THE HISTORY OF A CASE
OF
DISLOCATION OF THE HEAD OF THE FEMUR,
BACKWARDS,
WITH
SOME OBSERVATIONS ON THAT FORM OF DISLOCATION.

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OPPORTUNITIES of ascertaining, by dissection, the exact position of the bone and the condition of the surrounding soft parts in cases of dislocation, especially those of recent occurrence, are so infrequent, that every example of the injury examined under such circumstances becomes a study of value to the practical surgeon. It is on this account that I venture to bring under the notice of the Society a case of dislocation of the femur, at the hip joint, which I dissected soon after the accident by which the bone was displaced, and without any attempt having been made to restore the bone to its natural position.

Maurice Coghlan, ætat. 60, a stout man, employed as a bricklayer's labourer, while carrying a burden up a ladder, when he had ascended about thirty feet, was observed by one of his fellow-workmen to pause, and then instantly to fall to the flagged court on which the ladder rested. He was taken

up lifeless, and his body was brought to University College Hospital, June 11, 1845.

The cause of death was found to be an injury of the head. The skull was fractured over the right parietal eminence, and the fracture extended completely across the base of the cranium, through the body of the sphenoid bone and the petrous part of the temporal bone on each side, rupturing both the internal carotid arteries at the cavernous sinuses. In the base of the skull the pieces of the broken bone were widely separated. Something very unusual having been observed in one of the lower limbs, I made a careful examination into its condition, assisted by Mr. J. T. Griffiths, heretofore my intelligent house-surgeon. The result was as follows :—

As the body lay on the back, the right lower limb was a good deal deformed. It appeared considerably shorter than its fellow, the knee being from two to three inches higher than natural. But notwithstanding the apparent shortening of one of them, only a slight difference was detected between both limbs, upon measurement of the distance from the respective superior spines of the iliac bones and the external malleoli. The dislocated limb was, however, a little the shorter of the two. It was likewise inverted in its whole length, the patella being inclined inwards, and the foot resting on its inner side upon the table which supported the body. The whole limb was further back than the sound one, and at a distance from it.

The great trochanter of the femur, which was readily distinguished, was altered in its position with respect to the iliac spine; and the depression or flatness that naturally exists behind that prominence was wanting. Towards the back part of the pelvis was found the head of the femur; but it was far from being so easily detected as the trochanter. The movement of the limb forwards (flexion) was easily effected; its rotation outwards was impracticable. It should be added that, at the time the body was examined, there was no cadaveric rigidity. The preceding statement of the ex-

ternal appearances is illustrated in a cast, (exhibited to the Society when the paper was read,) which includes the lower part of the trunk and both the thighs.

Dissection.—The bones.—The gluteus maximus being removed, the head of the femur was in view. It lay, with a moderate quantity of blood around it, below the pyriform muscle and immediately behind the acetabulum, over the base of the ischiatic spine, and opposite to a part of each of the two sacro-sciatic foramina. From the pelvic bone it was separated by the obturator internus and the gemelli muscles. The crista of the ilium was broken off, and the bone was likewise broken through its dorsum for the length of three or four inches, the fracture extending backwards into the great sciatic notch; but the edges of this fracture were separated by only a narrow space, and there was no looseness of the parts.

The muscles.—The gluteus maximus was uninjured. The gluteus medius was found in a state of relaxation at its back part, and some of the deeper fibres of this muscle, being connected with the ilium over the fracture above noticed, were torn. As regards the other muscles, the pyriformis (which it has been already stated lay immediately above the head of the femur) was slightly stretched; it might be said to have been held from falling loose rather than stretched; but the gemelli and the obturator internus were in a state of extreme tension. The last-named muscles, with the capsular ligament of the hip-joint on which they rested, separated the head and neck of the femur from the acetabulum, and from the surface of the innominate bone behind that cavity. The only muscles which sustained real injury from the dislocation were the obturator externus and the quadratus femoris. Both were torn quite across.

The joint.—The capsular ligament was torn at the internal and lower part of the joint, or, rather, was separated from the neck of the femur in this direction; while the posterior and the upper part of the same structure were entire. The ligamentum teres was torn out of the depression on the head

of the femur. The edge of the acetabulum was broken off at its upper part, but only to a small extent; otherwise the articular cavity was uninjured.

