On rupture of the popliteal artery and popliteal aneurism / by Alfred Poland.

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ON

RUPTURE OF THE POPLITEAL ARTERY

AND

POPLITEAL ANEURISM.

By ALFRED POLAND.

At first, it was our intention to have published an original communication on complete laceration of the popliteal artery produced by external violence, without any lesion of the integument, based upon three cases which had come under our especial treatment at Guy's Hospital within the past few years. But in so doing we considered that, by confining ourselves to these three isolated cases, we should be necessarily curtailing a very interesting subject, and should not well arrive at any satisfactory results. The symptoms, diagnosis, and treatment of this rare accident, as well as that of ruptured aneurismal sac, we found would well bear a thorough investigation; and this could only be done by collecting a sufficient number of cases, and, by comparing them together, thus elucidate the subject in all its possible bearings. Hence, then, we have determined to publish, in the 'Guy's Hospital Reports,' cases collected from all sources, the majority of which are unconnected with that institution, an objection the difficulty of which we could not overcome. Collective experience is far more valuable than individual experience—a fact much overlooked in the present day, when general conclusions are often deduced from one solitary instance. In introducing the

cases of other surgeons, as detailed in the public journals, we have judged it but fair to append their remarks which may accompany each.

The following is a summary of the lesions which we intend to consider:

A. *Direct or immediate rupture of the popliteal artery.*

- *a. Complete laceration;* the artery being torn completely across, and ends separated.
- *b. Incomplete laceration;* where there is only a partial lesion of the coats, as caused by fracture, diseased bone, ulceration of the artery, &c.

B. *Indirect*; viz., the rupture of an aneurismal sac in connexion with the popliteal artery, whether arising from injury or otherwise, and comprising:

- *a. Ruptured sac.*
- *b. Perforation of sac* by diseased bone, &c.
- *c. Ulceration of sac.*

We have thus omitted all lesions of the popliteal artery accompanied with breach of surface, such as punctured, incised, lacerated, and gunshot wounds.

A. Direct or Immediate Rupture of the Popliteal Artery.

Series I. *Complete laceration of all the coats of the artery, the ends being torn asunder and separated.*

Now at the very outset of our inquiry, supposing we had taken our Guy's Hospital cases as fair specimens of this accident, we should have argued that rupture of the popliteal artery was generally associated with severe and complicated injuries of the knee-joint; that the forcible separation and tearing asunder of the artery was due to the displacement of the femur backwards from off the tibia, the vessel being caught by the edge of the inner condyle or the intercondyloid portion

of bone, the ligaments of the joint having been wholly or partially lacerated; that the rupture thus arose from causes acting from within outwards. But we shall find that such is not always the case; and although there can be no doubt that the depth of the artery from the surface, its protection by the hamstring and heads of the gastrocnemius muscle on either side, and the filling up of the space with much fat, cellular tissue, and dense fascia, strongly defending it from causes of injury acting from without inwards, so much so that the possibility of its occurrence is denied by some, yet it may and does occur under such circumstances, as will be seen on reference to the cases.

The most usual form of accident met with, as associated with rupture of the popliteal artery, is compound dislocation of the knee-joint, showing at once the immense amount of force and laceration requisite before this elastic vessel will give way; and knowing this, the surgeon is not prepared to meet with a similar accident to the vessel when unassociated with breach of surface. On the other hand, the artery, even in compound dislocation, may escape, as is recorded by Sir A. Cooper in his work on 'Dislocations,' in a case where the femur was thrown behind the tibia on the outer side of the head of the latter; the external condyle dislocated backwards and outwards, and projected through a large opening in the integuments; the thigh-bone was twisted outwards, and the internal condyle advanced upon the head of the tibia. The limb was amputated, and, on examination, the vastus internus was found to have a large aperture in it, just above its insertion into the patella; the tibia projected forwards; both heads of the gastrocnemius were torn through, and the capsular ligament so completely lacerated, posteriorly, that both the condyles of the femur were seen projecting through the gastrocnemius; neither the sciatic nerve, the popliteal artery and vein, the lateral, nor the crucial ligaments, were ruptured. Here the whole of the force seemed to have been expended on the sides, and not on the centre, of the back part of the knee-joint.

It is in the complete dislocations, where the crucial and lateral ligaments are lacerated, and the condyles of the femur thrust directly backwards through the centre of the popliteal space, that the artery gives way; or in those compound dislocations,

where the head of the tibia is thrown backwards from off the condyles, tearing through the vessels and appearing at the external wound. Such instances are frequently recorded. In these cases the ruptured vessel is at once apparent, and the nature of the injury such as to require immediate amputation; and it is a remarkable fact, how often there is so little or even no hæmorrhage after the first gush of blood has issued from the wound; the forcible laceration of the vessel, so highly favorable to the plugging of the torn ends, is almost immediately succeeded by coagulation, and in a few hours is of such firmness and solidity as to allow of much manipulation and movement without disturbance. This was well exemplified in a case that was brought to Guy's Hospital many years ago. The man had fallen down a well, and one of his legs, during the descent, having been caught at the edge of the well, was forcibly doubled up, bending the knee in the contrary direction, so that the toes touched the bend of the thigh. The condyles of the femur protruded through a large wound in the popliteal space, and he lost some blood. In this condition he was sent to the hospital in a very shaky vehicle, and arrived about three hours after the accident. On admission, the ruptured ends of the popliteal vessels were lying exposed in a large wound in the popliteal space; no ligature had been applied, and no hæmorrhage had taken place during the journey. The ends of the vessels were firmly plugged with coagulum, and the upper end of the artery could be observed pulsating most vigorously and forcibly, and yet completely under the command of the plug. There was also a fracture of the thigh in its upper third on the same side; short splints were applied to steady this fracture, and the limb amputated at the junction of the middle with the lower third. A good recovery was made, and the fracture united firmly.

Not only in compound dislocations, but in other severe injuries about the knee, is the artery torn through and without hæmorrhage. In these cases, like the preceding, the injury is at once perceived, and amputation, as the only resource, performed; thus the following cases are examples of this circumstance:

A patient was brought into Guy's Hospital with a compound fracture of the leg, extending close to the knee-joint; amputation was performed above the knee.

On examining the popliteal vessels, they were found both torn through, but no external communication with the torn ends. Scarcely any blood had been lost; the ends had not retracted, but the orifices of the artery were contracted and filled with a small quantity of coagulum; a web of membrane was enveloping the extremity of the vessel. The vein was also torn, and its extremities appeared puckered, and also covered with cellular membrane. Quicksilver dropped into the vessel did not escape. In this case two causes prevented hæmorrhage—the cellular sheath enveloping the divided extremities of the vessel, and the contraction of the muscular coat. (See Prep. 1509, Guy's Museum.)

A similar case was admitted into Guy's, under Mr. B. B. Cooper. A man, æt. 32, was struck by a plate of iron weighing 4 cwt., and at red heat, on the outer part of the thigh, just above the knee, jambing him against the wall with fearful weight. There was a large vertical wound over the outer part of the knee, the vastus externus torn through, as also the capsule of the knee-joint; the femur fractured in its lower fifth, and protruding through a wound in the popliteal space. There had been but little hæmorrhage. Amputation was performed two hours after the accident. The popliteal vein and artery were completely torn through; both ends of the artery were filled with a large coagulum. (See Prep. 1515[82].)

We have thus somewhat digressed from our subject, but the foregoing remarks were introduced, in the first place, to show that it requires much force to rupture a popliteal artery; and secondly, that when ruptured completely across, there may be little or no hæmorrhage after the first immediate gush. These points will have to be borne in mind in investigating the class of cases for our consideration; the essential difference being the absence of lesion of surface and the want of a vent for the immediate escape of blood, so that in the majority of these cases tension takes place, and rapid gangrene ensues.

Of complete rupture of the popliteal artery without any, or but slight, external lesions, we have collected nine cases from the British journals; and of these, it is singular, three came under our especial notice and treatment at Guy's Hospital.

Eight were males, and one female; 3 of the age of 30, one aged 32, one aged 36, one aged 46, and 2 aged 50; and all due to violence and injury.

1. The more precise nature of the *causes* of the injuries in these cases were—

a. Those acting from without inwards.

In Case 2 it was maintained by the man that he was kicked in the popliteal space by a horse, and it was thought so probable by the surgeon, that, acting upon this and having decided the case to be one of ruptured artery, he cut

down upon the vessel, and tied the two lacerated ends; but when the limb came to be examined (as amputation had to be performed afterwards), it was found that the injury had been caused by a dislocation of the knee, and the kick could not have produced such an amount of injury; and, on careful inquiry, it turned out that the man was intoxicated, and was showing some passers by the methods of horse-taming, and while attempting to fasten the fore leg it was observed that he was thrown down, and his leg was doubled up under him; whether the horse bore his weight on the man could not be ascertained. In Cases 3, 4, and 9, it was the wheel of a heavy cart or van passing over the ham of the leg. Case 5, while standing a little raised upon the toes and leaning forwards, a sack of wheat fell from a height of seventeen feet, and struck the back part of the leg, about the bend of the joint. Case 6, whilst sitting on a square block of stone, was struck by another, which drove the popliteal space or ham against the block on which he sat. Case 7, the man was drawn into a revolving shaft, which carried him round and dashed him two or three times against the wall.

In two out of these four cases (Cases 4 and 8) the popliteal vein was ruptured with the artery, and probably also in Case 6; in these instances there was a laceration and crushing of the parts intervening between the integuments and joint, these latter structures themselves not being involved.

b. Those acting from within outwards.

In Cases 1 and 2 the rupture was entirely due to the forcible separation of the ligaments of the knee-joint, and displacement of the femur backwards; the posterior and crucial ligaments were all lacerated, and the artery torn through, but the vein, nerves, and integuments remained entire.

In Case 3 it is questionable whether the partial dislocation of the knee, or the passage of the cart-wheel over the joint, was the cause.

In Case 7 the accident is said to have occurred by a violent exertion in vaulting over a boat, but here the state of the knee-joint is not mentioned.

In Cases 4 and 5 it is also questionable whether the probable injury to the knee-joint was not the primary cause; for, from the examination of the limb, although seven weeks after the accident, the condyles of the femur were found exposed, and the greater part of the ligaments had sloughed.

In this latter class of cases there is a forcible wrenching and separation of the femur from the tibia, and it appears that the popliteal artery became torn through, the vein and nerves almost entirely escaping. This we can readily understand, for the artery is next and closest to the femur and joint, and would be the first vessel or structure implicated.

2. *The symptoms and effects produced by this lesion.*—We shall treat these separately, in the order of their occurrence.

a. The sensation of something having suddenly burst or given way in the ham.—The nature of the accident is generally so severe, and attended with such violence, as to preclude any information on the part of the patient respecting this symptom, one which is of great importance to the surgeon in ascertaining the bursting of an aneurism, or of an artery, in a more exposed situation. It was not noticed in either of the nine cases.

b. The sudden tumefaction and swelling of the popliteal space, rapidly increasing and extending above and below in the course of the vessels, greatly altering the shape and contour of the limb. This symptom is the most important and most reliable evidence of lesion of some large vessel. The extent and rapidity of the effusion of blood will depend upon certain conditions; thus, if the artery be torn across above the bend of the joint, it will be more extensive, and become more superficial, forming a large and evident tumour; but if the artery have given way below the joint, under the bellies of the gastrocnemius muscle, the blood will diffuse itself between them, elevating the muscles of the calf, and causing a uniform and general enlargement of the upper part of the leg, inducing much tension and pain, although but little extravasation need have taken place.

The following are the conditions noticed in respect to this symptom in our cases:

In Case 1 there was much swelling and tension, which, in three or four hours, increased to an enormous size, extending some distance down the calf.

In Case 2, observed for the first time twelve hours after the accident, there was much distension and tension extending down the calf, and increasing slowly.

In Case 3 the ham and leg were enormously swollen and distended.

In Case 4, soon after the injury, there was but slight swelling on the inner side of the knee, but in a few hours the swelling increased.

In Case 5, within five minutes of the accident, the leg became swollen to nearly double its natural size.

In Case 6 the knee was larger than the sound one, and continued to increase in size until it at last became greatly swollen.

In Case 8 there was considerable swelling, which increased and extended, reaching up the thigh and down the leg.

In Case 9, although there was a small, deep wound in the ham, and venous hæmorrhage therefrom, there ensued rapidly a large effusion in the limb, causing distension.

c. Condition of the skin covering the swelling depends upon the length of time elapsing after the injury, and the amount of damage done to the soft parts.

In Case 1 the skin was at first natural, but afterwards became tense, shining, and very elastic, and appeared as if about to burst.

In Case 2 the skin was slightly discoloured, and there was the mark of a bruise on the inner side of the leg, just below the popliteal space.

In Case 3 there was no bruise, but a slight wound along the inner side of the knee, through which the inner condyle could be felt, but no hæmorrhage or presence of blood; it appeared wholly unconnected with the large swelling, which latter felt firm, elastic, and fleshy, and the skin over it of a mottled appearance.

In Case 5 it was tense, hard, and shining, and the whole leg below the knee presented the well-known purple and mottled appearance of ecchymosis; above the knee it shaded off into a fawn colour, which reached nearly to the groin on the inner side, but not so high on the outer.

In Case 6, half an hour after the accident, it was of a dark, reddish-blue colour, evidently from the bruise and extravasation of blood; it afterwards became quite a blue-black.

In Case 8 there was considerable ecchymosis, which increased and extended up the thigh and down the leg; on the third day the discoloration was very extensive, and the whole surface of the calf of the leg of a grayish-purple hue.

In Case 9, integuments distended, and exploratory wound became sloughy and discharged ichorous and bloody matter.

In the first 3 cases there was little or no ecchymosis, owing probably to the cause of the rupture being from within outwards; whereas, in Cases 5, 6, and 8, much extensive ecchymosis existed, owing to the severe direct contusion of the skin and soft parts. In Case 9 there was a small, deep wound, from which there was a free hæmorrhage, and yet a large, rapid effusion in the ham ensued; this case, by rights, ought not to have been included in the series, yet it possessed characters similar to the other lesions, and we thought it advisable to append it.

d. The absence of any pulsation in the swelling or tumour.—In all these cases there was not the slightest pulsation; pressure on the femoral was tried in one case, but it had no effect on the tumour; and in another, the swelling was carefully examined, both by the hand and the stethoscope, and no beating was either felt or heard. It is the absence of pulsation which throws the surgeon off his guard, who generally expects

to find pulsation in cases where an artery has been ruptured. In the ham the artery is deep; the first gush of blood is large in quantity, and sufficient to distend the space and press upon the vessel, while the torn ends are rapidly closed by coagulum, hence the want of pulsation in the swelling.

e. The pulsations in the tibial vessels, noticed in 6 of the 9 cases.

In Case 1 it was thought that they pulsated feebly at first, but in a few hours ceased to beat. In Cases 2, 3, 4, and 6, there was no pulsation whatever. In Case 8 the anterior tibial artery was examined on the second day, and it *was thought* that pulsation could be perceived; and on the third day it was said to be very feeble; but on the fourth day there was no pulsation in the dorsalis pedis artery. The pressure of the effused mass of blood in these cases is so great as to press upon the vessels below the injury, and thus prevent their pulsation. In the instance in which the tibials were thought to pulsate, it is more than probable that it was the deceptive pulsation of the surgeon's fingers.

f. The presence or absence of pain, depending upon the amount of tension of the nerves, or injury done to them.

Thus in Cases 1 and 8 there was great pain, which increased as the distension came on; and in the latter case it amounted to great severity. In Case 5 theres was entire loss of sensation as well as motion below the knee, which was afterwards explained by finding the nerves torn across. In Cases 2 and 3 there wa little or no pain complained of; and in Case 8 there was loss of sensation in the foot.

g. The temperature of the limb.—A sudden diminution in the temperature of the limb is often a concomitant symptom when the main vessel has burst.

The leg and foot were of lower temperature in Case 3; they were cold in Cases 2 and 4. In Case 5 the whole leg was as cold as marble, the coldness gradually subsiding and ceasing near the groin; and in Case 8, the temperature of the lower part of the limb was much diminished, and became very sensibly so on the fourth day.

h. Œdematous condition of the limb, generally occurring a few days after, and in those cases where the effusion was great, and exerting compression on the arterial and venous vessels; this was only recorded in 2 cases (3 and 8).

i. Formation of abscess and disturbance of plug in ruptured

vessel, causing secondary hæmorrhage, which proved fatal in Case 9.

k. Gangrene of the limb is a natural sequence of a ruptured popliteal artery, not so much due to the lesion of the vessel itself, but to the severe attending complications and excessive injury done to the neighbouring tissues.

In all the cases, except where immediate amputation was performed, gangrene resulted. In Cases 1, 2, and 7, it might perhaps be referred to the treatment employed, viz., ligature of the vessel, either at the seat of rupture, or at the proximate end; but in Cases 5, 6, and 8, no primary treatment was adopted; hence we have fair evidence of the natural sequence of this lesion.

In Case 9 (hardly belonging to this series), by way of contrast, there was a small wound which was dilated by incision, and thus took off considerable pressure and tension, hence gangrene did not supervene.

The progress and termination of this lesion when left alone, without any operative measures, are well exemplified in 4 of these cases.

In Case 5, on the second day there was some return of warmth just below the knee, and the limb sensible to touch as far as the ankle; on the third day a return of sensation in the great toe, and of all the other toes on following day. During the ensuing four days sensibility and temperature remained about the same, and on the eighth day numerous vesications were forming below the knee; and by the eighteenth day the whole of the lower leg, with the exception of a small portion of the upper and inner surface, was converted into a gangrenous mass, and the separation of the dead from the living structures fairly began. On the forty-second day knee-joint completely opened from behind; limb amputated; recovery.

In Case 6, on the eighth day, vesications, filled with a bloody fluid, formed on outer side of leg over fibula, and whole limb manifestly about to pass into a state of gangrene. Patient's countenance and body had assumed a jaundiced hue; pulse very quick; tongue foul; countenance sunken and skin hot; head wandering. Free incision; morphia in abundance, and health improved. The mortification of the limb became complete; a line of separation formed about four inches below the knee in front, and extended behind towards the ham. On thirty-second day, the dead parts having almost entirely separated from the bones all round, those which remained were cut through where dead, the bones sawn through about six inches below the knee, and the lower part of limb removed, leaving an irregular and, in fact, a granulating stump; recovery.

In Case 8 on the fifth day the foot was evidently gangrenous; it was not swollen, but very cold, and the toes livid. This coldness extended to about three inches above the ankle, and was sharply marked off from the warmer parts. The patient had copious perspirations, but no rigors; his appetite was good, and he did not feel ill. For several days the gangrene did not extend materially; but

the whole calf was much infiltrated with blood, and there was a large collection in the popliteal space. On the fourteenth day the coldness had extended higher up, and the skin of the calf was seen to be sloughing. Amputation was then performed; recovery.

In Case 9, the discharge through exploratory incision was ichorous and bloody, and the wound turned sloughy; the swelling became somewhat diminished, and on thirteenth day wound assumed a healthier appearance, and things seemed fair for recovery, when on sixteenth day sudden and profuse hæmorrhage occurred and death.

Diagnosis.—The sudden and rapid swelling in the popliteal space, the loss of pulsation in the tibial vessels, the diminished temperature in the limb, and the tense, and often discoloured, state of the integument, would lead one to suspect and prognosticate that the main artery had burst. Pulsation in the swelling is absent, and its absence must not lead us to the supposition that the vessel is entire. We shall find that this negative symptom is associated with ruptured aneurismal sac, and has too often led the surgeon astray, so that he has thus totally overlooked the real nature of the case. In the 3 cases that came under our treatment, we successfully diagnosed the rupture of the vessel from the above facts, having observed such symptoms to accompany ruptured popliteal aneurisms.

Treatment.—We will first take a glance at the treatment adopted in the 9 cases, and then offer a few suggestions as to the best mode of proceeding in this injury.

In 4 of the cases no particular line of treatment was carried out, and no primary operative measures enforced; 3, however, recovered, and 1 died.

In Case 5, the limb became gangrenous, and was allowed to separate spontaneously, and this was being performed naturally, until the man's powers began to flag, when the surgeon had to amputate the limb above the thigh, with good result.

In Case 6, gangrene also followed, and the tense parts relieved by incision on the seventh day; nature here again undertook amputation, and the limb separated below the knee successfully.

In Case 8, the gangrene continued slowly advancing and exhausting the patient, when, on the fifteenth day, amputation was performed, and recovery.

In Case 9, an incision had been made in the ham soon after the injury, and thus gangrene was averted, but fatal secondary hæmorrhage took place on sixteenth day.

In the remaining 5 cases immediate operative measures were adopted, and all died.

In Cases 3 and 4, immediate amputation was performed.

In Case 2, a long incision was made in the ham, and the two ends of the ruptured artery ligatured; gangrene, however, supervened, when amputation was performed on the third day, and death resulting in forty hours.

In Cases 1 and 7, the femoral artery was ligatured; gangrene resulted in both; in Case 1, followed by rapid death, and in Case 7, amputation was performed on the twenty-second day, but did not save the patient, who died three hours after the operation.

Now, in all these cases (except Case 9, which was attended with immediate wound and incision), the limb was sacrificed, either by gangrene or amputation.

In Case 9, a recovery without loss of the limb might have been anticipated, for on the thirteenth day the wound in the ham had assumed a healthier appearance, and there was no evidence of gangrene, and the patient died of sudden profuse hæmorrhage.

