a large mass of callus, which is felt behind the psoas muscle when the patient leaves the care of the surgeon. After a time, however, when the patient has regained freedom in walking, and is thought to be well, the limb of the same side becomes much shortened and somewhat inverted; and at the same time some inconvenience gradually comes on in the perineum, and increases equally with the shortening of the limb. All these symptoms would be explained by such a condition as that on the right side of the pelvis under consideration. The fracture not having united, and the bones being, perhaps, somewhat soft, the acetabulum has been elevated more than an inch, and as its aspect became more anterior the more it was raised, the limb must have been turned inward. The other anterior extremity of the fragment being raised too, necessarily encroached upon the lower part of the pelvis, and could easily have been felt pressing upon the rectum by the finger introduced within the anus.

On the left side the injury is such as must have produced very marked symptoms at the time of the accident. Some of these symptoms remain permanently, and have even been exaggerated by the subsequent changes in the pelvis. There may have been others at the time of the accident, but I do not venture to speculate upon them with insufficient data: I will mention merely those which do exist, and shall be happy if, in the interest that is so extensively felt in the Society's proceedings, the attention of the surgeon under whose care this terrible accident recovered, should be attracted to the account of its termination, and he should be induced to supply the particulars which at present are necessarily wanting.

1. The left limb is *shortened* more than two inches. This is due to the elevation of the femur, the head

of which lies so high within the pelvis as almost to touch the promontory of the sacrum.

2. The trochanter major is *sunken* deeply in the hip. It could not be more depressed beneath the surface than it is, without a still greater destruction of the os innominatum. It is, in fact, in contact with the ilium; and the gradual wearing away of that bone has increased not only the loss of the natural prominence of the trochanter, but also the shortening of the limb.
3. The *position* of the limb is that of partial flexion and adduction. It is neither inverted nor everted.
4. The chief movement of which the joint is capable, is *abduction*. The facility of this movement is due to the large size and incompleteness of the new socket, in which the head of the bone is but loosely lodged. *Flexion*, too, is moderately free, and the psoas and iliacus muscles have left two deep grooves in the situation of the ilio-pectineal eminence which give proof of their vigorous action. *Extension* of the limb is quite precluded by the position of the everted tuber ischii close behind the shaft of the femur below, and of a small projecting piece of bone in front of the shallow excavation on the ilium, which meets the front of the trochanter in extension of the limb. The movement of *circumduction*, not being performed on the radius of the neck of the bone, is reduced to a mere rotation of its shaft, and even that movement could have been but slightly effected in consequence of the close manner in which the neck is impacted between the fragments of the innominatum, as well as of the disadvantageous position of the rotatory muscles attached to the depressed trochanter.

The records of surgery contain accounts of other cases of fracture traversing the acetabulum, and attended with displacement of the fragments. Sir Astley Cooper mentioned some in which the symptoms had resembled those of dislocation of the dorsum ilii. Mr. Earle, in Vol. XIX of the Society's Transactions, brought forward others, which he distinguished from fracture of the neck of the femur. It is plain that with a careful examination (and if the effusion of blood were not inordinate) the injury on the left side of this pelvis would not have been confounded with any of the ordinary fractures and luxations of the hip. For, although with considerable shortening, and some flexion and adduction, it may have resembled a dislocation upon the dorsum of the ilium, it must have been distinguished from that accident by the disappearance of the head and trochanter of the femur, by the

facility of abduction of the joint, and probably by the absence of the symptom of inversion of the foot, as well as by the severe general symptoms which such vast injuries must have occasioned. It could not have been confounded with a fracture of the neck of the femur, when the loss of the prominence of the trochanter was observed, and the joint was found freely capable of abduction.

One other subject remains to be noticed, viz., the disease of the bones. It appears to have been general throughout the osseous system, and (judging by the appearances of the left ilium and femur, and of the interior of the skull,) to have been in great part inflammatory. The irregular manner in which the bony matter is seen, under the microscope, to be accumulated, corresponds with this opinion; and the disease agrees generally with that described by Rokitsansky under the name of Osteoporosis,—a rarefaction or attenuation of the osseous texture originating in inflammation and succeeded by a more or less excessive deposition of new bony matter, which gives hardness and increased weight to the bone. It is stated by him to occur in some elderly persons who bear marks of having suffered from rickets in early life. No such marks, however, were found in this individual; and the influence of the disease on the pelvis, which was limited to the narrowing of the lateral mass of

the sacrum under the compression to which that part was subjected, is too slight to have been produced by a disease which softens and leads to distortion of bones so much as rickets.

I have examined numerous examples of fracture of the os innominatum traversing the acetabulum, but have found none in which the course of the fractures seemed at all determined by that of the original sutures. Nor, indeed, have I found any in which fracture was combined with disease of the bone. In healthy bones the fractures pass in any direction, quite irrespectively of former suture. But in this pelvis the line of fracture through the left acetabulum, and the right ischio-pubal ramus, corresponds precisely with that of the original suture. The instance is a solitary one; yet I may venture to suggest the question, which future observation may solve, whether this disease in producing expansion and softening of the bones does not sometimes chiefly affect and reopen the sutures, reducing the bones to the condition which is natural to them in early life.

Lastly, I regret that the want of the history of the case should prevent a certain conclusion being drawn as to whether the failure in the process for repairing these fractures, although so much callus has been thrown out upon the bones, is to be attributed to the disease or to any accidental cause.