Over the neck of the femur was stretched the *great sciatic nerve*, which had passed into contact with the bone in the interval between the fragments of the quadratus muscle. Between the nerve and the bone was interposed the broken tendon of the obturator externus. Most of the facts brought to light by the dissection are represented in the accompanying drawing, for which I am indebted to the pencil of my friend, Mr. Noah Brangwin.

A comparison of the foregoing details with the generally received account of the dislocation will show several points of difference between them; at the same time that a full examination of the facts, at present ascertained, will lead us to correct some of the opinions which are commonly entertained respecting the nature and proper management of the displacement. The further observations will be arranged under the following three heads:—

1st. The condition of the structures immediately interested in the dislocation, and especially the exact position of the head of the femur: 2nd. The characteristic signs of the displacement: and 3rd. The course to be pursued in order to restore the bone to its natural position.

1st. Of the cases in which the result of post-mortem examination of the parts has been recorded, the first that requires notice is described in the work of Sir A. Cooper, where the dislocation of the head of the femur, backwards, or into the sciatic notch, is treated of;* the second dissection is reported by Dr. Scott;† and the third, conducted by Mr. Billard in the presence of Professor Bécлар, has been published by the former.‡ This short list shows the materials

* A Treatise on Dislocations, and on Fractures of the Joints, by Sir A. Cooper, Bart. 4th ed. p. 68, and plate iv.

† Case of Dislocation of the Hip-joint, and the manner of its reduction and the appearances on dissection. By James Scott, M.D., in the Dublin Hospital Reports, vol. iii. 1822.

‡ Luxation du Femur en arrière et en bas, in the Archives Générales de Médecine, tom. iii. p. 538. Paris, 1823.

for arriving at a satisfactory conclusion respecting the first of the subjects of inquiry above proposed, to be scanty. But they require on this account the more careful examination, in order to interpret them aright; and such examination will, I believe, lead to a more correct determination of the nature of the displacement than that which is usually received. Before we enter into particulars, a few remarks are necessary concerning the respective value of the cases above referred to for the purpose here in view.

Sir A. Cooper's dissection was made at a remote period from the occurrence of the injury, the person having survived it "many years," according to the opinion of the eminent observer himself. The structures about the joint had therefore undergone much change, and all the more because of the effect which the weight borne on the limbs must have produced. There is, moreover, no account of the person from whose body the joint was removed, neither is there any statement of the position or of the length of the limb. For these reasons the case in question, unless supported by others not liable to the same objections, cannot be regarded as illustrative of the alteration of structure which accompanies the dislocation. With respect to Dr. Scott's case, the reduction of the displacement having been effected before death, the amount of injury, sustained by the parts around the joints in consequence of the accident, cannot be very clearly separated from that which might have resulted from the efforts to restore the femur to the acetabulum. Still this case is valuable in so far as it corroborates the evidence afforded by others. To the objections made in the preceding remarks, the cases observed by Billard and myself are not liable. They were examined immediately after the accident, and without any attempt having been made to remove the head of the femur from its accidental position.

From the cases I now turn to an examination of the leading facts they exhibit:—The head of the femur is stated by Sir A. Cooper to be lodged on the pyriform muscle, at the edge of the sciatic notch; and it is spoken of as "buried in the

notch." Dr. Scott found the same part of the thigh bone below the pyriformis, where the nerve passes beneath that muscle, or rather found evidence of its having been so placed; and it occupied the same position in Billard's case and mine,—that is to say, the head of the femur in these instances was immediately behind the acetabulum, and opposite the interval between the two sacro-sciatic foramina.* Here, then, is a material difference, the statement of Sir A. Cooper placing the bone considerably higher than it was found in the other cases; and it is important to decide which of the positions indicated is the more accurate.