In treating this injury, our first consideration will be the propriety of preserving the limb with safety to the life of the patient. Were it not for Case 9, and the remarks of Mr. Guthrie, appended to Case 6, we should not hesitate for one moment in advocating amputation of the limb. In Case 9 the immediate incision relieved the tension, gangrene did not follow, and the limb was apparently saved; and in Case 6, Mr. Guthrie says, "if the incision had been had recourse to, during the first two or three days, and the artery sought for, and secured if found bleeding, it is possible the mortification might have been prevented; although it is probable, from the pressure arising from the great extravasation and coagulation of blood, that the collateral circulation was so much impeded, as not to have been able to maintain the life of the limb below, even during that time." The only justification for saving a limb would be the following circumstances; viz., when the rupture has occurred from a blow, or injury from external causes, without apparent injury to the knee-joint, and without much damage to the neighbouring soft parts; when there is only a certain amount of extravasation, and, although there be no pulsation in the ham or tibial arteries, yet it does not form a sufficient impediment to the collateral circulation to cause gangrene, as in Case 9; when the patient is of good constitution, temperate habits, and young. Should such a favorable

condition of things warrant us in saving the limb, one of the following measures will have to be carried out:

1st. *To leave the limb to nature's own resources,* as in Cases 5, 6, 8, and 9. This plan in all these cases was unintentional, as the severity of the nature of the injury, viz., a ruptured popliteal artery, was not at first recognised. In these (Cases 5, 6, and 8) gangrene set in, and it required much constitutional effort to withstand the dangers and risk of this complication; in Case 6 it was fortunately arrested, and the limb separated below the knee; in the other 2 cases amputation had, after all, to be performed at the twenty-second and forty-fifth day; in one of which it proved fatal. Case 9 was interesting in many points, as showing that a ruptured popliteal artery may not necessarily be followed by gangrene, where the tension of the skin is relieved by incision; and, although escaping this one mischief, the incision was the probable cause of the secondary hæmorrhage which took place on the sixteenth day, for immediate pressure on the ruptured ends had been taken off, but the plug in the vessel not sufficiently firm to resist the arterial impulse. Had the injury been suspected, and had the incision been made larger, the clot turned out, and the torn ends ligatured, as in Case 2, a recovery might have resulted.

2d. In saving the limb we must or ought to guard against further extravasation by means of *compression of the femoral artery in the thigh and groin,* which must be carefully and judiciously employed. This can only be successfully performed in such rare instances as in Case 9, for in the majority the extravasation is sudden, immediate, and in such large quantities as at once to impede all collateral circulation in the limb, the mischief is done, and the speedy gangrene of the limb inevitable, and then the compression would not be of any service. In Cases 1, 4, 6, 8, and 9, compression might have been useful, if it had been employed early at the time of their admission into the hospital.

3d. *Should we cut down and tie the ruptured ends of the vessel,* as is ordinarily done in rupture of other arteries? This seems to be the most rational treatment, and was adopted in one of the cases (Case 2), attempted in two others (Cases 6 and 9), and regretted not to have been employed in a fourth

(Case 6). By this measure we relieve tension and prevent any further hæmorrhage.

Where no complication existed otherwise than a ruptured artery, there can be no doubt as to the propriety of the proceeding; and it is not at all improbable that, had no complication existed in Case 2, a more satisfactory result might have been anticipated.

The operation is generally extremely difficult, on account of the great depth to reach the wound, and the obscurity rendered by effused, coagulated, and infiltrated blood. This was evinced in Cases 6 and 9, where an incision was made, and the artery sought for and not found; but its beneficial effect was to allow of all the coagula to be turned out, and in this way getting rid of one source of subsequent irritation, knowing that the quantity of blood is too great to admit of absorption.

4th. *Ligature of the femoral artery at a distance,* as in ordinary aneurism performed in Case 1 and Case 7. In both, gangrene supervened, and the operation did not seem to place the patient in any more favorable condition, as in nearly all the cases early plugging of the vessel had taken place. The remarks respecting compression will equally apply here; ligature of the artery being but of little service when the whole mischief has taken place.

Respecting *amputation* of the limb, we have already referred to this measure as the treatment most appropriate in ordinary cases of ruptured popliteal artery; it is the one indicated by nature. When we consider the causes of the accident, the immense violence and force required; the complications involving the soft parts and knee-joint; the sudden outburst of a large quantity of blood in a confined space, bound down by dense fascia from behind, with the solid femur in front, and tense hamstring-muscles on either side, we can no longer wonder that all circulation in the limb below should be cut off, and death of the part result. But here a question arises as to whether amputation should be primary or secondary? There can be no doubt that when a limb is so thoroughly injured as to preclude all hopes of saving it, the primary operation ought to be performed, instead of allowing the patient to run the risk of passing through all the dangers attending

gangrene, which necessarily induces great constitutional irritation and disturbance. The fatal issue of the primary amputation in the present series does not in the least invalidate the propriety of this measure, for, in two of the cases, death would in all probability have taken place independent of the operations, from the severity of the shock, as these cases died in two and sixteen hours respectively after its performance. The third case, which has been recorded as primary amputation, was in a measure a secondary operation, inasmuch as it was performed on the third day, after gangrene had set in, and after ligature of the femoral had been employed.

As regards secondary amputation, it was had recourse to in 3 cases, and was performed on the fifteenth, twenty-second, and forty-fifth days; 2 recovered and 1 died three hours after the operation. In another case, nature successfully performed the secondary amputation, assisted by the surgeon dividing such tissues which could not readily be thrown off. These go much in favour of the latter practice; but in pursuing the history and progress of them, we find that much suffering and great risk of the patient's life was undergone.

Again, in our secondary amputations, after gangrene has set in, should we amputate while it is spreading, or wait until a line of demarcation has taken place? This question we shall not enlarge upon; each plan has its advocates; and space will not permit us to treat this point in all its bearings in the manner which we should feel inclined to do.

Porter states that amongst a large number of cases of amputation in spreading gangrene, he has never seen one recover, where the origin of the mischief was an extensively diffused aneurism.

Guthrie says, in his remarks upon the Case 6, "Experience has demonstrated in too many cases of the kind that the formal operation of amputation at this time, as recommended by most modern surgeons, would in all probability have cost him his life."

We will now give a detailed account of each case, as reported.

Table of Cases of Complete Rupture of the Popliteal Artery.

No.	Name.	Age.	Occupation, &c.	Cause.	Primary operation.	Effects of injury or operation.	Secondary operation.	Result.	Surgeon.	Hospital.
1	Male	50	Stout, bloated	Fell some distance with leg doubled up on thigh	Ligature of femoral eight hours after	Rapid gangrene	—	Death on fifth day	Poland	Guy's
2	Thomas H—	30	Cabman; intemperate	Said to be from kick of horse, but he fell with leg under him	Long incision in ham, and the ends of ruptured artery ligatured	Gangrene	Amputation on third day	Death forty hours after	Poland	Guy's.
3	John F—	32	—	Passage of cart-wheel over thigh	Immediate amputation	—	—	Death in sixteen hours	Poland	Guy's.
4	John B—	30	Locksmith; intemperate	Wheel of heavy van passed over leg	Immediate amputation	—	—	Death in two hours	South	St. Thomas.
5	James C—	46	Labourer	Sack of wheat fell upon bend of knee	None	Gangrene; attempts at spontaneous reparation	Amputation at seventh week	Recovery	Cooper	Liverpool Infirmary.
6	Richard C—	50	Mason	Struck on ham by block of stone	None	Gangrene, natural amputation	Long incision on seventh day	Recovery	Guthrie	Westminster.
7	John Z—	30	Sailor	Violent exertion in vaulting over a boat	Ligature of femoral	Grangrene	Amputation on twenty-second day	Death three hours after	Lawrie	Glasgow.
8	James T—	36	—	Caught in revolving shaft, and great contusions	None	Gangrene	Amputation on fifteenth day	Recovery	Cæsar Hawkins	St. George's
9	Anne M—	—	Intemperate	Wheel of coach passed over lower and back part of thighs	Wound dilated; no bleeding vessel found	Sudden hæmorrhage on sixteenth day	—	Death immediate	Quoted by Travers	Guy's.

Case 1.—*Complete rupture of popliteal artery; ligature of femoral; gangrene; death.*

Æt. 50. Exceedingly stout and bloated. Said to have fallen down some distance with leg doubled up on thigh, and he was admitted a few hours after the accident. There was no wound or fracture about the thigh or leg, but the back part of the popliteal space was much swollen and tense; this gave no indication of pulsation. The man complained of severe pain down the calf of the leg, and a sense of tension about the knee. The tibials were thought to pulsate feebly. Evaporating lotions were ordered. In the course of three or four hours the swelling had increased to an enormous size, extending down the calf to some distance. The skin was tense and shining, and very elastic, as if about to burst; it had no pulsation, and pressure on the femoral produced no effect. The tibials had ceased to beat. A consultatiou was held, and it was considered advisable to ligature the femoral artery. This was performed by Mr. Poland. The operation was followed by great relief to the patient, who stated that a great weight had been taken off, and that he had less acute suffering. On the following day the tension had subsided, and the whole of the swollen parts were soft; the temperature of the limb was good. On the third day gangrene set in, and was so rapid as to reach the knee in twenty-four hours. He died on the fifth day.

Examination of the limb.—The popliteal artery was completely torn across, opposite the bend of the knee; the vein was entire; there was much extravasated blood about the ham and under the gastrocnemius muscle. There was rupture of the ligaments of the knee-joint, allowing a displacement of the femur backwards from off the tibia.

Case 2.—*Complete rupture of the popliteal artery; artery laid bare and both ends tied; amputation; death.*

T. H—, æt. 30.—Admitted into Guy's Hospital under Mr. Poland. A cabman of intemperate habits. While drunk was stated to have received a severe kick from a horse in the left popliteal space, which was immediately followed by swelling of the part, and inability to stand on the leg. He was brought to the hospital in about twelve hours. The whole of the popliteal space was much distended and tense, the swelling extending some way down the calf; the integuments were slightly discoloured, and there was a mark of a bruise on the inner side of the leg, just below the popliteal space, the site of the kick. There was no pulsation whatever in the popliteal swelling, and the position of the tibia, with regard to the femur, was quite normal. The pulsation in the anterior and posterior tibial arteries could not be felt. The leg and foot were cold, and he could not move the toes, although he had not entirely lost sensation.

Mr. Poland gave his opinion that the case was one of ruptured popliteal artery, but that he would not proceed to immediate operation until the patient had some little rest from his journey. Ice was applied over the swelling, and the leg and foot covered with cotton wool and wrapped up in flannel; a pill containing a grain of opium was administered, and repeated at intervals of two hours.

Seven hours after admission the swelling and pain had not been checked, so that he was placed under the influence of chloroform, and turned on his side, so as to expose fully the back of the knee. Mr. Poland made an incision, of from seven to eight inches in length, along the course of the popliteal artery, and cleared out much coagulum, and without difficulty found the ends of the ruptured artery lying an inch and a half apart; the upper end seemed to be plugged by coagulum, and was secured by ligature; the lower end seemed to be patent, and was similarly ligatured. The popliteal vein was distinctly seen, and appeared to be uninjured, although it did not look quite normal—perhaps discolored by the effused blood; the inner head of the gastrocnemius was found torn. Further examination of the space was not made.

The man appeared to be much relieved by the operation. He passed a comfortable night, and the temperature of the limb was maintained. Symptoms of delirium tremens set in, causing much violence to the limb, but this subsided under large doses of opium and gin *ad libitum*. On the third day, thirty-six hours after ligature of the vessel, gangrene rapidly set in, when the limb was amputated above the knee. The man never rallied, and died 40 hours after the operation.

On examining the leg the popliteal vessels and nerve were carefully removed throughout their extent and dissected out, so as to be preserved; the popliteal artery was torn across, the ends, an inch and a half apart, having ligatures securely attached to both, were connected by a string of cellular tissue. The vein was entire, and pus was found close to its sheath; the nerve appeared to be bruised. (See Preparation.) The posterior and crucial ligaments of the knee-joint were completely torn through, as well as the lateral ligaments, and the condyles of the femur could be readily displaced backwards from off the tibia, so as to project into the popliteal space.

There was much extravasated blood under the gastrocnemius, as well as under the integument.

Case 3.—*Complete rupture of popliteal artery; amputation; death.*

John Fitch, æt. 32, was brought to Guy's Hospital with severe injury about the knee. The accident was said to have been produced by the passage of a cart-wheel over the thigh. No fracture or bruise could be detected, but there was a small wound along the inner side of the knee, through which could be felt the inner aspect of the condyle of the femur; a finger introduced into this opening could not discover any lesion of the joint, nor could it be made to extend to any great distance; there was no hæmorrhage or appearance of extravasated blood about the wound. It was therefore considered of but minor importance. The chief attention was drawn to the condition of the popliteal space and upper part of the calf of the leg; the integuments in this region, though uninjured, were enormously swollen and distended; somewhat mottled on its surface; there was not the slightest pulsation in it, but it felt firm, elastic, and fleshy; the leg and foot were œdematous, and of lower temperature than the sound limb; there was no pulsation in either tibials.

The case was considered to be one of ruptured popliteal artery. Mr. Poland performed immediate amputation; but the man never rallied, dying sixteen hours afterwards.

Upon examining the limb, some extravasation was found under the integuments in the popliteal space and calf of leg; but the chief effusion had taken place under the

gastrocnemius and soleus, extending down the leg. The popliteal artery was completely torn across in its centre, exactly opposite the bend of the joint; the ends were an inch to an inch and a half apart, and both extremities were well plugged. The vein was entire, and the nerves uninjured. On carefully examining the joint, the posterior ligament was torn through, as also part of the internal lateral ligament, exposing the inner condyle of the femur, a small piece of which was broken off. The crucial ligaments were entire. The inner condyle of the femur was readily moved backwards. The head of the fibula was dislocated from the tibia.

Case 4.—*Rupture of the popliteal artery and vein; immediate amputation; death in two hours after.*[1]

J. B—, æt. 30, locksmith, was admitted into George's Ward, St. Thomas's Hospital. under the care of Mr. South, on August 14th, between twelve and one o'clock a.m., having had the wheels of a heavy van pass over the ham of his left leg. There was an inconsiderable wound over the patella, and slight swelling on the inner side of the joint. There was no fracture. The man, when admitted, was exceedingly drunk, and was said to have been drinking for some days. During the night he was very violent, and the house-surgeon was sent for to see him early in the morning. He found the swelling to have increased, that the leg was cold, and that there was no pulsation in the anterior or posterior tibial arteries.

Mr. South was sent for, and immediately amputated the leg, diagnosing rupture of the artery. The man was very low, although he was well plied with stimuli, and after the operation he complained of severe pain in the precordial region, and died in two hours.

On examining the limb, the popliteal artery and vein were found to be torn through in the middle of the popliteal space. Blood was extravasated superficially, but not in large quantities, at the sides of the patella, particularly on the outside, as well as into the ham. There was no extravasation in either the anterior or posterior tibial regions. A clot of blood was found in each end of the torn artery, the clot in the proximal extremity being an inch and a quarter long, and particularly firm. There was a very considerable effusion of serum into the leg and thigh. No muscle was torn. The body was extremely muscular, and all the viscera appeared to be healthy.

Case 5.—*Rupture of the popliteal artery; gangrene; attempts at natural separation; amputation at end of seventh week.*[2]

James —, æt. 46, a labourer, was admitted at the Liverpool Infirmary under the care of Mr. Cooper on the 28th of July, 1850. He stated, that when working yesterday in the hold of a ship, measuring wheat, a sack of wheat fell on him from a height of about seventeen feet. He was standing at the time a little raised upon his toes, and leaning forwards. The sack struck the back part of the right leg, about the bend of the joint, and threw him forwards. He lay for a minute or two unable to rise, until the sack was removed from over him. Within five minutes

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[1] 'Lancet,' 1859, vol. ii, p. 287. [2] 'Lancet,' 1851, vol, ii, p. 85.

from the time that the blow was given, the leg became swollen to nearly double its natural size, and quite powerless. He felt no pain at first, but afterwards a good deal. When admitted, his leg was swollen, as before mentioned, to nearly double its proper size. The whole leg, below the knee, presented the well-known purple and mottled appearance of ecchymosis; above the knee it gradually shaded off into fawn colour, which reached nearly to the groin on the inner side, not so high as the outer. Below the knee the whole leg was tense, hard, shining, and cold as marble; above it, the hardness, tension, and coldness gradually became less, and ceased entirely near the groin. Below the knee the sense of touch was entirely gone.

No treatment had been adopted previous to his admission. A consultation was immediately held, and it was decided to adopt merely expectant treatment, to support any returning warmth, and to wait until nature should show how much of the limb was beyond all hope of recovery, before any operation should be performed. The limb was enveloped in flannel, and a grain of morphia was given the patient at bed time, and ordered to be continued for the present.

July 29th. Just below the knee there is some return of warmth, and he is sensible to the touch so far as the ankle. He had retention of urine, and his water was drawn off.

30th.—Sensibility had returned in the great toe.

31st.—The feeling of the second, third, and fourth toes had returned, but there is none in the little toe.

From this date until August 4th the sensibility and the temperature remained about the same, and at the latter date, numerous vesications were forming below the knee; and by the 14th, the whole of the lower leg, with the exception of a small portion on the upper and inner surface, was converted into a gangrenous mass, and the separation of the dead from the living structures fairly begun. Charcoal poultices were kept constantly applied to diminish the fœtor.

September 7th.—The knee-joint is completely dead from behind. September 10th, Mr. Cooper amputated the limb about the middle of the thigh.

Examination of limb.—The lower leg, with the exception of the portion before mentioned, was converted into one disorganized and putrid mass. The cartilage covering the condyles was beginning to ulcerate in consequence of its exposure to the air, and the greater part of the ligaments had sloughed. Above the condyles where the line of separation had been, all the structures were blended into a hardened mass, covered by granulations. The upper ends of the artery, vein, and nerve were found in the line of the lower flap, and traced from that point to their termination in the granulating mass, which formed the lower boundary of the sound parts on the back of the leg. The artery was quite pervious, to within a little more than a quarter of an inch of its lower extremity, which space was occupied by a firm, fibrinous coagulum. To within the same distance from its end, the coats of the artery appeared healthy, and presented no trace of any atheromatous deposit. Near its end the coats became softer and more fragile than natural, deeply injected, and at the inner side, the internal coat was separated for a short distance from the other. At its termination the artery was slightly contracted around the coagulum. The lower extremity of the vein could not be so distinctly made out; it was slightly narrowed at about an inch before its end, then returned to its natural calibre, and finally became narrowed, and at its extremity, could not be distinguished clearly from the mass of granulation in which it lay. Immediately beneath the inner coat

of the vein, lay a narrow coagulum, extending upwards for more than an inch. The *nerve* ended in a bulbous extremity, with some ragged-looking processes extending from it, having all the appearances of the fasciculi of a nerve torn across, and separated from each other. The bulbous extremity of the nerve was much harder than the healthy portion, and when cut across, presented a denser and more uniform surface than the rest. In this dense mass several fasciculi could be seen terminating in bulbous extremities.

Remarks by Mr. Fletcher, the house-surgeon, who drew up the above report.—From these appearances, I think, it may safely be inferred that the injury caused by the blow, was a rupture of the artery, with some laceration of the coats of the vein, as evidenced by the clot lying beneath the internal coat; and I should think, by the look of the end of the nerve, that it too must have given way. The diagnosis of rupture of the artery was first considered the most probable, from the immense amount of swelling and tension, evidently due to the effusion of blood, and only to be accounted for by the rupture of some large vessel. Rupture of the nerve was not considered probable, until the dissection of the parts offered evidence of this lesion having taken place. The partially restored sensation of the limb could be fully accounted for by the supply of nervous branches for the musculo-cutaneous and long saphenous; the trunks of both being out of the way of injury.

I am not aware that I have ever seen any record of a similar case to the one which I have just recorded; and in order to account for an injury so extensive, we must take into consideration the peculiar position of the man's leg at the time of the accident; the whole of the back of the limb being in a state of the utmost tension possible, and the sack (no inconsiderable weight) falling so as to strike just below the knee; thus exerting an immense force on structures already stretched to their utmost limit, and causing laceration in those that were least yielding.

Sir S. Ballinghall, who saw the case after the amputation, mentioned that he had seen both artery and vein torn across without any injury to the nerve.

The most important consideration arising from this case is, whether it would not be better, under similar circumstances, to amputate immediately, and thus to save the patient the

confinement, pain, and exhaustion caused by waiting till nature had nearly completed the division of the living from the dead portion.