With a view to elucidate the point, I performed some experiments on the dead body. After removing the gluteus maximus and dividing the quadratus femoris and the obturator externus, as well as the inner and lower part of the capsular ligament with the ligamentum teres, I reproduced in several instances the dislocation, as it is represented in the drawing; and I then found that the length of the limb, as compared with its length before the head of the femur had been displaced, was diminished by $\frac{7}{8}$ ths of an inch. Slight variations of length were noticed in different bodies, and even on the opposite sides of the same body, owing probably to the varying degrees in which the capsular ligament happened to be divided at its lower part.† In the experiments I found like-

* Mr. Wornald has published an account, accompanied with a drawing, of an interesting case of dislocation backwards and "downwards," which I have not taken into account in these observations, in consequence of the head of the femur having been lower than the position assigned in this paper to the common form of the dislocation backwards. The femur in Mr. Wornald's case was "on the ischium, opposite to the lesser ischiatic notch and the upper part of the tuberosity." The difference is so small between this and the cases adverted to in the text, that it might well be considered a modification of the dislocation backwards. See a paper entitled, Cases of Dislocation of the Head of the Femur, (Case I.) by Thomas Wornald, Esq., in the Medical Gazette, vol. xix. p. 657. London, 1837. And A Descriptive Catalogue of the Anatomical Museum of St. Bartholomew's Hospital, vol. i. p. 128. London, 1846. The preparation is preserved in the Museum.

† It is often difficult, in consequence of some peculiarity in the construction of the bones, or the manner in which they are covered with the soft

wise that, in order that the head of the femur should reach the sciatic notch, it was necessary to divide the posterior part of the capsular ligament together with the muscles covering it there, namely, the obturator internus and the gemelli (the obturator externus and quadratus were previously cut across); and when the head of the femur was in that position, i.e. lodged on the pyriformis and at the edge of the sciatic notch, the limb was diminished in length by upwards of two inches. Now the statements of all observers agree in this, viz. that the shortening of the limb which attends the dislocation backwards (to the sciatic notch, as it is usually called), is less than an inch,—“from half an inch to an inch . . . but generally not more than half an inch,” according to Sir A. Cooper. But this alteration of the length is exactly what is found when the head of the femur is lodged behind the acetabulum, in the position noticed in Billard's case and mine, probably also in Dr. Scott's; while, on the contrary, it differs materially from that which would accompany the displacement of the bone into the place assigned to it in the work on Dislocations and Fractures of the Joints.

Proceeding now to the condition of the other structures immediately concerned in the dislocation:—The muscles most affected are those named the external rotators of the femur. Some variety was observed in the state of these muscles in the different cases, as the following plan will show:—

	SCOTT.	BILLARD.	QUAIN.
Pyriformis and obturator internus	Entire.	Entire.	Entire.
Gemelli	Ruptured.	Ruptured.	Entire.
Obturator externus	Not stated.	Entire.	Ruptured.
Quadratus femoris	Ruptured.	Entire.	Ruptured.

parts, to mark the spines of the ilia with such accuracy as to determine small degrees of difference between the limbs. When assistance is at hand, I have found it best to mark the pelvic prominences with the fore-fingers of both hands at the same time, while an assistant measures from these to the lower edges of the internal malleoli. But in the experiments on the dead body, after dividing the integuments over the bones, I fixed a nail into the spine of the iliac bone, and another into the edge of the malleolus. The space between these points was then measured before and after the dislocation was effected.

From the circumstance of the femur being moved backwards in the dislocation, the *psosas*, *iliacus* and *pectineus* muscles are perhaps necessarily in a state of tension. They are stated to have been found so by Billard. For the same reason the posterior parts of the two smaller gluteal muscles are in a state of relaxation.

The capsular ligament was torn at nearly the same part in Dr. Scott's case and mine—at the inner and upper part in the former, the inner and lower part in the latter. The condition of the structure is not mentioned by Billard, but, considering that the *obturator internus* was uninjured, it is reasonable to conclude that in this instance, as in the others, the capsule was entire at its posterior aspect. The *ligamentum teres* was torn in all the cases.

Looking to the state of the capsular ligament in this dislocation, it seems to me that the head of the femur leaves the *acetabulum* towards the inner or the lower part of the cavity, and turns from below, backwards and upwards, to reach the position which appears to belong to the dislocation. Moreover, the place at which the bone rests is materially influenced by the condition of the capsule; for, if the posterior part of this structure should not be torn through, the femur will not reach the *sciatic notch*; and the small muscles about the joint—*obturators*, *gemelli*, and *quadratus*—have the same effect.* (See ante, the experiments on the dead body.)

The connection of the great *sciatic nerve* with the dislocation is not devoid of interest. It was found to turn over the neck of the femur, coming into contact with the bone between the ends of the ruptured *quadratus* muscle, in the case of Coghlan detailed at the head of this paper (see the drawing): and it is highly probable that in Billard's case, though no mention is made of the fact, the nerve was likewise behind the same part of the femur; for the *quadratus* muscle, un-

* In a case of dislocation recorded by Mr. Todd, the head of the femur being lodged over the back part of the *gluteus medius*, all the small muscles, viz., "the *pyriformis*, *gemini*, *obturatores*, and *quadratus*," were completely torn across.—*Dublin Hospital Reports*, vol. iii. p. 395.

broken, occupied this position with reference to the bone; and in the natural state of parts the nerve is behind that muscle.

A circumstance observed in the treatment of a case of this form of dislocation may be here noticed, because it seems explicable only by reference to the position of the nerve. The patient (Horan, whose case will be afterwards detailed) stated that he suffered, and he appeared to suffer, much pain when his limb was moved, and even when it lay stationary on his bed; so much so, indeed, that taking the suffering he complained of in connection with his inability to evacuate his urine before the dislocation was reduced, I feared that he had sustained some injury of the trunk or of organs within the abdomen. But when the traction of the limb with the pulleys was begun, the countenance of this patient lost the expression of anguish it previously bore, and on being questioned he said that the pain was relieved by the pulling. It seemed to me that the relief experienced by this person might be explained by supposing the femur and the weight of the limb to be withdrawn from the sciatic nerve, the relative position of both structures (the bone and nerve) being the same as in the cases above referred to.

In Dr. Scott's case, however, the nerve is said to have been in front of the little cavity in which the head of the femur had been temporarily lodged; and it is also stated that, before the bone was replaced, "every attempt at rotation outwardly caused extreme pain in the groin, at the hip, and in the course of the sciatic nerve." These facts, especially the latter, would lead to the conclusion that, in this instance, the nerve was between the head of the femur and the pelvic bone. In the same situation was it found by Mr. Wormald, in a case before alluded to.*

The great nerve then, it is manifest, is always close to the neck or to the head of the femur in the dislocation backwards; but it may be either over or under [behind or in front of] the bone.

* Ante, p. 344.

2nd. So far respecting the anatomical history of the parts immediately concerned : the signs of the dislocation are next to be considered. Into this subject some inquiry becomes necessary, in consequence of a few points of difference between the external appearances of the limb, as observed in the case of Coghlan,* and the generally received account of those that characterize the displacement. The peculiar extent of the shortening of the limb ; its inversion ; the direction of the femur ; the situation of the two great prominences at the upper end of that bone, viz. the trochanter and the head, together with the fulness behind the former prominence—these indications are the same in all the cases. The points of difference have reference to the direction of the dislocated thigh and the position of the foot.

“The knee,” says Sir A. Cooper, “is not so much advanced as in the dislocation upwards, but is still brought a little more forwards than the other; . . . the toe rests against the ball of the great toe of the other foot.” According to Dr. Scott’s report of the case he had observed, “the thigh lay very awkwardly upon the other;” and when the patient was “lifted out of bed and placed erect, the limb retained the position above described; the toes . . . lay above the opposite instep.” The dislocated thigh is described by Billard to be slightly inclined towards the trunk, and the position of the limb such, that, to use his own words, “le genou droit chevauche sur le genou gauche.” The foot is not mentioned by this observer; but it might be inferred from the direction of the thigh, which, in a great measure, determines the position of the lower part of the limb, that the foot must have been placed somewhat as it is said to be in the preceding extracts. In the case of Coghlan, however,† the dislocated thigh, instead of being inclined towards the trunk, or in advance of the sound limb, was actually further back than it; and the foot of the same side, though directed towards the opposite foot, as a part of the general inversion of the limb, was at some distance from it. The question therefore arises—Is that

* Ante, p. 340.

† Ibid.

case to be considered altogether exceptional in these respects? To assist in the reply to this question I will refer to a case which occurred in my practice at the hospital.

John Horan, æt. 47, a middle-sized and rather muscular man, was admitted April 3rd, 1847. He stated that, being engaged in driving a large empty brick-cart, and standing on one of the shafts, a wheel having suddenly struck against a post, he was jerked forwards on his belly upon the horse, and then slipped to the ground head foremost. While he lay prone on the road, one of the wheels of the cart passed over his loins and the back of his right thigh to the outer side of the knee, the course it took being marked by ecchymosis and slight excoriation. He is not able to give any more detailed account of the position of the limb when the wheel struck him.