Case 6.—*Ruptured popliteal artery; gangrene; spontaneous amputation; recovery.*[1]

Richard Cook, æt. 50, a mason, whilst sitting on a square block of stone on the 23d of February, was struck by another, which drove the popliteal space or ham against the edge of the block on which he sat, giving him great pain, and otherwise greatly bruising the leg, although no bones were fractured, nor was the skin torn. The limb, on his admission half an hour afterwards into the Westminster Hospital, was much larger than the other, and of a dark, reddish-blue colour, evidently from the bruise or extravasation of blood, which appeared to be still issuing from the vessel or vessels as the limb continued to increase in size, until it at last became greatly swollen. The pulsation of neither the anterior nor the posterior tibial artery could be distinguished through the swelling the next morning. The bowels were opened, and a cold spirit lotion was applied to the calf and around the leg, and the swelling somewhat subsided, the limb becoming quite a blue-black, which, with the tenseness of the parts, distinctly indicated the effusion of a large quantity of blood. It was soon obvious that greater mischief had occurred than had been expected; and on the 2d of March, as vesications, filled with a bloody fluid, were formed on the outside of the leg over the fibula, and the whole limb was manifestly about to pass into a state of gangrene, if it had not already done so, I prepared everything for tying the popliteal or other arteries if found necessary, and made a long and deep incision on the outer and back part of the leg, through the integuments and muscles, posterior to the fibula, and removed a considerable quantity of coagulated blood from between the muscles, and from a large cavity which extended upwards into the ham without causing further hæmorrhage, and in no part of which cavity could an artery be felt. The patient's countenance and body had assumed a jaundiced hue; the pulse was very quick; the tongue foul; the countenance sunken; the skin hot; the head wandering. Poultices of linseed meal and stale beer were applied, with gentle stimulating applications. Brandy and wine in proper quantities were ordered every hour or two, with sufficient doses of muriate of morphia at night to allay irritation and induce sleep. The incision, together with these remedies, gave great relief; and on the 7th, the man seemed to have been saved from a state of the most imminent danger. On the 8th the pulse was 112, the tongue clean, the skin of a whiter colour, the bowels opened by injections. Eight ounces of brandy were given in the twenty-four hours; wine, with sago, arrowroot, jelly, oranges, and anything he chose to ask for. The greatest cleanliness was observed, and the chloride of lime used in profusion all around him. The mortification of the limb was complete; a line of separation formed about four inches below the knee in front, and extended behind towards the ham. On the 26th, the dead parts having almost entirely separated from the bones all round, those which remained were

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[1] Guthrie in his "Lectures on some of the more important points in surgery."—'Lancet,' 1850-1, vol. i, p. 618-19.

cut through where dead; the bones were sawn through about five inches below the knee, and the lower part of the limb removed, leaving an irregular, and in part a granulating stump, with an inch of bone projecting from it.

On the 24th of May this portion was found to be loose; diluted nitric acid had been applied to its surface, and on the 20th of June it separated.

On the 16th of August, Cook left the Hospital in good health, with a very good stump, having cost the hospital £57 in extra diet.

Mr. Guthrie's remarks.—In this case there can be little doubt of the popliteal artery having been torn; and if the incision made on the 2d of March had been had recourse to during the first two or three days, and the artery sought for and secured if found bleeding, it is possible the mortification might have been prevented; although it is probable, from the pressure arising from the great extravasation and coagulation of blood, that the collateral circulation was so much impeded, as not to have been able to maintain the life of the limb below, even during that time. The incision made on the 7th saved the life of the patient, by taking off the tension of the part, and relieving thereby in a remarkable manner the constitutional irritation, which hourly appeared likely to destroy him; indeed, no one expected anything but his dissolution. When the line of separation had formed, he was evidently unequal to undergo the operation of amputation, to make a good stump, without great risk, and the red parts were therefore separated, merely for the sake of cleanliness and comfort. Experience had demonstrated in too many cases of the kind, that the formal operation of amputation at this time, as recommended by most modern surgeons, would, in all probability, have cost him his life.

Case 7.—*Ruptured popliteal artery; ligature of the femoral; gangrene; amputation; death.*[1]

John Lyle, æt. 30, sailor, has a large, diffused, pulsating swelling in right ham, caused by a violent exertion in vaulting over a boat. Ligature of the femoral; came away on 10th day. Secondary hæmorrhage. Gangrene; amputation performed on twenty-second day. Death in three hours.

Examination of limb.—The vessel in the ham was found fairly torn across, and the severed ends separated half an inch.

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[1] 'Med. Gaz.,' vol. xxxi, p. 634. Dr. Lawrie's collection in Glasgow Infirmary.

Case 8.—*Ruptured popliteal vessels; gangrene: amputation on fifteenth day; recovery.*[1]

James T—, æt. 36, admitted, in the morning of October 6th, 1858, into St. George's Hospital, under Mr. Cæsar Hawkins. His apron had been drawn into a revolving shaft, which carried him round and dashed him two or three times against the wall. He was not stunned. On admission he was found to have sustained trifling injury to the face. There was considerable ecchymosis and swelling in the right popliteal space, with great pain. The left leg was a good deal bruised. He complained of dull pain down the middle of the back, and of numbness of the fingers and arms, the muscles of which contracted but feebly; and of pain when he moved his arms. There was no paralysis of the lower part of the body, and no sickness. By the middle of the day, the popliteal ecchymosis and swelling had increased and extended; there was some loss of sensation in the right foot, and to a less extent in the left also. As no pulsation could be felt in the extravasated blood, it was hoped that the injured vessel might prove to be merely a vein, and that the parts might recover themselves. A free dose of laudanum was given, and good diet allowed.

Next day, the ecchymosis had increased both in size and extent, reaching up the thigh and down the leg, and being most marked on the external surface. Pressure gave great pain, especially in the popliteal space. The lower part of the limb was much diminished in temperature. The sensation in the sole of the foot was still diminished. He was recovering power in the upper extremities; the face was very pale, and the tongue pale and tremulous. The limb was wrapped up in flannel, and the laudanum repeated. The anterior tibial artery was examined, and it was thought that pulsation could be perceived in it.

On the third day the swelling remained the same, but the discoloration was very extensive. The whole surface of the calf was of a grayish-purple hue, and there was some sero-sanguineous oozing both from this part and from the popliteal region. The pulse was quick and feeble. The anæsthesia had disappeared, except in the sole of the foot. The pulsations of the tibial artery were very feeble.

On the fourth day the tenderness of the limb was less; the temperature of the foot was very decidedly diminished. The ham was again examined, both with the hand and stethoscope, but no beating was either to be felt or heard. On the inner side of the knee the anastomotic artery could be distinctly felt enlarged. There was no pulsation in the dorsalis pedis.

On the fifth day the foot was evidently gangrenous; it was not swollen, but very cold, and the toes livid. This coldness extended to about three inches above the ankle, and was sharply marked off from the warmer parts. The calf of the leg was very tender to slight pressure. He had copious perspirations but no rigors. His appetite was good, and he did not feel ill. It was decided to defer amputation, as his health was suffering so little, in order to see whether it would be possible to obtain a flap below the knee. Warmth was applied to the toes, and generous diet with laudanum given.

The case was watched for several days without any fresh symptoms presenting

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[1] 'British Med. Journal,' January, 1859.

themselves, and the gangrene did not extend materially; but the whole calf was so much infiltrated with blood, and there was so large a collection in the popliteal space, that it was felt that it would be unsafe to form a flap from the parts below the injury to the vessels. Still, even up to two days before the operation, the vitality of the foot was not quite destroyed, for capillary action could be perceived, although foul gas had collected in the cellular tissue (and was let out by incision), and sensation was abolished.

On the fourteenth day, however, the coldness had extended higher up, and the skin of the calf was seen to be sloughing. Accordingly amputation was performed next day through the lower third of the thigh. At the operation it was noticed that the femoral artery was partially closed by a clot, which, however, still allowed some passage for the blood, so that it was necessary to use a ligature.

The man recovered and left the hospital.

On examining the limb, it was found to be gangrenous as high as the upper part of the calf, and there was some ecchymosis in the popliteal space above the fascia. Underneath the deep fascia of the leg was a large abscess, containing pus mixed with blood-clot and foul gas, which infiltrated the superficial muscles of the calf. The deep muscles of the calf were comparatively healthy. The superficial cellular tissue was much thickened. The short saphena vein was entire and pervious. The popliteal vein, just below its junction with the saphena, was broken across; the two ends being separated by an interval of about one and a half inches. The lower end of the vein was blocked up by coagulum, adherent to its walls, and extended below its bifurcation. The upper end was empty; the coats of the vessel at its point of rupture were somewhat contused, but not otherwise altered. The vein and artery above the seat of rupture were closely matted together. The mouth of the femoral vein, where it had been cut through, stood open. The femoral artery, where it had been cut through, was partially closed by a small clot. The popliteal artery was ruptured at the same place as the vein, and the ends separated to the same distance; but the two ends remained connected by a string of cellular tissue. The upper fragment of the artery was firmly plugged by red coagulum for the space of about one inch, above which the clot only partly filled the vessel; the lower fragment was partially closed by clot, and by the remains of the middle and internal coats. A small mass of condensed cellular tissue, of cartilaginous hardness, was found lying at the inner side of the upper fragment. The vessels lower down were healthy.

Remarks as appended to the above case.—The lesion of the great vessels of the ham, which is described above, was accompanied at first by few of the symptoms that would have been expected, since, although both artery and vein were found completely interrupted, no symptoms of gangrene occurred till several days after the receipt of the injury, and no pulsation was at any time detected in the effused blood. That the vein was torn completely across at the time of the accident, hardly admits of doubt, from the appearance of the clot, which plugged its lower end, compared to that of the upper; a contrast so decided, as to show that the two parts of the

vessel had been subject to quite different conditions from the first. But it is not so clear that the continuity of the artery was interrupted at the time, as the circulation appeared to go on for some time in the injured limb with sufficient power to produce pulsation in the tibial vessels, which could hardly have resulted merely from an indirect circulation. It suggested itself, therefore, to some of those who saw the case, that it was possible that the wound of the artery might at first not have been so extensive as it was when the limb was examined, and might have been so far occluded by the clot as to have allowed the circulation to go on; and then might have afterwards yielded under the weight of the column of blood. The powers of nature in maintaining the circulation under the most unfavourable circumstances could not be more forcibly illustrated than by this case, in which the only channel for the direct supply of blood to the leg was, at any rate, seriously injured, and the principal vein broken off, leaving no channel for the return of blood, except the internal saphena vein; and yet where mortification was delayed, until the establishment of the collateral circulation, and the deep parts retained their vitality throughout.

CASE 9.—*Complete laceration of popliteal artery; slight wound and hæmorrhage therefrom; exploration by incision; extensive extravasation; secondary hæmorrhage on fifteenth day; death.*[1]

Anne Mould, was brought into Guy's Hospital intoxicated. She had been run over by a coach, the wheel having passed over the lower and back part of both her thighs. It was immediately followed by a large effusion into the ham. A small deep wound was found in the ham, from which there was free hæmorrhage, to appearance venous. The wound was dilated, but no bleeding vessel discovered; it was dressed, and a gentle pressure applied. From the swollen state of the limb, it was thought right to keep up evaporation from the surface. It was evident, for some days after the accident, that an internal hæmorrhage was going on, and the blood extravasating between the flexor muscles on the thigh. The integuments of the whole limb became distended, and the wound turned sloughy. An ichorous bloody matter issued from the wound, and the swelling of the limb was somewhat diminished. On the thirteenth day, the wound had assumed a much healthier appearance, and things seemed fair for recovery. On the fifteenth day, profuse hæmorrhage took place, and death ensued.

Preparation of lesion preserved in the St. Thomas's Museum, Section V, No. 5.

[1] Vide 'Medico-Chir. Trans.,' vol. iv, p. 448, quoted by Travers.

The right popliteal artery was completely torn across.

The femur has not been retained, but it doubtless formed the front wall of the cavity exposed in the preparation. This cavity was filled with pus and blood, is large and irregular (about the size of a goose's-egg), and its walls have a flocculent appearance. Into it is seen descending, at the upper part, about half an inch of the artery, the torn mouth of which is open, a thin fibre of adherent lymph lining the tube above; about half an inch to the left, is the lower part of the artery, about three inches in length; its torn end has the conical form common to a divided artery in process of cure, and contains a well-defined though not large clot, and a film of lymph runs down the vessel for about an inch. Upon the back of the preparation, near its middle, is the passage which led from the cavity to an external wound.

Series II.—*Incomplete laceration of the popliteal artery.*

The popliteal artery is very liable to incomplete rupture of one or more of its coats, such as is so frequently observed in the formation of popliteal aneurism, in many instances of which the lesion may be distinctly traced to external injury or violent exertion and straining of the knee. But it is not to this class of cases which we intend to direct our attention, inasmuch as in these there is formed a bag or sac, of a circumscribed character, which distinctly localises and confines the mischief to the seat of injury, there being no extravasation of blood into the neighbouring tissues.

The following series comprises partial lesions of all the coats of the artery, such as is produced by rupture, penetration or perforation by spiculæ of fractured bone, ulceration of the coats, &c. &c., in all of which blood becomes extravasated into the cellular tissue, diffusing itself among the muscles, without any sac or barrier being formed by the coats of the vessel, and having no characters of an aneurism, excepting that of pulsation in the swelling, and even this sign is not always present. In general, these cases are called diffused aneurisms, as may be observed in perusing the details of the cases here selected; but we prefer the more correct and intelligible definition, viz., lacerated or ruptured artery with extravasation.

The symptoms, we shall find, are very similar to those in the first series, but in a less aggravated form; for the blood is not completely cut off from the limb below, as the tube has not entirely undergone solution of continuity, but is still able to allow sufficient blood to maintain circulation in the foot and

toes. John Bell, in his remarks appended to a case of ruptured femoral artery in the middle of the thigh, makes the following comment upon the lesion; and we here introduce it, as bearing most appositely to that of partial rupture of the popliteal artery, where the progress has been slow and gradual, as was more especially observed in Cases 12, 17, 19, 21A, 21B, and 27. He says: "I desire you to observe, 1st, how well this great artery is supported by its cellular substance, and how slowly it overcomes the resistance of its own sheath; for had this been a natural aneurism, dilating slowly for a year, and bursting then by mere extension, the appearance on dissection would have been very singular.

"2d. You will remark how, when the sheath bursts, and the closer cellular substance which immediately surrounds the artery is torn, the blood, escaping among the muscles, tears the cellular substance in the interstices of the muscles from time to time, with successive lacerations and successive injections of blood.

"3d. How the limb is supported by the main artery, while its sheath continues firm, and while the blood is confined to its natural channel. And here I must also remind you, that this case is an additional proof of the limb surviving the total bursting of the artery, supported by the inosculating arteries, not only against this loss of its main artery, but also in spite of the effusion of the extravasated blood injected among the muscles, and swelling up the whole limb, and oppressing it to such a degree as entirely to prevent the pulse of the aneurism.

"And yet there may be a sort of misgiving in your mind that this was not a bursting of the artery; that the strain caused some injury, which injury might bring on disease and dilatation of the vessel; while the sense of inward lacerations in the last days of this man's life might be nothing more than the giving way of the vessel thus dilated. But I will remove all such doubts, by demonstrating to you that the artery is actually ruptured by the strain, and that the progress of the disease, the time of its enlargement, or the degree of extravasation depend altogether on the manner in which the artery is ruptured, or on the exertion of the limb; for it is the occasional exertion that causes those inward hæmorrhages by which the aneurism is from time to time enlarged."

We have collected together nineteen cases, and perhaps many more might have been added from the foreign journals or works, but these will be sufficient for our purpose.

With regard to the *causes* mentioned in these Cases:

In Case 10 it was attributed to the exertion of walking; Case 12, to a severe fall whilst in a state of intoxication, but on dissecting the state of the limb on the thirty-ninth day, it is questionable whether the rupture was not due to partial dislocation of the knee, similar to the cases of the foregoing series; Case 14 to a blow on the ham from jumping over an iron gate; in Case 19, to a hurt of the knee; in Case 15, the foot slipped off a spade as he was digging, and his heel came forcibly to the ground; Case 16, violently striking the knee against a door to force it in; Case 17, whilst working in breaking up rafters, his leg became locked in between two logs of wood, and he made violent efforts to disengage himself, causing forcible extension of limb; Case 18, jumping up ascent, with knee tense, from the bottom of a ditch to the edge; in Case 21B, a lamplighter slipped from off a board, his right leg passing between two other boards as far as the ham; Cases 11, 13, 20, and 21A, no assignable cause is given, and it is difficult to say whether the mischief had a spontaneous origin or not; in Cases 22 and 23, the injury was produced by fractured bones, the femur and tibia respectively; in Cases 24, 25, and 26, the artery was perforated by a sequestrum of bone; in Case 27, Mr. Travers attributed it to ulceration of the artery, but this is questionable.

Symptoms.—In many of the cases the actual rupture of the artery was not at first recognised, the lesion having been generally followed by slow and insidious changes, and it was not until a sudden or fresh outburst ensued, that attention was directed to the condition of affairs; in others, however, it was at once manifest. The symptoms will be best detailed by referring to the several points in each individual case, as adopted in the first series.

The latent or premonitory symptoms of a ruptured vessel before its final development—the primary complaint noticed in 11 cases.

Case 10, for two weeks complained of a sensation of numbness in the lower part of the calf, and in a few days the foot and ankle swelled, and gradually extended up the leg.

Case 12, had experienced slight stiffness in the leg, which subsequently increased, and was attended with pain.

Case 13, flying pains in the joints for three weeks, which ultimately settled in the knee, and the leg swelled, confining him to bed.

Case 17, immediately after the injury, he had great pain, and fell down.

Case 18, experienced sharp pain at the time of the accident, which made him fall back, but the pain subsided.

Case 19, the injury upon and about the knee was followed by cramp and lameness, and in six weeks inability to walk on account of excessive cramps.

Case 21A, for five months had frequent pains in ankle and foot, and ankle began to swell without any assignable cause; this was supposed to be rheumatic. The swelling increased up the leg, and the pain continued.

Case 27, after mowing grass with unsound shoes, foot and leg began to swell and inflame, and shortly after a number of red spots appeared in the leg, and in five days the inflammation reached the thigh.

In Cases 24, 25, 26, there was diseased bone, sinuses, and hæmorrhage through the latter at intervals.

1. *Sensation of something having given way,* and sensation of swelling, &c., &c., only observed in 4 cases:

Case 27, although premonitory symptoms, whilst sitting in a chair before the fire, he felt something give way, and had a trickling sensation down the thigh; suddenly turned pale, and fainted.

Case 13, had all symptoms of rupture, and attempt at repair by formation of coagulum, when, on fourteenth day, he felt a sudden snap attended with aggravation of all former symptoms.

Case 22, complained of constant sensation of swelling of thigh and calf of leg, attended with acute pain in the foot.

Case 25, while dancing at a wedding, felt sudden uneasiness in the thigh, and hæmorrhage took place through the fistulous openings.

2. *The swelling and tumefaction of the ham, leg, &c.,* observed in all the cases, excepting Cases 25 and 26, where sinuses existed which permitted the effused blood to pass out externally, and thus prevented further extravasation.

a. It was sudden in 6 cases.

In Case 10, this took place three weeks before admission, and afterwards it steadily increased; in Case 14, after attempts at repair of the rupture, on the fourteenth day, sudden enlargement and tense condition of the limb; in Case 19, there was immediate swelling of the calf of the leg, which remained stationary for three months, when the swelling began to enlarge, and remained thus for another seven months; in Case 22, sudden swelling of ham on fifth day after fracture of the thigh; in Case 23, sudden enlargement and tension, increasing rapidly, and extending above the knee and down to the ankle; in Case 24, there was a sudden filling up of the ham.

b. Although not sudden, yet a rapid increase of size of limb in 5 cases.

Case 11, there was a swelling in the ham for three weeks, which rapidly increased, and continued to do so, enlarging the size and circumference of the limb; in Case 13, the whole limb, from the trochanter to the toes, was enormously distended,

and swollen to nearly double the size of the other; in Case 15, the leg at first swelled, and he continued work for a few days, when the swelling increased and soon formed a large tumour; in Case 16, the blood was extravasated with sufficient promptitude as to form, in the space of eight days, a tumour which filled the ham; in Case 18, on the day following the accident, the tumour, which had already become large, increased rapidly.

c. The swelling was gradual and slow in 5 cases.

In Case 12, during five weeks before admission; in Case 17, daily increase for five weeks; in Case 21A, the swelling commenced at the ankle and extended up the leg, and at the end of three months the parts at the back of the knee began to swell; in a few days the whole knee became enlarged, and at the fifth month the knee became uniformly swollen, and nearly half as large as the other; in Case 27, the swelling also began from below the leg and ankle, and extended upwards, reaching the thigh, which became enormously large; the swelling increased from day to day; in Case 21B, a small swelling appeared two weeks after the accident, which increased for some weeks, and attained a large size at end of two months.

3. *Condition of the skin covering the swelling, and character of the tumour.*

Case 10, very tense, red and inflamed, supposed to be erysipelas, and treated accordingly previous to admission. Most of the effused blood appeared to be in a fluid state, as by pressure the size of it might be reduced and when, by removal thereof, it instantly refilled. The tumour increased in size, became more distended and tense; commencing below the knee, extending along the whole calf, encircling the knee.

Case 12, swelling became hot and hard, and gave the sensation of a diffused fluid; on the outer side of the ham there was a fluctuating spot under the integument, which was somewhat discoloured, and into which an exploring needle had been passed, previous to admission, and some blood evacuated.

Case 13, integuments generally white, but about knee and ham red; the whole thigh, particularly the lower part, was very tense and hard; below the ham the swelling was not so tight, though considerable; remained much the same for fourteen days, when sudden snap, and tumor became suddenly more tense.

Case 15, considerable ecchymosis extending up the inside of the thigh; much general swelling, which prevented the boundaries being distinguished. There was considerable effusion into the knee-joint.

Case 17, calf of leg raised and tense.

Case 19, whole leg exceedingly tense; not the least visible discoloration of the integuments.