When placed upon his bed at the hospital, Horan lay on his back, but inclined to the sound side. The right lower limb was inverted, the inner side of the leg and foot being flat on the bed at the distance of some inches from the left limb, towards which the patella and the toes were directed. The length of the dislocated limb was about an inch less than that of the uninjured one. The outline of the femur being followed upwards with the eye, which was easily done, the bone appeared to be behind its natural position; and the trochanter seemed to be separated by more than the usual distance from the spine of the ilium. The head of the same bone was obscurely felt at first, but it became more distinct by slight rotation of the limb inwards. It was situated behind the trochanter and lower than that process, far back upon the pelvis, close to the upper end of the fold of the nates. Doubtless from this change in the position of the femur the thigh was altered in shape, the alteration consisting in an augmentation of its depth from before backwards, and apparently a decrease of breadth. When the affected limb was raised and placed in contact with the sound one the patient complained of pain, as indeed he did whenever it was moved; and the new position seemed to

cause so much suffering that the leg was again laid upon the bed, resting on its inner side.

The patient being then raised from bed and supported in the erect position, the displaced limb was observed to hang still at some distance from its fellow,* and further back than it—certainly not in advance of it. The toes rested on the ground. While he was in the same position I moved the foot inwards, and made the toes to rest on the other foot; but this movement, and the retention of the foot in the new position, were attended with an increase of pain.

To the preceding statement of the signs of the displacement may be added some evidence as to its nature of a different kind. During the efforts to restore the femur to the acetabulum the patient experienced decided relief from pain, which before that was constant. Of this fact mention has been already made, and its probable cause has been adverted to in the observations on the sciatic nerve.† Subsequently, also, to the reduction of the dislocation (on the day after), I found that on manipulating the dorsum of the ilium, no uneasiness was felt by the patient; but he complained of pain when moderate pressure was made at the back part of the pelvis, in the depression behind the great trochanter of the femur; and the pain was greatest behind the top of that prominence. The various facts now detailed leave, I think, no doubt that this was an example of dislocation backwards, as that dislocation has been described in the preceding part of this paper. And since, in this case, as well as in that of Coghlan, while unerring signs of the nature of the displacement were present, others usually stated to be characteristic of it, namely, the advanced position of the thigh and the lodgment of the foot upon the opposite one, were altogether

* I observed in another case of the same dislocation, which occurred in a young boy, that the leg on the injured side hung in the same manner away from its fellow, when the little patient was raised from bed; but when he lay down, the flexed position of the limb in close contact with the sound one was most agreeable to him.

† Ante, p. 346, 7.

wanting, it must be concluded that though these signs, when present, have their value in the diagnosis, their absence is by no means to be considered a proof of the non-existence of the dislocation they are taken to indicate.

3rd. *Reduction of the dislocation.*—Sir A. Cooper, in the rules he lays down respecting the means of effecting this object, states that, when the extending force is to be applied, “the thigh is to be brought across the middle of the other thigh.” Acting on this rule, I began the extension in the direction here laid down in two cases—that of Horan and that of a little boy æt. 8,* whose limb had been dislocated about sixteen hours; but, in consequence of circumstances to be presently noticed, I soon changed the direction so as to bring the thigh forward to a right angle with the trunk.† After this alteration the head of the bone, in each of the two cases, speedily returned to the acetabulum. The circumstances by which I was led to place the limb in the position just indicated were these:—While making the experiments on the dead body, which have been before alluded to, I observed that, as the thigh was bent towards the abdomen, the head of the femur was brought nearer to the lower part of the acetabulum, where the capsular ligament was divided. To this it should be added that, in the bent position several muscles must be in a state of diminished tension; viz. the psoas, iliacus and pectineus, with, to a certain extent, the pyriformis, and the other so-named external rotators of the thigh. Be this, however, as it may, this important point remains, namely, that the restoration of the femur to the acetabulum was effected the more easily in proportion as the thigh was approximated to the abdomen.‡

* Ante, p. 350, note.

† In order to make the alteration in the relative direction of the limb and the trunk of the patient, it is not necessary to change the pulley or the perineal cloth. It will be sufficient to alter the direction of the body by turning the mattress on which it is laid.

‡ After extension has been carried to a certain degree, rotation of the limb outwards is required, on the dead body, in order to turn the head of the femur in the opposite direction towards the acetabulum; but in the

It is likewise advantageous that, while the extension is being made, the thigh should be in a state of abduction, so that the head of the femur shall be drawn in a degree away from the side of the pelvis. With the view of effecting this object the pulleys were, in each of the two cases of dislocation before mentioned, fixed at a point higher than the patient's body, which was laid in the usual position for the reduction of the dislocation, viz. on the sound side. I was led to adopt this plan by observing the facility it gave me in reducing the dislocation on the dead body.

Sir A. Cooper, it will be remembered, advises that the upper part of the thigh should be drawn away from the side of the pelvis while the extension is carried on. "Whilst this [the extension with pulleys] is in progress, an assistant pulls the napkin [previously adjusted beneath the limb] at the upper part of the thigh with one hand, rests the other upon the brim of the pelvis, and thus lifts the bone, as it is drawn towards the acetabulum, over its lip." My own observation has led me to the conclusion that the object to be obtained in this part of the operation is, not only to prevent the head of the femur from being drawn against or along the pelvic bone, but also, to give space or opportunity for that rotation of the thigh bone, by which its head is turned forward beneath the trochanter to its natural situation. For this purpose I have, in several experiments, found the abduction of the thigh, as above suggested, the most effectual means ; but there is no reason why the plan of Sir A. Cooper should not be used at the same time ; and the combination of the two expedients might perhaps be resorted to with advantage in some difficult cases.

It will not be irrelevant to mention, in concluding this part of the subject, that the plan of fixing the pulleys to the thigh above the knee which is commonly practised, but without, I believe, any other reason for its adoption than that of

living person a "spontaneous evolution" of the limb is, as it is generally known, effected through the agency of the muscles, and by means of this the femur is wheeled into its place.

convenience, is important on other grounds in reducing the dislocation backwards. The reason is this: when the knee is straight the great sciatic nerve is extended, but when the joint is bent, the same structure is in the opposite state, loose; and I have repeatedly observed that the great nerve is much stretched during the extension of the limb, when made from a point below the knee. This observation applies, whatever the position of the nerve may be, but most strikingly when it happens to be above the neck of the femur.

The inferences to be deduced from the foregoing observations may be summed up as follows:—

In the ordinary form of the dislocation backwards, the femur does not reach the sciatic notch.

The head of that bone is lodged immediately behind the acetabulum, over the base of the ischiatic spine and opposite to a small part of each of the two sacro-sciatic foramina.

The advanced position of the displaced limb at the knee, and the situation of the foot, "the toe resting against the great toe of the other foot," are not necessarily present in this dislocation.

During the extension made to restore the bone to its place, the thigh is most advantageously directed across the pelvis, so that it shall form a right angle, or nearly a right angle, with the abdomen.

At the same time the limb is to be in a state of abduction. The femur is thus drawn away from the pelvis forwards and outwards.

And the knee is to be bent, the extending force being fixed above this joint.

To prevent misapprehension it may be well to state, in conclusion, that certain cases, mentioned in the preceding pages, exemplify important modifications of the most fre-

quent form of the displacement of the femur "backwards," which it has been the purpose of this paper to illustrate. Thus, the case observed by Sir A. Cooper, and that by Mr. Todd, should be regarded as instances of dislocation "backwards and upwards," but in different degrees. While, on the other hand, Mr. Wormald's case should, in strictness, be considered an example of the dislocation "backwards and downwards;" it being understood, however, to deviate but slightly from the usual form of the injury.

EXPLANATION OF PLATE V.;

Exhibiting dislocation of the head of the right femur,
backwards.

- a.* Head of the bone.
- b.* Large trochanter.
- c.* Small trochanter.
- d.* Sacrum.
- e.* Tuberosity of ischium.
- f.* Lower end of gluteus maximus.
- g.* Gluteus medius.
- h.* Pyriformis.
- k.* Obturator internus, and gemelli.
- l.* A fragment of obturator externus.
- m.* Quadratus femoris.
- n.* Hamstring muscles.
- o.* Long sacro-sciatic ligament.
- p.* Great sciatic nerve.
- q.* Small sciatic nerve.
- r.* Sciatic artery.