Case 21A, the ham hard, skin very tense, of natural colour over anterior and lateral parts, but of a dark-livid and almost black patches in ham. Swelling elastic to the touch, and sense of fluctuation, extending four to five inches above the knee. After being in hospital two months, the ham was still as large as ever, and prominent; the skin exceedingly tense and firm, but of natural colour. A superficial ulcer, of the size of a shilling, appeared on the outer ankle, and dis-

charged freely. A week after this, a vesicle appeared in the ham, which burst and discharged a clear fluid; and at the end of another week, a small fluctuating swelling was perceived at the under part of the tumour, which was opened and gave exit to a small quantity of bloody fluid.

Case 21B, no discoloration at time; at end of six weeks, much tension.

Case 22, ecchymosis in ham.

Case 23, distended, and integuments assumed a dark livid colour, and vesications observed about the leg.

Cases 24, 25, and 26, fistulous openings about knee, leading to diseased bone, the first only attended with swelling in the ham.

Case 27, There was a large swelling occupying lower three fifths of thigh, extending into ham; although circumscribed, it was most considerable on the inner side. Tumour was elastic on pressure, but no fluctuation could be detected; the integuments were very much discoloured, of a livid colour, and at the upper and inner part of the swelling, there were two small openings discharging a sanious fluid.

4. *Pulsation of the swelling in the ham.*—This symptom is generally present in cases of partial rupture, and thus differs in one essential feature from that of complete rupture; it materially assists the surgeon in his diagnosis and mode of treatment. Here the main vessel is still pervious to the current of blood, part escaping through the lacerated opening in the artery into the ham, and part continuing its course through the lower end of the trunk; there is no coagulum blocking up the vessel, and at each beat of the pulse an impulse is communicated to the extravasated blood in the swollen limb, causing pulsation to be felt and a bruit or whiz to be audible.

In analysing the 19 cases brought under notice, in 6 this circumstance is not recorded, viz., Cases 11, 14, 18, 20, 25, and 26, but in all probability pulsation was detected, inasmuch as they were called aneurisms. Of the remaining 13 cases this particular symptom was carefully attended to; in only 3 instances was there an absence of pulsation, viz., in Cases 19, 21A, and 27, and in all the rest more or less pulsation was evident and distinct; thus—

Case 10. Pulsation, synchronous with the arteries, plainly perceptible over the middle of tumour in ham, but not nearly so distinct at the sides; on following day pulsation less evident.

Case 12. Tumour gave a distinct but feeble pulsation over whole surface; a slight bellows-murmur heard; pressure on femoral arrested the pulsation.

Case 13. Pulsation evident to the touch; distinct thrill, somewhat bellows-like

when ear applied over rectus muscle; tumour became less pulsatile, as coagula appeared to be forming.

Case 15. Large, pulsating tumour in ham; a dull sound was heard in the tumour, but no genuine aneurismal bruit.

Case 16. The pulsations raised the hand with the greatest force, but nowhere could the part be felt indicating the site of the rupture.

Case 17. On applying the hand over the femur there was a general thrilling sensation, and a peculiar whiz on the external side.

Case 21B. At first strong pulsation; afterwards a confused pulsation.

Case 22. A diffused pulsation in the ham, but absence thereof in *tibials*.

Case 23. Distinct, although slight, pulsation could be felt in the ham; *tibials* pulsated.

Case 24. Pulsation quite distinct, and bruit de soufflet audible for some distance around it, as if from aneurism; the pulsation of the artery below the tumour in the ham was distinctly perceptible.

Case 27. The thigh became enormously swollen and beat very quickly, but after three or four days the pulsation ceased; there was no pulsation in the swelling in ham.

In Cases 19, 21A, and 27, where there was no pulsation, the lesion existed five months, much effusion had taken place, and the parts rendered tense and hard.

The pulsations in the tibial vessels were only paid attention to in two cases; in one, Case 23, it was present, and in one, Case 22, it was absent.

5. *The presence or absence of pain.*

It was attended with considerable pain in Cases 10, 11, 12, 15, 17, and 18; and with excessive pain in Case 19, which, however, subsided; it was intense in Case 24. In Case 13 there was little or no pain until a fresh and sudden snap in ham, when it became very great. In Case 21A there was a dull, aching pain, which was constant, and at times excruciating. In Case 21B there was considerable pain, which increased, and afterwards caused great misery. In Case 22 there was acute pain in the foot, extending to the ham and thigh.

In Case 27 not much pain was complained of.

Pain was probably present in the other cases, 14, 16, 20, 23, 25, and 26, but no record was made of the fact.

6. *Sensation in the limb,* only stated in 2 cases.

In Case 10 it was imperfect; and in Case 21A loss of sensation, from the knee downwards, for the last month.

7. *Temperature of the limb,* observed in 4 cases; it was in all probability natural in the other cases.

In Cases 10 and 23 the leg and foot became cold, in Case 15 the toes were said to be not cold, and in Case 17 there was no great heat or sensibility in the limb.

8. *Œdematous condition of the limb,* only noticed in 6 cases.

Case 10. The lower part of the leg and foot were very œdematous.
Case 11. Severe œdema of limb, which increased.
Case 13. Ankle œdematous, which greatly diminished on third day.
Case 16. Œdematous condition of limb.
Case 21A. Leg and foot œdematous.
Case 27. Foot and leg swollen and œdematous, with desquamation of cuticle.

9. *Position of the limb* is not materially affected, as evinced by the few cases in which it was observed.

Case 10. Limb in bent position, and much pain on the least attempt to move it.
Case 18. Could scarcely move the limb, in consequence of swelling and pain.
Case 21A. At third month the parts at the back of the knee began to contract, preventing the straightening of the leg; the leg became flexed and fixed.

10. *Gangrene* supervened in 8 cases.

In one, Case 24, it followed as a natural sequence to large extravasation from a wounded artery; and in another, Case 23, gangrene was threatening. In both these cases amputation was proposed, but refused.

In 7 cases it supervened after ligature of the femoral had been effected, viz., Cases 10, 11, 12, 16, 23, and 25, who ultimately died, and Case 14, who recovered.

11. *External hæmorrhage and secondary hæmorrhage,* noticed in 5 of the cases.

Case 21A. Incision made into fluctuating part of swelling, followed by hæmorrhage, and checked by pressure; in three days very copious secondary hæmorrhage supervened, and again recurred in the space of another three days, when fatal syncope ensued.

Case 27. Two small openings formed in the skin, and about a pint of dark-coloured fluid escaped from one of the openings.

In Cases 24, 25, and 26, hæmorrhage through old-standing fistulous openings. Case 24 some time back had a very alarming hæmorrhage from one of the openings, but no recurrence until night before admission, when he bled with great violence; the blood, at intervals, spirting out to a considerable distance, at other times trickling down the limb, but in neither case was he able to restrain it. He supposed that he lost several quarts of blood, and fainted from exhaustion seven or eight times. Bleeding occurred during the night of admission and on the following day, and amputation refused. Death.

In Case 25 sudden bleeding took place through two fistulous openings, and continued, more or less, for eight days, notwithstanding compression.

In Case 26 recurrence of bleeding at frequent and long intervals.

12. *The progress and results* which ensue when these cases are left alone, from the refusal of the patient to undergo operation, are well exemplified in Cases 21A and 24.

The DIAGNOSIS in these instances was comparatively easy, for in 11 of the 19 cases pulsation in the swelling was readily detected, and in 6 others, although the actual condition was not stated, yet the disease was called aneurism, as indicating the essential characters thereof. In the remaining 2, arterial hæmorrhage escaped through the sinus, and at once showed the nature of the mischief.

In Cases 19, 21A, 21B, and 27, there was some difficulty in the diagnosis, owing to the absence of pulsation, but which could be readily cleared up by careful attention to the previous history of each; thus, in Case 19 it was presumed to be aneurism from the deepness of the swelling, the sudden enlargement, and the violence of the pain; in Case 21A it was questionable as to whether the disease was not an abscess or fungoid disease; in Case 21B, on account of the tension and confused pulsation, the disease could not well be ascertained; and in Case 27, although the history pointed out the true nature of the lesion, yet the absence of all pulsation in the swelling rendered the diagnosis unsatisfactory, and to the employment of an exploratory incision.

PROGNOSIS of 19 cases—10 recovered, and 9 died.

Limb and life saved in 6 cases; 4 by ligature of femoral, and 2 by ligature above and below rupture.

Limb lost by amputation, and life saved—4 cases.

Life lost in 9 cases, 2 refused operative measures, 1 after amputation, 6 after ligature of artery and subsequent gangrene.

THE EXAMINATION OF THE LIMB and actual condition of the lesions induced, where a dissection of the parts had been permitted, are fully detailed in the report of cases, and do not require further analysis.

TREATMENT of partial rupture of the popliteal artery.—In the majority of these cases the lesion had taken place without much damage to the surrounding tissues or to the knee-joint, so that it had not been attended with such excessive violence as witnessed in complete rupture. Hence we ought to expect less mischief ensuing, and to entertain hopes of saving the

limb; but can we do so without operative measures? Cases 21A and 24, which were left alone, owing to the refusal, on the part of the patients, to undergo operation, tell us no; a perusal of their cases will at once satisfy us on this point, one of them dying from secondary hæmorrhage, and the other succumbing to secondary hæmorrhage and gangrene.

The remedies resorted to were the following:

1. *Compression of the femoral artery* was tried in only one case (14), but could not be borne. We should certainly feel disposed to recommend this line of treatment in all cases of partial rupture, where there is no great amount of distension interfering with the collateral circulation.

Direct compression on the seat of rupture is useless; the depth of the artery, and inability to compress it without excessive force and injury to the vein and nerve, preclude its performance. It was attempted in Cases 24 and 25 without effect, and in Case 18 it could not be borne.

2. *Ligature of the femoral artery,* as a substitute for compression when the latter fails.—Ligature was performed in 9 cases, in 4 of which it was successful, and in 5 gangrene supervened and death resulted. The following table will explain all details.

Cases.	Date of operation.	Ligature came away.	Effects.	Results.
10	5th week.	21st day.	Gangrene, attempts at separation.	Death 4 weeks after operation.
11	3d „	—	Gangrene.	Death 43 days after.
12	6th „	17th day.	ditto.	Death 39 „
23	30 hours.	—	ditto.	Death on 8th day.
25	8th day.	—	Rapid gangrene.	Speedy death.
13	3 weeks.	17th day.	Fever, diarrhœa, and pneumonia.	Recovery.
14	8 „	19th „	Gangrene of foot and natural separation.	ditto.
15	3 „	13th „	—	ditto.
22	5th day.	20th „	—	ditto.

3. *Incision into the ham, and a ligature above and below rupture.*—This was performed in the 4 cases quoted from M. Pelletan (Cases 16, 17, 18, and 20), and was attempted in Case 19.

In Case 16 it was had recourse to on the eighth day, but gangrene followed in thirty-six hours, and death on the sixth day. In Case 20 the ligature on the vessel was insecurely applied, the knot slipped, secondary hæmorrhage supervened, and amputation had to be performed, but death resulted. In Case 18 the operation was performed several days after the rupture; suppuration took place, and recovery at the end of three months. In Case 17 the ligatures were applied on the sixth week; the lower one came away on the nineteenth day, and the upper one on the day following; recovery took place at the end of six months. In Case 19, upon opening the tumour, the coagulated blood appeared to have acquired a fleshy consistence, and adhered very firmly one portion to another; the ruptured artery appeared just between the heads of the tibia and fibula, so that it was impracticable to tie, or at least judged unadvisable, considering the condition of the leg; therefore amputation was immediately performed.

4. *Amputation* performed in 5 cases; of these, in 2 it may be called *primary*, viz., Cases 19 and 20, in both of which unsuccessful attempts had been made to secure the artery in the ham, when it had to be resorted to; one recovered and one died.

The secondary amputations were in Cases 21B, 26, and 27, in two of which there was success, and in the other the result was not stated.

The summary of the results has been already anticipated under the head prognosis; thus, of the 19 cases, 9 died and 10 recovered.

Of the 9 *deaths*, 2 refused any operation, 5 died of gangrene after ligature of the femoral artery, 1 of gangrene after ligature at seat of rupture, and 1 after primary amputation, in consequence of secondary hæmorrhage.

Of the 10 *recoveries*, 4 after ligature of the femoral, 2 after ligature at the seat of rupture, and 4 after amputation, of which 3 were secondary and 1 primary.

Cases of Partial Rupture of the Popliteal Artery.

Case 10.—*Ruptured popliteal artery; ligature of femoral; gangrene; death of the patient.*[1]

George Charles, æt. 49, admitted into Guy's Hospital, on November 10th, 1830, under Mr. Key, for a large, diffused, aneurismal tumour in the calf of the right leg. All that could be learnt was that, while walking one afternoon, about five weeks

[1] 'Medical Gazette,' vol. viii, p. 635.

before his admission, he felt, for the first time, pain and a sensation of numbness in the lower part of the calf; in a few days he perceived the foot and ankle to be swollen, which gradually increased and extended up the leg; this, however, was not sufficient to prevent his walking as usual, until three weeks before admission, when he was conscious of a sudden increase in the swelling, and particularly about the calf; since then he has been unable to walk, and has suffered considerable pain. He consulted a practitioner, who, from the swollen and inflamed state of the limb, overlooked the aneurism, and supposed the disease to be erysipelas. Leeches in abundance were applied to the lower part of the leg, and purgative medicines given freely; by these means the inflammation was much reduced, as was also the man's general health. He had two or three rigors, and suppuration was anticipated.

On admission, the tumour appeared to be of a very large size, commencing immediately below the knee, extending along the whole calf, and nearly encircling the limb; it was very tense, and the integuments red and inflamed; most of the supposed effused blood appeared to be in a fluid state, as by pressure the size of it might be much reduced, and when removed it instantly refilled; a pulsation, synchronous with the arteries, was plainly perceptible over the middle of it, but not nearly so distinct at the sides. The lower part of the leg and foot were very œdematous, and sensation imperfect. He was unable to bear upon the leg, but lies with it in a bent position, and complains of much pain on the least attempt to move it. His strength was much reduced, and he appeared in ill health. There was no aneurismal thrill about the pulse, which was feeble and rather quick. Cold lotion was ordered to the tumour, but as the leg and foot soon became cold, warm flannels were applied to the foot.

On the following day the tumour had increased in size, was more distended and tense, and pulsation less evident. A ligature was placed on the lower part of the femoral artery previous to entering the opening formed by the triceps tendon. Immediately upon the vessel being secured, the tenseness of the tumour was much diminished, and not the slightest pulsation could be felt, but in the evening the distension had rather increased.

On the third and fourth days the foot and leg continued warm, but symptoms of constitutional irritation set in, and on the fifth day signs of gangrene showed themselves. Mr. Key wished to amputate, but Sir A. Cooper, considering the livid appearance arose rather from obstruction to the cutaneous circulation than from incipient gangrene, wished gentle friction to be used; and even should mortification ensue, Sir A Cooper thought amputation had better not be performed, hoping it would not extend beyond the calf, and thus, perhaps, the knee-joint might be saved. The ligature came away on the twenty-first day.

Gangrene extended slowly up to near the calf of the leg, suppuration ensued, and nature endeavoured to separate the limb, but her powers failed, and the patient succumbed at the end of the ninth week, worn out by the excessive discharge and constitutional irritation. No post-mortem allowed.

Remarks by Mr. Key.—The day following his admission a consultation was held as to the propriety of amputating the limb at once, or whether an attempt should be made to save the limb. It was a matter of considerable doubt if it were an aneurism of the lower part of the popliteal or of the posterior tibial artery; on the other hand, the situation of the

tumour seemed to point out the posterior tibial as the affected vessel, and the possibility that in this case the blood, contrary to what is usually found to take place, might have descended, inclined some rather to consider it as popliteal.

Independently of the doubt as to the affected vessel, it was considered an unfavorable case for tying the artery. In the *first* place, if the femoral artery were tied, the patient's low state, the largeness of the aneurism, and the swollen state of the limb, rendered it probable there would not be sufficient circulation to maintain the life of the leg. *Secondly*, if, instead of tying the femoral artery, the aneurism should be opened and the coagulum turned out, the difficulty there might be in securing the ruptured vessel, and if found to communicate with the posterior tibial, the deep situation of that artery, would render it extremely difficult, if not impracticable. *Thirdly*, if the affected vessel were secured, it was hardly to be expected that, reduced as the patient was, he would be able to support the immense suppuration which must necessarily ensue.

In favour of tying the femoral artery, it was said that, by passing the ligature round it as low down in the thigh as could be, just as the vessel passes through the tendon of the adductor muscle, probably the supply of blood to the tumour would be cut off, or at any rate so much lessened, and the impetus of that sent so diminished, as not to prevent the curative process being set up, while the anastomosing branches would be sufficient to maintain a due circulation in the limb; the absorbents might then possibly remove the effused blood, and if this did not take place, the bulk of the tumour being much diminished, the consequent suppuration would not be greater than the man could bear. By adopting this plan the only chance of saving the limb would be given; and if it did not succeed, recourse could then be had to amputation.

Case 11.—*Ruptured popliteal artery; ligature of femoral three weeks after; gangrene; death forty-three days after operation.*[1]

N. D—, æt. 52, habitually intemperate, and readily excited; admitted into Marylebone Infirmary, under Mr. B. Phillips, with a diffused popliteal aneurism on the

[1] 'Med. Gaz.,' vol. xxxi, p. 377.

right side, which had already produced some œdema of the right foot. His account of it was, that he had discovered a swelling in the ham three weeks before admission; that it had rapidly increased in size, and become very painful, especially at night. There was so much general irritability and arterial action, that it was thought advisable to delay operative measures for a few days. However, the pain in the ham increased, as also the size and circumference of the limb; and it was resolved to operate forthwith, but no persuasion could move him to submit. Several days passed on, the pain increased, the size of the limb also, as well as the œdema, and he then himself proposed operative measures. Ligature of the femoral was performed, and two other large arterial trunks, seen in the course of the operation, likewise ligatured.

The patient's suffering was lessened from the moment of the operation; the pain in the tumour was dissipated, and in forty-three hours his general condition and countenance improved; but one thing created uneasiness, and that was the large quantity of blood effused at the ham and at the upper part of the calf. On the eighth day there was heat and redness, and on the eleventh fluctuation was evident; this was explored; a dark, thin, red, bloody fluid escaped, containing pus. Two incisions were made, to allow of escape of fluid, but not much evacuated. Gangrene set in. Death on forty-third day after operation.

No facilities afforded in examining limb. The parts were so broken down by gangrene that nothing could be made of them.

Case 12.—*Ruptured artery; ligature of femoral on sixth week; gangrene. Death thirty-nine days after operation.*[1]

Thomas C—, æt. 56, tailor; pale; unhealthy; admitted into the Liverpool Royal Infirmary, under Mr. Stubbs. About five weeks before admission, while drunk, met with a severe fall. For some time previous to this occurrence he had experienced slight stiffness in the left leg, which subsequently increased, and was soon attended with pain. After the accident he soon perceived a swelling behind the knee, which became hot and hard, and caused pain on walking; it had gradually increased in size.

On admission, there was a swelling in the left calf, giving the sensation of diffused fluid; a tumour of considerable size occupied the inner side of knee, and extended into popliteal space, and gave distinct but feeble pulsation over whole surface; a slight bellows-sound heard. The veins crossing it were large. Pressure on femoral arrested the pulsation. On the outer side of the ham there was a fluctuating spot under the integument, which was somewhat discoloured, into which an exploring needle had been passed previous to admission, and some blood evacuated.

Ligature of the femoral performed on the eighth day. Favorable progression until tenth day, when gangrene attacked fourth and fifth toes. The ligature came away on seventeenth day, and an incision was made into the ham, and a large quantity of coagulated blood removed, and with relief. Gangrene continued to progress, and amputation unable to be performed on account of patient's condition. Death resulted on thirty-ninth day.

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[1] 'Med. Times,' vol. xxxi, p. 60.

Examination of limb.—No aneurismal sac could be discovered. The structures in the ham had all sloughed to a considerable extent. The popliteal artery was traced down to opposite the knee-joint, and at that point it was destroyed; the same remark applies to the vein; the internal and external popliteal nerves were to a great extent destroyed. The knee-joint was opened from behind. The arteries of the limb were the seat of extensive atheromatous deposit.

Case 13.—*Rupture of artery; ligature of femoral at fifth week; pneumonia. Recovery.*[1]

W. Warren, æt. 36, carman; admitted into London Hospital, under Mr. Scott. Perceived flying pains in the joint three weeks ago, which ultimately settled in the left knee; the leg swelled and confined him to bed. On admission, the whole left limb, from the trochanter to the toes, was enormously swollen, and nearly double the size of the other; the integuments generally white, but about the knees, and in the ham especially, they are red; the whole thigh, particularly the lower part, where there is a strong pulsation, was very tense and hard; below the knee the swelling is not so tight, though considerable; the ankle œdematous; little or no pain, except on motion. He had an attack of double pneumonia, and was bled; had calomel and opium and colchicum. On the third day the œdema had greatly diminished; the tumour much the same; pulsation evident to the touch; a distinct thrill, somewhat bellows-like, when the ear is applied over the lower part of the rectus.

On the fifth day tumour harder, less pulsatile; coagula appear to be forming; pneumonia still in the lower part of the left lung.

On the fourteenth day, feeling a sudden snap in the ham this afternoon, attended with great pain, and the tumour becoming suddenly tense, the femoral artery was secured by a double ligature at the usual spot.

Fever and diarrhœa supervened, which subsided, as also the pneumonia.

Ligature came away on seventeenth day. Slow recovery.

Case 14.—*Ruptured artery; six weeks after, compression tried; ligature of femoral. Recovery.*[2]

A man, æt. 30, was admitted into King's College on account of a large popliteal aneurism. The tumour had followed a blow on the part, inflicted six weeks before admission, in jumping an iron gate.

Treatment by compression was tried, but could not be borne. During the fortnight the man was in the hospital before the operation, the aneurism became diffused, and double in size.

Ligature of the superficial femoral performed. Four days after, mortification of foot began. A line of demarcation afterwards formed about the ankle, and separation is now proceeding.

The ligature came away on nineteenth day, and the wound healed well.

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[1] 'Med. Gazette,' vol. xiv, p. 460.

[2] 'Med. Times and Gazette,' 1856.

Case 15.—*Ruptured artery; a few days after, ligature of femoral. Recovery.*[1]

J. W—, æt. 30, admitted into St. George's Hospital, under Mr. Pollock; agricultural labourer, in good health. Three weeks before admission his right foot slipped off spade as he was digging, and his heel came forcibly to the ground; two hours after, he noticed that the leg was swollen; next day the leg remained swollen, but was not particularly painful, and he continued his work for a few days. The increase of the swelling and the accession of pain then compelled him to take to his bed.

On admission, there was a large, pulsating tumour in the ham, and considerable ecchymosis, extending up the inside of the thigh; there was much general swelling, which prevented the boundaries of the pulsating tumour being distinguished. A dull sound was heard in the tumour, but no genuine aneurismal bruit. There was considerable effusion into the knee-joint. The toes were not cold.

Ligature of femoral immediately performed. Ligature came away on thirteenth day. Recovery.

Case 16.—*Ruptured artery; incision into ham; ligature above and below wound; gangrene. Death.*[2]

A man, about thirty, well-developed, ruptured his popliteal artery in violently striking his knee against a door so as to force it in. Blood extravasated with sufficient promptitude as to form, in the space of eight days, a tumour which filled the bend of the knee, a determined swelling, and an œdematous condition of the leg. The pulsations raised the hand with the greatest force, but nowhere could the part be felt indicating the site of the rupture. In this state he was sent to the Hospital of the College of Surgery, and M. Louis, the surgeon, charged M. Pelletan to operate. A long incision was made in the ham, coagula removed, and the whole space cleared; but still he could not find the large packet of vessels, only laying bare a large cavity, in posterior part of which were observed the condyles of the femur and tibia. On turning aside the external border of the wound, the artery was immediately seen, and an oval aperture observed at its anterior aspect. Two ligatures were applied, and tied, one above and the other below the wound. Gangrene supervened in thirty-six hours. Amputation could not be performed, and death ensued on sixth day.

Dissection of the limb proved that all the arterial branches had been likewise ruptured, and comprised the superior external and internal articular arteries.

Case 17.—*Ruptured popliteal artery; incision into ham; ligature above and below wound. Recovery.*[3]

J. S—, æt. 32, robust, many years a soldier; had lately had much rough employment; had never had any pain or disease in the ham. Whilst working in breaking up rafters, his right leg became locked in between two pieces of wood, and he made violent efforts to disengage himself. He immediately experienced great pain, and

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[1] 'British Med. Journal,' 1857.

[2] M. Pelletan, in his work on 'Clinical Surgery.'

[3] Ibid.

fell down. He soon felt a lump in the ham, of the size of a nut; this daily increased, as well as the pain in proportion, and six weeks after this, was admitted into the hospital. He was then suffering great pain; the calf of the leg was raised and tense, and there was great heat and sensibility in the limb. On applying the hand over the ham there was a general thrilling sensation, and a peculiar râle, on the external side.

A long incision, ten inches in extent, was made in the popliteal space, and a ligature applied above and below the wound in the artery. Suppuration ensued. The lower ligature came away on the nineteenth day, and the upper one on the day following. Recovery at the end of six months.

Case 18.—*Ruptured artery; incision into ham; ligature above and below wound. Recovery.*

M. L—, a violinist, an active, vigorous young man, was jumping up an ascent, with knee tense, from the bottom of a ditch on to the edge, when he experienced a sharp pain in the ham, which made him fall back. The pain soon subsided, but on the following day a tumour was discovered in the ham, which was already large, and was increasing rapidly. Compression was tried, but could not be borne. The tumour increased daily in size, so that he could scarcely move the limb in consequence of the swelling and pain.

The case required urgent and immediate operation; the ham was laid open, but there was much confusion of parts; the ruptured artery was exposed, and a ligature applied above and below. Suppuration ensued. Recovery in three months. (See Pelletan.)

Case 19.—*Ruptured popliteal artery; slow and partial extravasation; nine months after, incision into ham; inability to secure lacerated artery; amputation. Recovery.*[1]

A man, about 30 years of age, received a hurt upon and about his knee in the month of November, followed by a cramp and lameness. "In six weeks he had excessive cramps, and was unable to walk, which was followed by an immediate swelling of the calf of the leg, attended with excessive pain, and it continued in much the same state for about three months, when the pain began to increase and the swelling to enlarge. On admission, in April following, the whole leg was exceedingly tense, but there was not the least pulsation to be discovered in it, nor the least visible discoloration of the integuments. However, from the deepness of its situation, as well as from the sudden enlargement and the violence of the pain, it was presumed to be aneurism, and on that presumption the operation for aneurism was attempted on the 15th of October.

"Upon opening the tumour, the coagulated blood appeared to have acquired a fleshy consistence, and adhered very firmly one portion to another. Upon removing it totally, the tibia and fibula were found carious, and the ruptured artery appeared

[1] Warner's 'Cases in Surgery,' quoted by John Bell.

just between the heads of the tibia and fibula, so that it was impracticable to tie it, or at least judged unadvisable, considering the condition of the leg." "It was amputated above the knee upon the spot, and the patient did well."

Mr. Bell's remarks.—Here a most important fact is proved in all its circumstances. The sudden rupture of the artery, the slow growth of the tumour, the want of pulsation (which is the usual characteristic of aneurism), but, above all, the inevitable destruction of the bones, and the incurable nature of the disease! The ease with which the artery might have been tied at the first, and the necessity of amputating the limb in the end, are important lessons. We thus perceive that the very slow growth of an aneurism is perfectly compatible with the most desperate wound, or total laceration of a great artery.

Case 20.—M. Pelletan remarks that three months previously to the above (Case 17) a case occurred in which the patient had aneurism following a ruptured artery; attempts were made to secure the vessel by ligature, but this did not succeed in arresting the hæmorrhage; amputation was performed, and death resulted. On examining the limb it was found that the ligature on the vessel had slipped, in consequence of the knot not having been firmly made.

Case 21a.—*Ruptured artery; slow extravasation; difficulty of diagnosis; exploratory incision; secondary hæmorrhage. Death.*[1]

J. L—, æt. 33, admitted into St. Thomas's Hospital, under Mr. Green; rather tall, light hair, pale, sallow, emaciated. In the silk trade. Become lately reduced in circumstances. Has led a gay, dissipated life. Always enjoyed good health.

About five months back he had frequent pains in right ankle, and foot and ankle began to swell without any assignable cause; supposed rheumatic. Swelling increased up leg, and pain continued. Three months after this the parts and back of knee began to contract, preventing the straightening of leg. Soon after this he perceived a swelling at back of knee; and, after a few days, the whole knee became much swollen, the back part being harder than the rest. Has had no shivering fits, nor has ever observed any pulsation.

On admission, the right knee uniformly swollen, nearly half as large as left; skin very tense, of natural colour over anterior and lateral parts, but in dark, livid, and almost black patches in popliteal region. Swelling elastic to touch, with a sense of fluctuation; it extends four to five inches above knee; thigh above attenuated, and smaller than opposite; leg flexed and fixed. Has lost all feeling from knee downwards for last month; leg and foot œdematous; skin thereof tense, but of natural colour; a dull,

[1] 'Lancet,' 1841.

aching pain in and about knee constant, at times excruciating. Want of rest; constitutional irritation; emaciation. Some of opinion it was fungoid, others abscess.

April 3d.—After being in hospital two months, swelling on sides of knee very considerably diminished, but back part still as large as ever, and prominent; leg has been gradually getting harder; skin exceedingly tense and firm, but of natural colour. A superficial ulcer, the size of a shilling, on outer ankle, discharging freely.

9th.—A week after this a vesicle appeared under the knee, burst, and discharged clear fluid.

16th.—At end of another week a small swelling perceived at under part of tumour; was opened; small quantity of bloody fluid escaped; hæmorrhage supervened, checked by pressure; secondary hæmorrhage three days after, very copious; a third very copious hæmorrhage three days subsequently; fatal syncope, and died on 23d of April.

On examining limb, tumour found to be a false aneurism; sac formed of the condensed surrounding tissues, and extremely thick. The artery presented a small, irregular, lacerated opening, about centre of popliteal space.

Case 21B.—*Partial rupture of popliteal artery; subsequent circumscribed tumour; difficult diagnosis; amputation.*

(*Case as related by* John Hunter.[1])

John Staples, æt. 33, by trade a lamplighter, about the latter end of March, by a board giving way under him, his right leg slipped down as low as his ham between two other boards, but he did not feel any other inconvenience from the accident, not even a discoloration of the skin.

About a fortnight after, he perceived a small swelling in this ham, accompanied with a strong pulsation; the swelling increased, with considerable pain for some weeks, the last two of which he was in great misery.

Rather more than two months after the accident he came into the hospital. The whole leg was now much swollen, very painful, and there was a confused pulsation; but there was so much tension in the part, that the disease could not be well ascertained. Amputation was performed twenty-seven days after admission.

Upon examination of the parts after their removal, it plainly turned out to be a rupture of the artery, but whose orifice was extremely small; it allowed at once the blood to escape into the cellular membrane opposite to this opening, which, we may suppose, dislodged a cell or cells, and at the same time squeezed one cell against another, forming an artificial coat, which dilated from the force of the blood to the size we found it, and in the end had the common effects produced upon it that take place in an aneurism when its coats, both natural and acquired, give way, viz., the blood becoming diffused into the general cellular membrane of the surrounding parts.

On cutting into the tumour and scooping out the coagulated blood, then introducing a probe into the sound artery above, it readily passed through a small lateral opening, with rounded or smooth edges, into the cavity of the tumour. On tracing the artery downwards through this opening, I found it passing along the tumour on

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[1] Hunterian MSS., 'Cases and Observations,' No. 44. See 'Catalogue of Gen. Pathol.,' vol. iii, p. 207, Royal Coll. of Surg. of England.

that side next to the bone, but obliterated nearly the whole diameter of the tumour, and become so soft and pulpy as not to be distinguishable from the other parts which were composed of coagulated blood, cellular membrane, artery, &c. In tracing the artery from below, I lost it in this mass. The crural artery, as it approached this lateral orifice for about two inches in length, became contorted or serpentine in its course, similar to what sometimes takes place in an aneurism.

Mr. Hunter's remarks.—Here was a case where there was every external appearance of an aneurism, such as a circumscribed swelling, with a pulsation.

This was what would be called or understood by a spurious aneurism; but it was probably a rupture of the coats of the artery, and which, I do imagine, is only to be distinguished from the [true] aneurism, or dilatation, by the time it takes in coming to its ultimate size, viz., from its first appearance to its threatening destruction to the parts beyond, as a limb, or destruction in the surrounding parts in which it is placed, threatening mortification and bursting. An aneurism being as many months in coming to this ultimate as this disease was days; for, in aneurism, although the artery gives way at last, and then its coats are principally composed of the condensed cellular membrane, as in this case; yet it is strong, owing to the time it has had to thicken and form a coat while the artery was dilating.

Prep. 1571. (See 'Cat. of Gen. Pathol.,' vol. iii, p. 207. Royal Coll. of Surgeons, England.)—Part of a popliteal artery, from which, in consequence of rupture of a small portion of its coats, blood escaped into the surrounding cellular tissue. A sac, with walls about a line in thickness, composed of the surrounding tissues, laminated and condensed, formed round the coagulated blood; but it is now emptied, the coagulated blood being turned downwards. A portion of whalebone is passed through the aperture in the artery into the cavity of the sac.

There is little doubt that the preparation was taken from the above case.

Case 22.—*Fractured femur; lacerated popliteal artery; ligature of femoral; recovery.*

Richard W—, æt. 41, a stout, healthy, regular-living man, was admitted into Guy's Hospital, under Mr. B. B. Cooper, with a compound fracture of the lower third of right femur, occasioned by the kick of a horse. The fractured extremities of the bone were readily brought into apposition, and the limb was placed upon a double-inclined plane, with a splint on either side of the thigh, and a piece of lint placed over the wound.

On the fourth day he complained of a constant sensation of swelling of the thigh and calf of the leg, attended with acute pain of the foot. There was also swelling and some appearance of ecchymosis in the ham.

On the fifth day he was still restless, and complained of more pain in the ham and thigh, and particularly of the foot; and for the first time was discovered a diffused pulsation in the ham, which led me at once to the conviction of the artery having given way. On consultation with Sir A. Cooper, Messrs. Key and Morgan, it was decided that a ligature should be placed upon the femoral artery, thus giving the patient the chance of saving his limb, leaving other means to be resorted to should that operation fail.

The artery was tied at the junction of the upper with the middle third of the thigh. The tumour in the ham gradually decreased; the ligature came away on the twentieth day. On examining the limb on the twenty-eighth day, the fracture was found united. The wounds cicatrized, and the patient recovered.

Remarks by Mr. Cooper.[1]—The patient, whose case we have related, was a healthy man; and, but for the laceration of the popliteal artery, there would have been no doubt as to a successful result of the case; for neither was the femur comminuted, nor the laceration of the soft parts sufficiently extensive to render amputation necessary; the only point, therefore, left for consideration was, how to obviate the ill effects of the rupture of so large a vessel; for, from the quantity of blood diffused, and the absence of any pulsation either of the anterior or posterior tibial branches, it was clearly the popliteal artery which had given away. Having determined not to amputate, the only plan to be adopted was evidently to secure the bleeding vessel; but this involves two questions—*first*, as to the situation in which the vessel is to be tied; and, *secondly*, when tied, whether the reparation of the femur could, under such circumstances, be expected, and, if so, by what means the blood would be conveyed.

With respect to securing the vessel, the surgeon would be guided in such a case by the situation of the external wound; for, had the wound in this case been in such a situation as to admit the escape of the diffused blood, I consider the case would have been entirely altered, and that the limb must have been amputated, or else the wounded artery tied above and below the opening, which in the popliteal space could hardly be accomplished; but as the blood did not escape, the coagulum was capable of forming so firm a compression upon

[1] B. B. Cooper's 'Essays,' p. 79.

the wounded vessel, that upon the application of a ligature above there was no fear of the recurrence of the hæmorrhage; while, on the contrary, if the blood had escaped through an external opening, and the femoral artery had been tied, the collateral branches which convey the blood to the arteries below the rupture would almost certainly have induced a hæmorrhage from the lower part of the wounded vessel. Hence in compound fracture, with a laceration of vessel, it is a great point of consideration whether the external wound does or does not communicate with the wound of the artery; and, speaking generally, it may be said that the former will require amputation, while the latter will preclude the necessity.

In reference to the means by which blood would be conveyed to the femur itself, the anatomist will at once understand, so far from there being any danger of the supply of blood being cut off by this operation, that, through the profunda branch, even a greater quantity would be conveyed to the interior of the bone; and, indeed, I may say in this case, the rapidity of the reparation, and the perfect solidity of the bone, equally proved this fact. During the progress of ossific union, the limb was allowed to lie upon the outer side, and in the semiflexed position, nor were splints applied until the wound in the thigh was entirely healed. (B. B. Cooper's 'Essays,' p. 79, *et seq.*)

CASE 23.—*Probable injury of popliteal artery by fractured portion of tibia; threatening gangrene; amputation refused; ligature of femoral on 2d day; gangrene; death.*

Wm. B—, æt. 60, admitted into Guy's Hospital with fractured leg; a strong, powerful man, and accustomed to drink a good deal of ale. While getting down from the hind part of a stage coach, he put his foot upon the wheel, and fell backwards, with his right leg under him. He was brought to the hospital about one hour afterwards. On examining the right leg, both bones were found broken a little below the knee; there was a very oblique fracture of the head of the tibia, which appeared to extend into the joint; the upper fracture projected inwards and backwards, and the lower portion upwards and outwards. The leg was tense and enlarged, there being considerable swelling and effusion; the foot was cold (probably owing to exposure), and he complained of great pain. In about one hour afterwards the distension had increased very rapidly, extending above the knee down to the ankle; distinct, although slight, pulsations could be felt in the ham; both anterior and posterior tibial arteries could be felt—the anterior more so than the other. It was inferred that the lower part of the popliteal artery was wounded.

Immediate amputation was proposed, but the man and his friends would not consent.

On the following day the limb was still more distended, pulsations not so distinct, foot warm, sensation perfect; the integuments of a dark livid colour, and vesication about the limb. Amputation again proposed and refused. Ligature of the femoral was permitted and performed; some little difficulty occurred, owing to the depth of the artery, its cessation of pulsation, and the presence of a plexus of veins covering the artery. The artery itself was much diseased. Gangrene soon became evident, and he sank exhausted eight days after ligature.

Examination of limb very imperfectly performed, in consequence of interference of friends. The popliteal, anterior, and posterior tibials, and peroneal, examined without discovering any lesion thereof. The hæmorrhage was supposed to have arisen from some smaller arterial branches; and could a more minute examination have been obtained, its source might have been ascertained. The femoral artery, at the seat of ligature, had a considerable quantity of earthy deposit between its coats. This did not appear to have been a serious objection against the ligature, as in this instance the artery was rendered impervious by its sides being glued together by coagulating lymph, as firmly as usually takes place in the same time when the vessel is quite healthy.—Prep. 1515[50].

Case 24.—*Necrosis of femur; wounded artery; extravasation of blood; operation refused; secondary hæmorrhage and gangrene; death.*[1]

John Jackson, æt. 29, of delicate habits, hard drinker. Admitted into Meath Hospital under Dr. Porter. He stated that several years previously (perhaps fourteen or fifteen) he had been seized with violent pains in the left knee, which, as well as the lower part of the right, shortly afterwards swelled to a great size, but without redness. This tumefaction subsided a little under the use of blisters, but this knee always remained larger than that of the opposite limb. About one year afterwards a small swelling appeared, four or five inches above the knee, on the inside, which he opened himself, and gave exit to some purulent matter; a fistulous opening has remained there, discharging, ever since. In August, 1832, he had a very alarming hæmorrhage from this fistulous opening; but there was no recurrence until the night before his admission, when he bled with great violence; the blood, at intervals, spirting forth to a considerable distance, at others, trickling down the limb, but in neither case was he able to restrain it. He supposed himself to have lost several quarts, and fainted from exhaustion seven or eight times.

On admission, face blanched, and expressive of greatest anxiety; extreme exhaustion, thirst; pulse small, thrilling, 150. There was a small, livid, fistulous opening on outer side of lower third of right thigh, slowly discharging a thin, serous blood, on pressing which the finger seemed to sink into a deep cavity. Pulsation was quite distinct, and bruit de souffle audible for some distance around it, as if from aneurism. The femur, at its lower third, could be felt enlarged, and the popliteal space filled up, but the pulsation of the artery below it was distinctly perceptible. He complained of intense pain in the knee, and throughout the tumour. He was too weak to make further examination.

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[1] Dr. Porter, 'Dublin Journal,' vol. v.

From all these circumstances it was conceived that the case was one of popliteal aneurism, complicated with diseased bone; the sac having probably burst into the cavity of an abscess in connexion with the bone. A compress of lint was placed over the opening, and a bandage rolled from the foot, over and above it. Some bleeding occurred during the night, and next day he was seized with severe vomiting.

On the third day there was intense pain in the thigh; the face was bleached with a yellowish tinge, and extreme anxiety. Amputation was obstinately refused by the patient. The vomiting continued. The debility increased; and on the fifth day there was great swelling of the thigh, with gangrene on its posterior surface, nearly as high as the buttock. A constant though feeble hæmorrhage trickled from the limb, and he died in the evening.

Examination of limb.—Popliteal space was found filled with thick grumous clots, extending as high as the lower third of femur, in contact anteriorly with the bone, and with something that appeared to be part of the sac, but whether of an aneurismal sac, or the cyst of a former abscess, could not be determined. An opening existed in the popliteal artery, a little below the spot where it enters the space. The femur was found diseased in its lower half, being considerably enlarged, its surface rough, and a large portion of the posterior or popliteal aspect destroyed, so as to permit the introduction of the fingers into a large cavity within; the edges of the bone on each side of this opening were thick and very full of rough, sharp points; in the upper part of the excavation, the sharp point of a sequestrum was discovered, moveable and accurately corresponding to the aperture in the artery, which it evidently seemed to have occasioned. The cellular tissue of the entire thigh was filled with a reddish serum.

Case 25.—*Diffused false aneurism of popliteal artery, from wound by sequestrum of bone; operation; death.*[1]

A young man, æt. 25, who had laboured under necrosis of the lower third of right femur for some years, and in whom two fistulous openings discharged moderately, one on each side of the thigh, a little above the joint, was induced to dance at a wedding; in the midst of the glee he felt sudden uneasiness in the thigh, and bleeding took place from each fistulous opening. Some compression was resorted to, but more or less hæmorrhage occurred for eight days, when he was received into the hospital, under the care of Dr. Byron. Finding that compression on the femoral artery arrested the bleeding, Dr. Byron tied the femoral artery in the upper third without difficulty, and with the effect of putting an immediate stop to the hæmorrhage. The vis vitæ, however, had been previously too far exhausted to allow of salutary reaction, and the limb passed rapidly into gangrene, which quickly extended to the groin, and carried him off in a few hours.

The examination discovered a longitudinal slit, nearly a quarter of an inch long, in the front of the popliteal artery, close to which lay a jagged portion of sequestrum; this was thin and sharp, and formed a part of half the circumference of the cylinder of the old bone, the greater portion of which was firmly incased in the new one.

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[1] 'Med.-Chir. Rev.,' vol. xxiv, p. 259.

Case 26.—*Æt.* 19. *Similar to Cases* 24 *and* 25.[1]

Similarity in situation of wound in artery; recurrence of bleeding at frequent long intervals; infiltration of limb; exhaustion of patient; amputation and recovery. —Dr. Jacobs. Wound transverse, vessel being nearly cut across; sequestrum, although moveable, unable to be extricated.—Quoted by Tuffnell.

Case 27.—*Supposed ulceration of ruptured artery; slow extravasation; sudden rapid increase; exploratory incision; amputation; recovery.*[2]

H. Richard D—, æt. 45, admitted into St. Thomas's, under Mr. Travers; of sallow, exsanguineous appearance, and out of health. Admitted with very extensive swelling on the inner side of the thigh and ham of right side. There was no proper history to be obtained. He stated that about ten weeks since he had been engaged mowing grass with unsound shoes, which had caused his foot and leg to inflame and swell; that shortly after a number of red spots appeared on his legs; a few days after this, when the inflammation had reached the thigh, while sitting in his chair before the fire, he felt something give way, and that he had a sensation of trickling down the thigh; suddenly turned pale and fainted, and should have fallen to the ground but for immediate support. He is certain the swelling began from below and extended upwards. The thigh became enormously swollen, and beat very quickly; but after three or four days the pulsation ceased, whereas the swelling increased from day to day. The leg had been fomented and leeched.

On admission, there was a large swelling occupying the lower three fifths of the thigh, extending into the popliteal space; although not circumscribed, it was most considerable on the inner side. It was elastic on pressure, but no fluctuation could be detected; no pulsation could be felt. The integuments were very much discoloured, of a livid colour; and at the upper and inner part of the swelling were two small openings discharging a sanious fluid. The foot and leg were much swollen and œdematous, with desquamation of the cuticle. The femoral artery below Poupart's ligament pulsated more freely than on the opposite side.

A probe introduced at one of the openings passed freely in all directions, and when withdrawn was followed by a sanious discharge.

On the second day after his admission a considerable quantity, about a pint, of dark-coloured fluid escaped from one of the openings. The patient did not complain of much pain, but was much debilitated. An incision was made into the tumour, and a large quantity of grumous blood escaped; the finger introduced passed readily in every direction.

Amputation was immediately performed; recovery.

Examination of limb.—Tumour was found to consist of coagulated blood diffused among the muscles beneath the fascia, in large masses, and from the pressure on the tissues causing their undergoing a change; in the centre of the popliteal space, the artery presented an opening in front; this was of an oval shape, half an inch in length, its edges rounded off by ulceration.

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[1] Jacob, 'Diss. Med.-Chir. de Aneurism.,' Edinburgh, 1814.

[2] Crisp, 'On Aneurism,' p. 227. 'Lancet,' Sept., 1825.

Summary of Cases of Incomplete

No.	Name.	Age.	Occupation and habits.	Cause.	Primary operation.
10	George C—	49	—	From exertion of walking, &c.	Ligature of femoral on fifth week
11	William D—	53	Habitually intemperate	Spontaneous	Ligature of femoral
12	Thomas C—	56	Tailor; unhealthy, pale	Severe fall while drunk	Ligature of femoral on sixth week
13	William W—	36	Carman	Unknown; flying pains in joint	Ligature of femoral, three weeks
14	Man	30	—	Blow on ham, from jumping an iron gate	Compression for two weeks, ligature of femoral
15	John W—	30	Agricultural labourer; healthy	Foot slipped off spade whilst digging	Ligature of femoral three weeks after
16	Male	30	Well developed	Knee forcibly knocked against door	Incision into ham on eighth day, and ligature placed above and below rupture
17	John S—	32	Soldier; robust	Forcible extension of limb	Incision into ham six weeks after injury, and ligature above and below rupture
18	M. L—	Young man	Active, vigorous	Jumping up ascent with knee tense	Ditto, several days after injury
19	Man	30	—	Hurt upon knee	—
20	Male	—	—	—	Attempts at ligature of vessel; amputation
21*a*	George L—	33	Sallow, emaciated, dissipated, good health	Not assignable.	—
21*b*	John Staples	33	Lamplighter	Slipped, and ham caught between two boards	—
22	Richard W—	41	Stout; healthy	Fractured femur	Ligature of femoral on fifth day
23	William B—	60	Robust; intemperate	Fractured head of tibia	Ligature of femoral thirty hours after
24	John J—	29	Delicate; drinker	Necrosis of femur; sequestrum of bone	Amputation refused
25	Young man	25	—	Sequestrum of bone	Ligature of femoral
26	Male	19	—	Sequestrum of bone	Amputation
27	H. Richard D—	45	Sallow; out of health	Supposed ulceration of artery	—

Rupture of the Popliteal Artery.

Effects of operation, injury, &c.	Secondary operation.	Result.	Surgeon.	Hospital.
Gangrene; attempts at separation	—	Death	Key	Guy's.
Gangrene	Incision into ham	Death, forty-three days after ligature	B. Phillips	Marylebone Infirmary
Gangrene	Incision into ham	Death, thirty-nine days after ligature	Stubbs	Liverpool.
Fever, diarrhœa, pneumonia	—	Recovery	Scott	London.
Gangrene	—	Recovery	—	King's College.
—	—	Recovery	Pollock	St. George's.
Gangrene thirty-five hours after	—	Death on sixth day	Pelletan	Hospital of College of Surgeons, Paris.
—	—	Recovery	Pelletan	Ditto.
—	—	Recovery	Pelletan	—
Slow and gradual extravasation	Nine months after, attempts at ligature in ham; amputation	Recovery	Warner	Guy's.
—	—	Death	Pelletan	—
—	Eight months after incision; secondary hæmorrhage	Death	Green	St. Thomas's.
—	Amputation three months after	Not stated	J. Hunter	St. George's.
—	—	Recovery	B. B. Cooper	Guy's.
Gangrene	—	Death, eighth day	Key	Guy's.
Gangrene	—	Death	Porter	Meath.
Gangrene	—	Death	Byron	Meath.
—	—	Recovery	Jacob	—
Slow extravasation, sudden increase	Exploratory incision; amputation	Recovery	Travers	St. Thomas's.

B. Indirect.

Series III. *Rupture of a popliteal aneurismal sac, &c.*

This series comprises cases of bursting of an aneurismal sac, either from external violence or otherwise, as well as cases of ruptured artery close to the aneurismal sac. In these instances, we shall find that the symptoms, progress, and treatment very much resemble those of the foregoing series; but they possess this additional advantage, viz., the existence of a previous diseased condition of vessel, as indicated by the presence of a pulsating tumour. However, in some of the instances, the rupture occurred previous to medical observation, and then only a confused history, given by the patient, of the previous antecedents; so that, in more than one case, the diagnosis was rendered anything but satisfactory. We shall pursue the same line of investigation in these cases as adopted in the other series, but shall, in addition, first premise a few remarks on the antecedents of each case, previous to the occurrence of the rupture. The number of cases collected in this series amount to 42 in number.

Of the antecedents previous to the rupture.—In all of the present series there has been, for a longer or shorter period, an aneurism of the artery, and we shall cursorily review the length of time or duration of the existence of the disease previous to the rupture or perforation of its sac.

In Case 28 we have an accurate description of the formation of a popliteal aneurism, as being apparently of spontaneous origin; this continued steadily increasing for four or five months, attaining the size of a man's head, causing excruciating agony and limited movement of the knee. It is very questionable whether the sac had not given way for some time; and it is also a matter of probability as to the real nature of the disease being a ruptured artery, with direct extravasation of blood, as in Case 21B.

In Case 29 there was an aneurism of five months' standing, attended with intense pain and œdema of leg, foot, ankle, and knee.

Case 30. Observed a tumour for four months, and attributed it to a hurt received from a door, as she was in the act of running out of a room, when the thigh was forcibly caught between the door and the frame. Gradual and steady increase to size of walnut, and pulsations so strong as to lift the thigh and leg off, when placed across the opposite one. It is questionable whether this was not a ruptured artery without aneurismal sac.

Case 31. The aneurism came on after a march of twenty-three miles over a mountain-road; he was admitted into the military hospital on the seventh day; was treated by compression for ten days, applied three inches below Poupart's ligament; a slough was produced, which cicatrized (an inch and a half long by one inch wide). Compression again used, an inch lower down, with similar results. After nine months in hospital, returned to England, and no effects found to have been produced on the aneurism; he again underwent compression for thirteen days over the middle of the thigh, which caused a deep slough, and over the inguinal region, where there became a superficial one; when these ulcers were healed he was discharged, the tumour having rather increased in size, having been in the last hospital five months. About five months after this, rupture of sac took place.

Case 32. Aneurism of six months. No detail.

Case 33. Had undergone much hardship in the Crimea; eight weeks before admission, an aneurism formed in the left popliteal space, which rapidly increased in size, and ultimately became as large as a cricket-ball; the foot and leg were œdematous. Compression was employed, and the aneurism was undergoing a process of cure, becoming hard and of original magnitude, and impulse scarcely perceptible.

Case 34. A soldier had been troubled with pain in the ham for twelve months, and it was only after a field-day, two days before admission, that he discovered any tumour, which was small, well-defined, and pulsating, but this on the third day became diffused.

Case 35. Aneurism of six weeks' standing.

Case 36. Aneurism noticed six weeks, but he had numbness in leg for two years.

Case 37. Fifteen years ago felt a pain in both hams, and soon after perceived a tumour in each. These became somewhat larger when exposed to fatigue or cold. From the commencement a throbbing was felt in them, but the patient was never prevented from attending to the duties of his occupation as infantry soldier. These symptoms continued stationary until the present accident.

Case 38. Aneurism of two months' duration.

Case 39. Noticed five weeks a swelling towards the inner and back part of the thigh, about the junction of the middle with the lower third of limb; at the commencement of popliteal artery it was circumscribed, throbbing, and tender. He kept on working for three weeks, when it continued to increase, attended with pain in the knee, and extending down the back of the leg to the ankle and foot, and with numbness and inability to move the leg.

Case 40. Popliteal aneurism of only three weeks' notice.

Case 41. Popliteal aneurism of eleven weeks' duration; ineffectual attempts at compression; ruptured.

Case 42. Discovered three months ago a pulsating tumour in ham, with pain shooting down the leg. He continued his work for a month, when he sought advice. He was directed to apply a poultice to the part; and as this gave no relief, a puncture was made into it with a lancet; nothing, however, escaped; but severe hæmorrhage came on on the following day, when tourniquet was applied, and he was sent to the hospital.

Case 43. Not stated. No accurate history.

Case 44. Aneurism of eight weeks' duration.

Case 45. Aneurism of three months, size of walnut, and attended with pain and pulsation; leg began to swell; pulsation ceased.

Case 46. Disease existed five years without suspicion, the patient considering the lameness to arise from gouty rheumatic affection of the knee, and continued to follow his trade of organ-builder up to the present period.

Case 47. Aneurism, one year.

Case 48. Aneurism appeared four months ago, and became painful and large within last two weeks, and during his last voyage as sailor was unable to get out of his berth.

Case 49. Eleven months ago, after carrying a heavy sack of wheat up some steps, experiencing at times a tingling sensation in front of right knee, he noticed a small swelling; this disappeared in a few days; in nine months after this he again noticed the swelling, and that it throbbed, accompanied with pricking sensation up the thigh. It gradually increased to size of pigeon's egg.

Case 50. Aneurism of size of orange, noticed two weeks and cured in forty hours by compression, and in twenty days was reduced to size of pigeon's egg and perfectly solid, without pulsation. On 21st day, sudden bursting of artery above tumour.

Case 51. Two years previously received a hurt in the knee, and six weeks before admission got a blow in the ham from a stick; no attention paid to this, and continued working in digging coals out of a ship; led a reckless life, and when first seen it was at his lodging, in intoxicated state.

Case 52. Eleven months' duration, and attained size of goose's egg. Compression attempted, and could not be borne; operation refused; after several days, rupture.

Case 53. Three months before admission, whilst going down stairs, his foot slipped, and he felt something give way in back of leg. Recovered from the effects, and continued to work up to three weeks back, when tumour in ham enlarged in bulk and became painful; it filled up the lower half of the popliteal space. Compression of femoral for a week, and with apparent good effect, when rupture took place.

Case 54. For six weeks felt swelling in left ham, but continued to work for a month, when limb swelled and became painful. An aneurism occupied right ham, size of an egg; indolent; leg sound. Underwent ordinary compression for seventeen days, then digital compression for ninety-four hours, and apparent cure, when, on ninth day, after leaving off compression, rupture took place.

Case 55. Fifteen months ago he wore, for two months together, a pair of tight, leathern breeches, which made his legs swell and become so painful that he was obliged to leave them off. About a month after this, after walking ten miles on a very hot day, he felt uneasiness in hams of both legs, and in the course of the night observed a swelling in each, and that of the left was pulsating. The left gradually increased and diffused itself. The right was of the size of a nutmeg.

Case 56. Tumour existed for five months, and remained of moderate size until five weeks previous to admission, when it suddenly enlarged and increased considerably from that time. Had never noticed any pulsation in it.

Case 57. An insane Portuguese. No history, except that the swelling first commenced about two months back.

Case 58. Pulsating tumour of size of walnut, following a pain in ham, and only noticed some days, when it suddenly burst.

Case 59. Had been for many years in the habit of walking great distances, and had travelled upwards of 100 miles in two days very shortly before he was taken ill. Disease commenced two months before admission, with considerable pain in calf of leg, which shortly confined him to his bed, followed by œdematous swelling of left ankle. The pain and swelling increased, and health affected. He was not at any time conscious of the existence of a distinct tumour or pulsation.

Case 60. The patient denied that any tumour or uneasiness had existed previous to seven weeks before admission, when, without any assignable cause, the whole leg and foot became swollen and tense, and ultimately settled into the present tumour.

Case 61. Popliteal aneurism and symptoms of organic disease of heart and whole arterial system.

Case 62. About twelve months ago he received a blow on the fore part of the knee, causing pain, but this gradually subsided; and on another occasion, whilst walking, he suddenly felt something give way in the ham, and his knee became at once stiff and painful. Eight months after this he observed a swelling about the size of an orange in the ham; no pulsation at first, but afterwards it was very evident.

Case 63. Aneurism of six months' duration, of size of goose's egg, entirely filling up ham, and was more prominent on its upper and outer side, where an opening had been made with a lancet, three days before admission, by a country practitioner, which operation was followed by slight bleeding; a bandage was applied.

Case 64. Aneurism of three weeks' observation, of size of orange. Compression employed, and successful at end of twenty-seven days. Left hospital quite well twenty-five days after this sudden rupture.

Case 65. Suffered from aneurism eight months. Tumour of considerable size, but did not quite fill the whole space; it extended upwards and outwards. Compression of femoral employed, and continued for a week, when all pulsation had ceased. At this juncture rupture took place.

Case 66. Eleven years previously received punctured wound of popliteal artery, requiring ligature of femoral, and recovery. Subsequently had never the slightest inconvenience, nor even aware of existence of any tumour or swelling till, five weeks before admission, after recovering from fever, he found the leg stiff, painful, and swollen, which increased.

Case 67. Stated that twenty years ago he experienced an injury to the knee, and that ever since it had been weaker than the other, and he thought that a swelling had remained behind the knee up to the present time, but had not grown larger, nor caused him much annoyance.

Case 68. Double aneurism.

Left, of two months' duration, large, soft, and fluid. Compression unsuccessful; ligature of femoral; secondary hæmorrhage; reapplication of ligature, and progress favorable.

Right, observed only on admission. Ligature of femoral, followed on second week by rupture of sac.

Case 69. Aneurism size of orange, stated to be of only three days' standing.

The causes of ruptured sac was made mention of in 15 cases.

It is presumed to be spontaneous and unknown in 14 cases, viz., Cases 30, 31, 36, 39, 40, 46, 48, 50, 56, 57, 59, 60, 65, and 66; in Cases 40 and 50 it was sudden, and in Cases 39, 46, 59, and 66, it was gradual and successive. In 13 cases no record was made.

The causes were—In Case 28, while walking on crutches, one of them slipped, and he fell to the ground, bruising the swollen limb; but it appears probable that the rupture had existed previously. In Case 29, as the woman was trying to hobble through the room, she fell forwards on the floor, and is said to have strained the veins, particularly one running up the thigh, which became hard and black. Case 37, whilst labouring under popliteal aneurisms on both sides, which had existed fifteen years, the right leg was much and severely bruised between two cows, in his employment as cattle-drover. In Case 67, whilst carrying a sack of coals up the ladder of a waggon, his foot slipped, and he fell, twisting his knee upon the lower rail. In Case 51 there was blow on the sac. In Cases 42, 43, and 63, the aneurism had been punctured with a lancet, which caused the extravasation and in Case 62, although a rupture had probably taken place, yet the swelling increased after the introduction of a lancet. In Case 58 it occurred during a fit of sneezing. In Case 34, from over-exertion after a field-day as infantry soldier. In Case 49, while engaged in hoeing turnips, he felt something give way in the ham, and experienced rushing sensations down the leg and up the thigh in the course of the femoral artery. In Case 35 there was no particular cause for the aneurism, but it was very large, and was treated by forcible flexure and compression, and burst into the knee-joint. In Case 47 it occurred suddenly four days after leaving off compression on the femoral artery; and in Case 69 it took place suddenly on the eighth day of using compression.

1. *The sensation of something having suddenly burst or given way* is not frequently observed; thus it was only noticed in 3 cases.

In Case 29 she felt one night rather suddenly a remarkable sensation in the limb, as if the whole swelling was being drawn up from the ankle into the knee; in Case 58, after a fit of sneezing, he felt something burst in the tumour; and in Case 61, about eleven days after admission, he noticed that something gave way in his ham, after which he experienced great suffering. In Case 59 it is mentioned that there was no sensation of sudden bursting.

2. *Increase in the swelling or tumour, and in the size of the limb,* may be sudden and rapid, or slow and gradual, depending on the size of the rent and the situation thereof, &c.

In 31 cases this symptom has been recorded: in 21 itwas rapid and sudden: thus, in Cases 29, 34, 36, 41, 48, 49, 54, 56, and 62 there was rapid increase; it was sudden in Case 31, preventing his walking; in Cases 39 and 61 it became diffused; in Case 50, attended with immediate vast effusion, so also in Cases 40 and 52; in Cases 42, 58, 64, 65, 68, and 69 it was sudden and rapid.

In 10 cases it was gradual and slow—in Cases 30, 35, 37, 45, 46, 55, and 59; in

Case 28 there was steady increase, reaching the size of a man's head, and still continuing to enlarge; in Case 66 it was at first slow and gradual, but afterwards became sudden and rapid; and in Case 33 nothing further was noticed than the aneurism, which was in process of cure, and the gradual œdema of the leg and foot.

In 11 cases no mention is made—Cases 32, 38, 43, 44, 47, 51, 53, 57, 60, 63, 67.

Condition and character of the tumour after bursting of the sac, appearance of the skin, &c.—This will in some measure depend upon the foregoing symptom, viz., the slowness or rapidity with which the blood is extravasated, for in the one instance the tumour will attain a degree of firmness and solidity, whereas in the other it presents a fluctuating, elastic, tense feeling; but it will also vary according to the situation of the aneurism, whether it be above, opposite to, or below the bend of the knee; thus, when aneurism is seated at and above the knee, the tumour arising from the bursting of its sac in general will become large, superficial, and very evident; whereas, when it is seated below the bend of the knee, under the gastrocnemius, there will be an indistinct and diffused swelling of the calf; even the aneurism itself, in this situation, is often unrecognised. This fact did not escape John Bell when he wrote the following words:

"It is in aneurisms of the popliteal artery, often confined under the bellies of the gastrocnemii muscles, and betwixt the tendons of the hamstrings, that the resistance to its extension is very great; the destruction within is proportionally rapid, and the disease is always attended with severe pain. The tumour is not always clearly circumscribed, nor to be fairly traced to any connexion with the artery; and being covered and its pulse suppressed by the great thickness of the muscles and skin, the nature of the disease remains unknown. From the same pressure the leg becomes very early cold and œdematous; for the veins, lymphatics, and artery all pass in this straitened cavity of the ham, the pressure upon these produces a general swelling of the limb, and the general swelling conceals the particular tumour. From the elevation of the bellies of the gastrocnemius muscle over the tumour, and from the distension of the hamstring-muscles, the limb is thrown into severe and painful cramps; and from the nerve passing over the tumour (pressed sometimes

quite flat) a very distressing numbness is always felt, and the lameness and pain are such as the external swelling cannot account for."

We shall make no general summary of this set of symptoms, but will give the actual condition of the tumour, and its characters, as reported in each separate case. There are only 4 cases in which this was not stated, viz., 40, 49, 52, and 58.

Case 28. Skin over whole extent of tumour greatly inflamed and very tense; an oozing of bloody serum had taken place from the most depending part of the tumour, where the cuticle had burst.

Case 29. Tumour principally seated above knee; a process seemed to extend deep into the upper part of the calf of the leg, and another upwards along the course of the biceps. The mass well defined, round, and prominent below, not so well marked above, and laterally embracing the entire circumference of limb; surface smooth and slightly polished from the tension; circumference in measurement is 16½ inches. On touching it lightly there is no sense of fluctuation, but on pressing heavily with the thumbs a sensation of deep-seated fluid communicated.

Case 30. Large, pulsating tumour occupying lower part of thigh, for 6 inches above the patella, and extending spirally backwards and downwards as far as head of tibia; shape appeared to be irregularly quadrilateral; no discoloration of the integument over it; outline of patella lost, and natural shape of joint destroyed. Three inches above the patella the circumference of limb was 17½ inches, and the patella 16½ inches; on corresponding limb it measured respectively 16½ and 14½ inches. Indistinct fluctuation could be felt.

Case 31. The tumour extends from about 3 or 4 inches above the ham to the upper part of middle third of leg; it measures round the upper part 19 inches, lower part 17½ inches; length of tumour, 6 inches. It extends on each side above and around the condyles of the femur.

Case 32. Limb around tumour measures 20¾ inches; the opposite limb at same part, 12½ inches.

Case 33. On twenty-first day of aneurism undergoing compression, several bullæ, which had formed on instep, on different parts of the leg, and popliteal region, burst, and a large quantity of serum, tinged with blood, passed from the limb, and more or less continued to ooze from various points for the next six days.

Case 34. Large, diffused, hard swelling on inner side of ham, extending half-way up the thigh, and round to the inner and fore part, but not ascending so high in this direction, and continued to increase.

Case 35. A very large aneurism, 5½ inches long, burst into knee-joint; knee altered in shape, and patella raised.

Case 36. Alarming swelling, limb twice the size of the other, and swelling reaching to groin; integuments tense and discoloured, and of yellowish colour; parts below the knee natural; limb heavy.

Case 37. Tumour increased shortly after accident, and remained thus for six weeks, the man resuming his labours and exercising limb; but it soon increased and

became more diffused; veins upon surface of limb very distinct; a slight erysipelatous blush over the inside. Tumour became daily more tense and extended.

Case 38. Tumour occupied a large extent of surface, and was rapidly increasing; was hot and painful; became red and much more tender, and skin exceedingly thin, when it suddenly burst.

Case 39. In the popliteal space, or rather just above this, and over the course of the femoral artery, was a hard, firm, moveable mass, discoloured over a portion of its surface, and marked by enlarged, superficial veins; was tender and painful on pressure.

Case 41. Sudden increase; tumour extending 2 inches up inner aspect of thigh.

Case 42. Enormous, diffused extravasation about ham, leg, and thigh.

Case 43. Similar to Case 36; of considerable size.

Case 44. Elastic, circumscribed tumour, which was so large as not only to fill up ham, but to project beyond the space defined by the hamstrings. After ligature, tumour reduced in size; but thirty-three days after operation, distinct sense of fluctuation around joint.

Case 45. Ham and leg twice the natural size; integuments of calf exceedingly tense, of a dark-brown colour, with sense of fluctuation; the tenseness increased, and the limb measured half an inch more round the calf than before, and became more discoloured.

Case 46. Extensive tumour, occupying ham and extending over the sides of the condyles of the femur towards the patella, and reaching some way under the gastrocnemius. Integuments at the back part of it were at one point somewhat red and inflamed. Had an attack of gout, lasting two weeks, when, on subsidence, not any alteration in the appearance of the swelling and limb, except a slight discoloration above the inner malleolus resembling an ecchymosis; it remained as tense and as large as ever.

Case 47. Tumour occupied whole of ham; compression for four days; dark spot appeared on tumour, which burst five days after leaving off pressure.

Case 48. Tumour remarkably tense and hard to the touch, and shining; knee-joint greatly enlarged; aneurism found afterwards to have burst into joint. Tumour became more tense and hot, and two ecchymosed patches appeared on the inner aspect of the tumour.

Case 50. Vast effusion; acute inflammation of knee ensued; whole ham distended; measurement of knee, 15½ inches, and reached to 18 inches, the healthy one being 13 inches; a crimson blush appeared on surface.

Case 51. Ham swollen to great size, and entirely filled up; limb livid and veins turgid; compression of femoral for three days, with diminution in size of swelling; on seventeenth day tumour suddenly became more diffused, and limb swollen and congested; on twentieth day vesication on ankle and leg, and gangrene feared. Left hospital suddenly on fifth week, and returned in two days in state of intoxication; limb found not in a worse condition. Tumour went on increasing, and blood came quite near the skin, which was discoloured, corrugated, and tightly stretched over the blood, threatening to break, and veins distended and red; gangrene momentarily expected; effusion into knee-joint (not blood).

Case 53. Tumour filled up lower half of popliteal space; after a week's compression of femoral it became firm and solid, but attended with engorgement of limb, and

soon followed by mottled appearance of skin and distension amounting almost to bursting.

Case 54. Soft, fluctuating, of size of fist; large effusion into knee-joint, fluctuating, but no pulsation; it underwent change during compression, becoming firm, then solid, lumpy, less projecting behind, but much larger at its upper part. The tumour did not lessen.

Case 55. Firm, inelastic swelling, extending from middle of left thigh down to the toes.

Case 56. Large tumour, filling up whole ham, and extending on both sides of the femur towards the front of the limb; it had a firm, fleshy feel, being a little softer at one of its anterior protuberances than in other parts.

Case 57. Large tumour, circumscribed at its upper part, extending from the middle of the inside of the right thigh to the inner part of the knee-joint; the skin covering it was discoloured; there was a deceptive feeling of fluctuation.

Case 59. No distinct tumour, but general swelling of limb, reaching as high as lower third of thigh; it was twice the size of the other, and had a distinct feeling of fluctuation, as of matter underneath.

Case 60. Tumour about 14 inches in circumference, occupying the lower third and inner side of thigh, presenting its greatest bulk in that situation, and gradually decreasing forwards to the ham and the outer side of the thigh. Its circumference had a defined margin; the summit was tense and elastic, and gave to the touch an evident sense of fluctuation; the integuments retained their natural colour.

Case 61. Aneurism became diffused after bursting of sac; ham continued swollen for seven days, when fresh rush of blood, and the calf and entire back of leg enlarged, tense, and swollen almost to bursting; it was hard and shining, presenting in many parts a dark, mottled appearance.

Case 62. Enormous swelling of ham and inner part of knee; slightly elastic; integuments a little discoloured; surface smooth on exploration; on following day sudden increase of swelling; integuments of a blackish appearance, very thin, tense, and hot; oozing from puncture; circumference of limb, above knee, about 2 feet.

Case 63. Three days after puncture of aneurism by lancet, surface of tumour of a purplish-reddish colour, and tumour filling up ham, when sudden bursting through external wound.

Case 64. Much enlargement of knee; integuments firm, stretched and livid; these gave way, and allowed hæmorrhage.

Case 65. Tumour of considerable size, but did not quite fill the ham, and extended upwards and outwards; under pressure of femoral, pulsation ceased, when on seventh day sudden increase, &c.

Case 66. General enlargement and œdema from knee down to toes, but chiefly at the back of the leg, where the calf bulged out into a prominence, extending from the knee to rather more than half-way down; was tense and tender. Deep-seated fluctuation was very distinct, and there was evidently a large collection of fluid under the gastrocnemius. Opened by lancet; gradual subsidence of swelling and limb to natural size; on fifteenth day sudden arterial hæmorrhage and diffusion of blood into tissues; the entire leg became swollen, shining, and livid; integuments tense, and greatly distended.

Case 67. Eight hours after accident knee and ham very tensely swollen and discoloured by ecchymosis, and very painful to the touch.

Case 68. Enlargement and tenderness of ham; an intensely painful swelling appeared towards lower end of tibia; superficial veins over calf purplish and very distinct; integuments soon became dusky.

Case 69. Sudden tumefaction of parts and limb; the popliteal tumour appeared unchanged, but an additional swelling was found on inner side of joint, circumscribed and flattened; about twice the size of palm of hand, with considerable prominence and but slight pulsation.

4. *The presence or absence of pulsation in the popliteal swelling.*

In 6 instances these circumstances are not mentioned, and in all probability, if pulsation had existed, it would perhaps have been noticed; but we will not include them in the general summary. These cases are 47, 49, 52, 58, 64, and 68, thus leaving us 36 cases to draw conclusions therefrom.

In the following 14 cases there was no pulsation. Case 29, no pulsation, and on applying the stethoscope no sound could be heard; in Cases 36, 42, 43, 45, 55, 56, 59, 61, and 65, there was no pulsation; in Case 57 there was no pulsation, either by touch or by the stethoscope; compression with the hand did not in the least reduce the volume of the swelling; in Case 62 pulsation ceased, and no bruit heard; in Case 63 the tumour was without pulsation, and on examination with the stethoscope one could not detect any *soufflet;* under moderate pressure it was quite compressible, but on its removal the tumour rapidly resumed its original form and bulk; the femoral artery acted most violently. In Case 66 not the slightest sense of pulsation in the tumour, nor the faintest sound or murmur could be detected in the tumour of the calf, and it was totally uninfluenced by pressure on the femoral.

In 9 cases there was at first some pulsation, but which became weaker and in some entirely ceased; thus, in Case 28, at first it could only be discovered by pressing firmly with the fingers on the upper part of the tumour; however, soon afterwards all pulsation ceased entirely. In Case 33 the pulsation in the aneurismal tumour, while undergoing compression of the femoral, became imperceptible on the seventeenth day, and could no longer be detected. In Case 39 there was a weak pulsation to be felt with the hand, and arrested the moment pressure was made on the artery in the groin; and when the pressure was taken off, a fresh and sudden rush of blood into the tumour could be distinctly felt. In Case 42 there was at first distinct pulsation, but gradually became weaker. In Case 44 it afforded to the touch a distinct thrilling sensation, and pulsation of the femoral was strong. In Case 48, upon superficial examination, no pulsation could be felt in the tumour; but when firm pressure was made for some moments by the finger, these last had a movement and impulse communicated to them corresponding to the patient's pulse; when the stethoscope was applied with some pressure on the swelling, a distinct but rather muffled *bruit de soufflet* was audible. When the femoral artery was compressed, all pulsation and *soufflet* ceased, the shining tension of the skin lost, and the popliteal swelling flaccid and soft. In Case 60 no pulsation could be detected in the enlarged

surface, except to a slight degree at that part which lay immediately over the popliteal artery; pressure on the femoral produced no diminution in the bulk of the tumour, nor could any sound be detected on the application of the stethoscope. In Case 53, after undergoing compression of the femoral, the pulsation in the sac became evidently less distinct; and on its outer side a distinct, pulsating vessel was discovered, indicating a collateral circulation; this pulsation gradually lessened, as extravasation went on. In Case 54 there was pulsation, and a *bruit de soufflet* heard only at the upper and inner part; and after compression of the femoral, the pulsation in the tumour entirely ceased, but at the sides of the knee pulsation was very manifest; there was no *bruit de soufflet* afterwards, and the pulsation diminished daily.

In the remaining 13 cases there was distinct and evident pulsation in the tumour. In Case 30 there was a distinct, pulsating tumour; and a distinct *bruit*, best marked at the upper part, was audible all over the tumour synchronous with the systole of the heart; the tumour could be diminished by making firm pressure on the femoral above, but this diminution was very slight. In Case 31, by auscultation, a *bruit de soufflet* is audible, principally on the outer side over the head of the fibula, and on the inner side behind the head of the tibia; by pressure on the artery in the thigh, the size could be slightly diminished, but returned to its original bulk on removal of the pressure. In Case 32 there was pulsation. In Case 34 the swelling in every part had a pulsatory movement synchronous with the pulse, and arrested by compression of the femoral, when a slight subsidence of the swelling was observed; there was a whizzing sound heard by the stethoscope. In Case 35 a pulsation existed in the enlarged knee, which filled and emptied as pressure was made on the femoral and taken off. In Case 37 the pulsation augmented, and in six weeks was much diffused over the tumour. In Case 38 the tumour beat strongly. In Case 41 there was general pulsation. In Case 46 the pulsation was remarkably strong, and equally manifest both to sight and touch; he had an attack of gout for two weeks, and the throbbing of the tumour diminished considerably, so that in a few days there was no pulsation whatever; by direct auscultation a bellows-murmur was heard, hence still a current of blood into the aneurismal sac. In Case 50 there was forcible pulsation. In Case 51 an impulse in the swelling. In Case 67 the pulsation was not very apparent at first in the swelling, but afterwards it became more decided, especially towards the inner side; and in Case 69 there was pulsation.

The pulsation in the tibial arteries was only recorded in 7 cases. In Case 34 there was weak pulsation in the tibials. In Case 44 indistinct pulsation. In Case 66 the tibials could be felt pulsating after displacing the subjacent œdema by pressure. In Cases 48, 57, 61, and 67, no pulsation could be felt.

The above analysis disproves in a measure the opinions advanced by Porter, in his work on Aneurism, respecting pulsation in the tumour, formed by the bursting of the vessel or sac. He says, "Pulsation is either absent or scarcely appreciable, and when any approach is made to it, it is little more than a weak, indistinct thrill; the reason of this is easily

understood. When the blood is thrown out of the vessel, it lies in the cellular tissue as an inert coagulated mass; there is no reacting force to recoil upon the fluid blood, and return a portion of it back into the circulation; *bruit de soufflet* is seldom observable."

5. *The presence or absence of pain in the tumour and limb,* noticed in 28 cases.

There was not much pain in Case 45. In Case 39 there was pain in the knee, extending down the back of the leg to the ankle and foot, and also up to the hip; a throbbing pain in the tumour, and a pricking sensation in the knee. In Cases 38, 63, and 64 some pain was complained of. In Case 30 the whole leg was affected with painful twitchings. In 11 cases there was severe and considerable pain, viz., in Cases 31, 34, 44, 48, 50, 53, 58, and 67. In Case 56, although great pain in the leg, yet the tumour was not tender on being handled. In Case 59, although considerable pain in the tumour, yet not much tenderness in different parts of the leg. In the remaining 12 cases the pain was acute and most intense: in Case 28, described as excruciating and almost intolerable. In Case 29 intense pain about the knee, which became desperate. In Case 37, the tumour became so painful, and attended with such a sensation of constriction in the limb, as to deprive him totally of rest. In Case 41 writhing pain all over the knee. In Case 51, the pain became very intense. In Case 52 it was most agonizing about the knee and leg. In Case 54 there was intense agony and pain down the leg, lasting for three hours at a time, while undergoing digital compression; and on the ninth day after leaving off compression there was very violent pain in the calf, which became most acute. In Cases 55, 61, 68, and 69 it was most acute. In Case 62 it was so acute that the man urged to have his leg off.

6. *Condition of the sensation in the limb,* observed in 10 cases.

The leg and foot were benumbed in Cases 28, 30, 37, 49, and 52. In Case 36 there was very little feeling in the parts below the knee. In Case 39 the numbness of the leg became so great, that when touched or pinched the patient was scarcely conscious of the fact. In Case 44 there was a tingling sensation in the foot. In Case 46 the foot was torpid, and in two weeks there was increased numbness; and five days after this there was loss of sensation in the toes, which soon extended to the ankle. In Case 67 there was a feeling of numbness extending down to the toes, which increased, so that on the fourth day sensation became lost up to the middle of the leg.

7. *Temperature of the limb.*—This symptom has unfortunately not been recorded in more than 8 cases:

In all of which the heat of the limb was diminished and reduced, rendering the foot cold and benumbed, as was observed in Cases 30, 32, 37, 41, 52, 61, and 64. In Case 46, in the course of two weeks the foot became all of a sudden extremely cold, but afterwards became warm, owing, probably, to artificial means. Mr. S. Cooper, in his remarks on the latter case, and on cases of ruptured aneurism, observes, "There is a sudden fall in the temperature of the foot after a remarkable decline in the aneurismal pulsation, or after they have become imperceptible; and that we are not to be deceived by the artificial warmth induced by the application of hot fomentations, &c. The circulation in these cases becomes seriously obstructed, the foot soon turns cold, and, if the extravasation attain a certain degree, mortification ensues, whether the femoral artery be tied or not."

8. *Œdematous and swollen condition of the limb,* as indicating an embarrassed circulation and a pressure on the vessels, observed in 31 instances.

In 4 cases it was but slight—Cases 30, 41, 44, and 68; in 15 it was described as swollen and œdematous, as affecting the foot, ankle, and leg—Cases 37, 38, 45, 48, 49, 50, 51, 52, 59, 60, 62, 63, 64, 65, and 66; and in 11 cases the limb was extensively and greatly œdematous, viz., Cases 29, 33, 34, 39, 46, 47, 53, 54, 56, 57, and 67; in Cases 47 and 53 more so than the others, the limb becoming enormous in size.

9. *The position of the limb* is said to be generally flexed, and that any attempt to extend it causes great pain. It has been taken notice of in 9 cases.

In Case 28 the limb did not admit of flexion or extension. In Case 30 it was flexed at an obtuse angle on the thigh. In Case 31 the knee-joint was bent, the leg being nearly at a right angle to the thigh, and could not be made straight. In Case 32 the knee was a good deal bent and fixed. In Case 39 the knee was stiff, and there was an inability to move the leg. In Case 44 the motions of the knee were much impaired, and leg kept continually in a semi-bent position. In Cases 54 and 60 limb was semi-flexed, and could not be extended. In Case 63 the entire limb was flexed on the pelvis.

10. *The supervening of gangrene,* from the effects of the ruptured sac.

A. Where ligature of the femoral was not employed, observed in 7 cases. In Cases 51 and 52 a manifest disposition to gangrene. In Case 54 a slough of the size of a five-franc piece formed over the popliteal tumour. In Case 58, two or three days after bursting, gangrene commenced in the instep and foot, and quickly spread upwards, accompanied with severe constitutional irritation. In Case 64 the lower part of the leg was gangrenous; the gangrene became arrested a few inches below the knee. In Case 65 lividity of foot and rapid gangrene. In Case 67 there was gangrenous discoloration on the third day, and upon the toes

and heel patches of vesication and appearance of gangrene, which gradually extended over the whole foot and up the leg, without any line of demarcation.

B. Gangrene coming on after ligature of the femoral noticed in 8 cases, viz., Cases 36, 38, 41, 42, 46, 47, and 68.

11. *The bursting of the sac, &c., externally, causing hæmorrhage*, primary and secondary; observed in 14 cases.

In Case 28 there was bursting externally, and four pounds of blood were lost, but recovery without any secondary hæmorrhage. In Case 29, sudden hæmorrhage through punctured wound in the tumour. In Case 31, during the cure by compression, an opening was made into the fluctuating part, and twenty ounces of grumous blood escaped; as also, some time after, fibrous laminæ. In Case 32, after two months' compression, with partial success, an attack of erysipelas of the leg came on, and soon after this the tumour burst, discharging grumous blood and portions of coagula; no further hæmorrhage ensued, and was recovering, when another attack of erysipelas and difficulty of breathing followed, with death on the next day. In Case 33, on the twenty-seventh day of the process of curing the aneurism by compression, a sudden external hæmorrhage and immediate death took place. In Case 38 there was a sudden bursting through the skin, and blood was projected to a great distance; about two pounds were lost. In Cases 42, 43, 60, 63, and 65, hæmorrhage occurred through a lancet wound, and in one to a most alarming extent; in another, on the third day, a large jet came out *per saltum*, and in a full stream, being restrained temporarily by pressure with the finger and the application of a tourniquet; and in another hæmorrhage did not cease until the fifteenth day after the puncture. In Case 44 arterial hæmorrhage occurred from the lower part of an exploratory incision in the ham, after ligature of the femoral had been applied, and necessitating the amputation of the limb. In Case 47 there was a large aneurism, and treated by compression on the femoral for four days, when it was left off for the five following days; then the sac burst externally, and blood escaped to the amount of a pint; hæmorrhage recurred next day, when the femoral was ligatured. In Case 64, on the sixth day, hæmorrhage to a considerable extent took place from the ham.[1]

Diagnosis.—The previous history of the case, the sudden enlargement of the pulsating tumour, and the continuance of this pulsation after the rupture, form such distinctive characters as to render the diagnosis of the lesion easy and unerring; but although in 13 cases these conditions were more or less present, and in 9 others only partially and imperfectly ascertained, yet in 14 cases there was no pulsation whatever, but merely a large, solid, or elastic swelling, and in many instances accompanied without any definite or distinct history

[1] In Cases 48 and 54 the sac burst into the knee-joint.

to lead one to a right conclusion. In no less than 7 of these cases there was an error or difficulty in diagnosis; thus, in Case 29, it was at first supposed to be an enlarged gland, then some form of encysted tumour, and lastly, as it increased rapidly, to be fungus hæmatodes; in Case 45 some surgeons thought it to be a diffused abscess. In 3 cases, viz., 42, 43, and 63, the diagnosis likewise was obscure, and lead to the unfortunate exploration by the lancet. In Case 56 it was viewed as a large and rapidly increasing fleshy tumour; in Cases 57 and 59 the diagnosis was difficult; and in Case 62 it was thought to be fungus hæmatodes. Even in Case 60 there was no general pulsation, and only a slight pulsation just over the course of the artery; its exploration by a lancet was deemed advisable, and secondary hæmorrhage followed.

Now all these cases of ruptured sac, unattended with pulsation, put on for the most part the same characters and condition as observed in the first series, viz., incomplete rupture of the artery; and the diagnosis will be the same as explained in those cases, with this exception, that in ruptured aneurismal sac the progress may be slow and gradual, as observed in Cases 45 and 55; but in Cases 36, 42, 56, 61, and 65 the increase of the swelling was very rapid and marked.

Prognosis.—There were 25 recoveries and 16 deaths; in one case the result was not stated.

The limb and life were saved in 9 instances; in one case by Nature's own efforts, in 2 by means of compression on the femoral artery, and in 6 by ligature of the femoral artery.

Life was saved at the expense of the limb in 16 instances; in 6 of which ligature of the femoral had failed.

Death, when the limb was attempted to be saved, occurred in 6 instances; of these, in 1 all operative measures were refused; 2 died while undergoing compression of the femoral, from attacks of erysipelas and secondary hæmorrhage, respectively; and 3 after ligature of the femoral.

Death, where amputation had been performed, occurred in 10 instances.

Treatment.—Before entering upon this very interesting and important point, let us again carefully survey the treatment adopted in these 42 cases, and carefully analyse them

in all their bearings, so as to gather some practical deductions from bygone experience.

In 2 instances, Cases 28 and 29, we have fair specimens of Nature's endeavours to deal with the mischief; in one she failed, but in the other a remarkable cure was effected.

Case 28. No operative measures allowed. Integuments burst, and seemed to threaten the destruction of the patient. A tourniquet was kept constantly in readiness. Oozing of serum continued for days from the burst cuticle, and suddenly, when in bed, he felt the sensation of a fluid running down his leg; upon examination he found that the integument of the tumour had given way, and that the blood was rushing out from the wound in such quantity that, in the space of five minutes, four pounds were lost. During this time he fainted repeatedly. The wound became much enlarged, discharging large lumps of coagulum. The knee was soon reduced to nearly its natural size, and the wound suppurated; the discharge continued copious for some time, and subsequently the wound completely cicatrized, and he had a serviceable limb.

Case 29. Supposed to be fungus hæmatodes; amputation refused. Decomposition of the contents of the tumour ensued, and copious discharge of dark bloody stuff through the puncture, which was most offensive. The tumour became greatly reduced in size, suppuration ensued, and health became affected. Sixteen days after the exploration by trocar, sudden, profuse arterial hæmorrhage set in, and patient died.

The four following instances give full details of the effects and progress when compression has been employed; in 2, good results ensued, but the other 2 succumbed.

Case 30. Compression employed; could not be borne for a continuance. Under treatment twenty days from the first application of the compression until all pulsation had ceased in the tumour, during which period the absolute pressure did not amount altogether to more than 134 hours, or five days and a half. Some difficulties were encountered; the pressure could not be applied on any part of the thigh, owing to its being full, soft, and flabby, offering no support or counter-resistance to the instrument, unless it was carried to its maximum to arrest the pulsation in the tumour, and which could not be endured, when tried, but for a very short period; it also caused the aneurism to be more distended, and the limb to be considerably congested. The inguinal region was the only site, which was not very favorable; not only small enlarged glands, but the remains of a cicatrix, and very sensitive. Cured at end of eleventh week.

After leaving the hospital, having been cured by compression, she was brought into it again on the following night, in a state of great excitement from intoxication and pain; the limb was greatly swollen from above the knee down to the ankle, and very hot; she screamed violently, and she felt as if her leg had burst, referring to the calf of the leg as giving most pain. It appeared, from her account, she had been in the park all the day; that she had walked a considerable distance, and jumped across a stream; that she went to the theatre in

the evening, and, returning from thence, drank six glasses of brandy; she remembers nothing further. For four or five days she suffered much pain in the calf, the temperature of which was considerably lower than that of the other leg. Under the application of a flannel roller, from the toes to the middle of the thigh, and rest, she gradually recovered, and left in three weeks, at her own request, the limb being in function and appearance as perfect as the other.

Case 31. Left quiet in bed for twenty-two days, when compression was commenced. Limb bandaged, from toes to where compression was made. Notwithstanding the difficulties in its application, the complication of pneumonia, diarrhœa, and phlebitis of opposite limb, compression was persevered in for nineteen days; an eight-ounce weight was used ten or twelve times daily, and gradually decrease to twenty-sixth day. Part of the effused blood decomposed, requiring an opening to be made in the skin; evacuation of twenty ounces of fetid grumous blood; subsequent passage of laminæ of fibrine through wound. Cured at end of five months; the limb nearly straight, and patient able to walk well.

Case 32. Compression with Weiss's tourniquet, substituted afterwards by Bellingham's; continued for two months. On removal, no pulsation in tumour, but no subsidence in size, and had a soft elastic feel. One month after this, erysipelas attacked limb, which became swollen. Soon afterwards, tumour burst externally, and gave exit to twelve ounces of dark matter. No hæmorrhage. In course of two weeks, portions of firm coagula came away. In six weeks he was walking about. At seventh week, another attack of erysipelas and difficult breathing, and death on following day.

Case 33. While undergoing compression for aneurism successfully, rupture of artery above sac; sudden external hæmorrhage and death.

In the remaining cases operative measures were adopted.

Case 34. Compression for six days; but, in consequence of increase of swelling, &c., ligature of femoral. Ligature came away in five months; protracted recovery. Rejoined his regiment with hardly a vestige of the tumour. The limb was rather weak.

Case 35. Forcible flexure and compression for thirteen days used for a very large aneurism, followed by rupture into knee-joint. Ligature of femoral. Ligature came away on twenty-first day. Recovery.

Case 36. Extensive extravasation. Ligature of femoral. Gangrene followed, and death on twelfth day.

Case 37. Ligature of femoral. Recovery. Also ligature of other femoral for circumscribed popliteal aneurism, which had all along remained of same size. Recovery.

Case 38. Compression could not be borne, and arrangement made to tie femoral; it was performed on third day after admission, immediately after bursting of sac externally. Gangrene on fourth, and death on fifth day.

Case 39. Had been salivated, before admission, for supposed rheumatism. Ligature of femoral. Ligature came away on seventeenth day. Recovery.

Case 40. Compression for aneurism with apparent benefit, when sudden bursting of sac; immediate ligature of femoral. Recovery.

Case 41. Ineffectual attempts at compression, for five days, for aneurism; badly managed; rupture of sac; ligature of femoral; gangrene; amputation. Recovery.

Case 42. Ligature of femoral; gangrene; amputation. Death.

Case 43. Ligature of femoral; on following day tumour increased in size, and was as tense as before; secondary hæmorrhage occurred to an alarming extent; sinking; amputation. Recovery.

Case 44. Ligature of femoral; erysipelas; inflammation and suppuration about knee and ham; opened on thirty-third day; matter found in joint; amputation. Death in eight days after.

Case 45. Exploration by incision of two inches; large quantity of coagulum and arterial blood; ligature of femoral; flow of arterial blood from lower end of wound in ham; amputation. Recovery.

Case 46. Operation of femoral urgently advised, but patient desired its postponement for a week or ten days, until he had completed some urgent business; attacked by gout for two weeks; operation again declined and refused for eleven days, when threatening gangrene; ligatures of femoral: gangrene supervened on fifth day; amputation below ligatured vessel. Recovery.

Case 47. Large aneurism; compression of femoral for four days; left off for five days, when aneurism burst externally; repeated hæmorrhage; amputation refused; ligature of femoral four days after first hæmorrhage; followed, six days after, by gangrene, and amputation on following day. Recovery.

Case 48. Compression attempted, but could not be borne; amputation on third day after admission, and recovery.

Case 49. Compression attempted, but could not be borne; amputation performed. Recovery.

Case 50. Aneurism cured by compression, in forty hours; on twenty-first day after, sudden rupture of artery above sac; severe local and constitutional symptoms, with acute inflammation of knee-joint, so that amputation was deferred to thirty-third day after rupture. Recovery.

Case 51. On seventh day after admission, compression of femoral attempted, and in three days tumour much diminished and the pulse lessened; on seventeenth day, tumour became more diffused; gangrene imminent; left hospital suddenly on fifth week, and returned in two days in a state of intoxication; tumour increased; gangrene threatening; suffering acute; amputation. Result not stated.

Case 52. Compression attempted, and could not be borne; ligature of femoral refused; rupture of sac; disposition to gangrene; amputation. Recovery.

Case 53. Aneurism attempted to be cured by compression on femoral, and continued for a week with apparent success, when symptoms of rupture and threatening gangrene; amputation. Death on twenty-ninth day, having symptoms of pyæmia.

Case 54. Compression for seventeen days; difficult to accomplish, in consequence of bend of knee, and tumour became firmer; digital compression constantly and effectually for ninety-four hours; this was well supported at first, but on following night intense pain in whole limb, lasting three hours; these occurred again on second night, so as to cause him to cry out for pain; œdema of leg increased, and required a bandage from toes upwards; on ninth night after

leaving off compression, violent pains in calf of leg, tension, and œdema of limb; formation of slough over ham; intense fever; amputation; death six days after, with symptoms of purulent infection.

Case 55. Amputation. Recovery. Five months after, ligature of right femoral in Hunter's canal, for the right aneurism, which began to swell and increase in size, and in which, one day, after violent exertion on crutches, he had considerable pain, with increase in size, so as to stretch both hams; ligature came away on eleventh day. Recovery.

Case 56. Amputation, after having first plunged an abscess-lancet into the softest part, without giving issue to any fluid.

Case 57. Exploration with grooved needle, and small quantity of dark-coloured blood escaped; amputation; health gave way, and death in one month.

Case 58. Gangrene rapid; amputation on seventh day. Recovery.

Case 59. Exploration of most fluctuating part about middle of calf, but nothing escaped; by introducing the finger, an abundance of soft coagulum could be felt, occupying a large cavity within; amputation. Recovery.

Case 60. Exploration by lancet, but only a few drops of dark blood escaped; on following day at noon, on moving limb roughly, about one ounce of fluid blood escaped from lancet-wound, unattended with arterial jet, and easily checked by pressure on the limb; fourth day, probe introduced, and passed in every direction without resistance, and without hæmorrhage; amputation; exhaustion. Death.

Case 61. Immediate amputation refused by patient, but seven days after he consented; amputation; secondary hæmorrhage. Death in forty-eight hours.

Case 62. Previous to admission introduction of lancet, and small teacupful of blood escaped. After admission, exploration; dark-coloured blood evacuated, followed on next day by sudden increase; amputation. Recovery.

Case 63. Aneurism punctured by lancet; extravasation; alarming hæmorrhage on third day through wound; amputation; secondary hæmorrhage. Recovery.

Case 64. Aneurism cured by compression; twenty-five days after, rupture, and subsequently bursting through skin in ham; gangrene followed, and arrested at knee; amputation of thigh on fifteenth day. Death.

Case 65. Compression of femoral for aneurism; at end of week pulsation arrested, when sudden rupture; rapid gangrene; amputation three days after gangrene set in; secondary hæmorrhage two weeks after operation. Death.

Case 66. Incision into fluctuating part of tumour; a flow of blood followed, of a dark, grumous, and pitchy character, and on following day a copious discharge of pus. Gradual subsidence of limb to natural state; fifteen days after, sudden arterial hæmorrhage, filling and distending original abscess, and diffusing itself between muscles, and extending through ham to thigh; amputation. Recovery.

Case 67. Ruptured aneurism; rapid gangrene; no line of demarcation; health giving way; amputation on eighth day; violent delirium; secondary hæmorrhage on twenty-first day; ligature of femoral; recurrent hæmorrhage; reamputation. Death ninety-six days after first operation.

Case 68. Ruptured sac following ligature of femoral about second week. Rapid gangrene. Death.

Case 69. Compression of femoral; favorable progression for eight days, when sudden symptoms of sac giving way; ligature of femoral; separation of thread on twenty-sixth day. Recovery.

SUMMARY.—*Cases left entirely alone,* 2; 1 recovered and 1 died of secondary hæmorrhage.

Cases in which an aneurismal tumour was explored.

Case 42. Aneurism punctured by lancet; hæmorrhage; immense effusion; ligature of femoral; gangrene; amputation. Death.

„ 43. Exploration by lancet; ligature of femoral; alarming hæmorrhage; amputation. Recovery.

„ 45. Exploration by incision two inches long, as some supposed it to be a diffused abscess; large quantity of arterial blood escaped; ligature of femoral; secondary hæmorrhage; amputation. Recovery.

„ 56. Exploration by lancet; immediate amputation. Recovery.

„ 57. Exploration by grooved needle, and small quantity of dark-coloured blood escaped; amputation.

„ 59. Exploration of most fluctuating part, about middle of calf; nothing escaped; amputation. Recovery.

„ 60. Explored by lancet; only a few drops of blood escaped; secondary hæmorrhage; amputation. Death.

„ 62. Explored by lancet; dark-coloured blood escaped; amputation. Recovery.

„ 63. Explored by lancet; alarming hæmorrhage; amputation. Recovery.

„ 66. Incision into fluctuating part of the tumour; flow of dark, grumous blood, &c.; hæmorrhage on fifteenth day; amputation. Recovery.

Cases in which compression of the femoral artery was used.

Case 30. Intermittent compression for 134 hours during 20 days. Recovery.

„ 31. Compression carefully persevered in for 19 days; evacuation of decomposed blood. Recovery.

„ 32. Employed for two months, when erysipelas attacked the limb; tumour burst externally; no hæmorrhage; exhaustion. Death.

„ 33. Attended with apparent success, when the artery gave way just above the sac, and burst externally. Death.

Compression ineffectual, and requiring ligature of femoral.

Case 34. Compression six days; increase of swelling; ligature of femoral. Recovery.

„ 35. Compression and forcible flexure of knee for 13 days; sac burst into knee; ligature of femoral. Recovery.

„ 41. Ineffectual for five days; badly managed; ligature of femoral; gangrene; amputation. Recovery.

Case 40. Compression with apparent benefit; sudden rupture of sac; ligature of femoral. Recovery.

„ 38. Could not be borne; ligature of femoral; bursting of sac externally; gangrene. Death.

„ 47. Compression for four days, and left off for five days, when tumour burst externally; ligature of femoral; gangrene; amputation. Recovery.

„ 48. Compression attempted, but could not be borne; amputation. Recovery.

„ 49. Compression attempted, but could not be borne; amputation. Recovery.

„ 50. Aneurism cured by compression in forty hours; ruptured artery above sac; amputation on thirty-third day after. Recovery.

„ 51. Attempted compression, and with benefit, when on seventeenth day increase of swelling and threatening gangrene; amputation; result not stated.

„ 52. Compression attempted, and could not be borne; amputation. Recovery.

„ 53.[1] Compression attempted for a week, when sudden enlargement and threatening gangrene; amputation. Recovery.

„ 54. Compression for seventeen days, and digital compression for ninety-four hours; sudden enlargement and pain; amputation. Death.

„ 65. Compression for one week; sudden increase; gangrene; amputation; secondary hæmorrhage. Death.

„ 69. Compression favorable for eight days; rupture; ligature of femoral. Recovery.

Cases in which ligature of the femoral was employed. In 9 the limb was not amputated after ligature.

Case 34. Compression for six days, when increase of swelling; ligature. Recovery.

„ 35. Compression for thirteen days; sac burst into knee; ligature. Recovery.

„ 40. Compression with benefit; sudden increase; ligature. Recovery.

„ 38. Compression unbearable; ligature; gangrene. Death.

„ 36. No previous treatment; ligature; gangrene. Death.

„ 68. Two weeks after ligature, sac burst; gangrene. Death.

„ 37. Gradual and slow progress for two or three months; ligature. Recovery.

„ 39. Sudden; several days ruptured; ligature. Recovery.

„ 69. Sudden and immediate operation; ligature. Recovery.

In 7 the operation of ligature was performed, but afterwards amputation found necessary.

Case 41. Ineffectual compression, five days; ligature; gangrene; amputation. Recovery.

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[1] Dr. Carte and Mr. Tuffnell remark, on Case 53, that the cases, in which the rent occurs on the anterior surface of the vessel, are never successfully treated either by ligature or by pressure on the femoral.

Case 42. Following lancet wound, one day; ligature; gangrene; amputation. Recovery.

„ 43. Exploration; ligature; secondary hæmorrhage; amputation. Recovery.

„ 44. Large aneurism; rupture indefinite; ligature; inflammation and suppuration; amputation. Death.

„ 45. Exploration; ligature; hæmorrhage; amputation. Recovery.

„ 46. Operation declined for eleven days; ligature; gangrene; amputation. Recovery.

„ 47. Compression for four days and omitted five days; bursting; ligature, gangrene; amputation. Death.

In no case was the *popliteal space laid open* in ruptured aneurismal sac; and Porter, in his work, well observes, "If the diffusion has been caused by the bursting of a circumscribed sac of an idiopathic aneurism, it will be more objectionable to cut down upon the injured spot, because there is so far presumptive evidence of the artery not being healthy in that situation, and consequently the risk of secondary hæmorrhage will be greater."

Cases in which amputation was performed, 27 in all, in 1 of which the result is not stated; 16 recoveries and 10 deaths.

1*st set*, in which amputation was performed without any previous treatment except exploration. In 13 cases 7 recoveries, Cases 55, 56, 58, 59, 62, 63, 66; 6 deaths, Cases 57, 60, 61, 64, 65, 67.

2*d set*. Where compression had been previously employed. In 6 cases (Case 51 not stated) 3 recoveries, Cases 48, 49, 50; 2 deaths, Cases 53 and 54.

3*d set*. After ligature of the femoral had been employed. In 8 cases, 6 recoveries and 2 deaths; of these 3 had previous employment of compression of the femoral, viz., Cases 41, 47, 52, and were recoveries; in 3 there was exploration of the tumour previous to ligature; viz., 42, 43, and 45, the two latter recovering; and in 2 cases, 44 and 46, ligature was immediately applied; one died and one recovered.

We will now review these amputations according to the conditions which demanded amputation.

1*st set*. *Immediate or primary amputation deemed advisable.*—In 8 cases 6 recoveries, Cases 49, 55, 56, 59, 62, and 63; 2 deaths, Cases 57 and 60; 75 per cent.

2*d set*. *Deferred or secondary amputation.*—19 cases, 1 not stated; 10 recoveries, 57·89 per cent., 8 deaths.

a. For threatening gangrene in 6 cases, the result in one, Case 51, not stated, 2 recovered, Cases 48 and 52; 3 deaths, 53, 54, and 61, the two former from pyæmia.

b. For gangrene when fully set in, 8 cases; 4 recoveries and 4 deaths; in 7 it was performed whilst spreading. Cases 41, 42, 46, 47, 58, 65, and 67; and with success in 4, viz., 41, 46, 47, and 58. In one, Case 64, where it was arrested at time of operation, death ensued.

c. For hæmorrhage and secondary hæmorrhage in 3 cases, in all of which recovery took place, viz., Cases 43, 45, and 66.

d. For inflammation, suppuration, &c., exhausting the patient, 2 cases, one recovery, Case 50; and one death, Case 44.

We will now give the full detail of each case of ruptured aneurismal sac.

CASE 28.—*Ruptured popliteal aneurism; refusal of all operation; bursting of tumour externally; much hæmorrhage; spontaneous cure.*[1]

Richard Donovan, æt. 33, a blacksmith, in the month of October, 1796, perceived that his right leg was considerably swelled. The swelling was constantly augmented towards evening; this gradually subsided, and at end of two weeks entirely disappeared. At this time a small circumscribed tumour took place in ham, attended with pulsation, a slight degree of inflammation, and a great deal of pain. About a week after it attained the size of a walnut, and in a month that of a hen's egg. The pain increased in proportion, so that the limb did not admit of full extension or flexion without occasioning excruciating agony. Finding the tumour rapidly increasing, he applied to the Westminster Dispensary, and was recommended to come into the hospital. He procured admission into St. Thomas's Hospital, under Mr. Clive, and an operation being proposed, he left in a few days. The disease progressed, and in February, 1797, it had reached the size of a man's head. The skin over whole extent of tumour greatly inflamed and very tense, and pain almost intolerable. The pulsation was now only to be discovered by pressing firmly with the fingers upon the upper part of the tumour. He now entered St. Bartholomew's, but did not stay long, as an operation was proposed. On the day of leaving the hospital, one of his crutches slipping, he fell to the ground and bruised the swollen knee; on the third day from this he perceived two distinct tumours, each of which was half an inch in diameter, attended with violent pulsation, and situated high upon the course of the femoral artery of left thigh; they enlarged very quickly, and the limb on that side was considerably benumbed. In this condition he was admitted into the Westminster Hospital, under Mr. Lynn.

On the right side there was the large popliteal aneurism, in which, for more than nine weeks, there had not been any pulsation; the leg was benumbed; the skin over the tumour was inflamed and tense, attended with excruciating pain. An oozing of bloody serum had already taken place from the most depending part of the tumour, where the cuticle had burst; and as every moment seemed to threaten the destruc-

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[1] 'Trans. of a Society for Improvement of Med. and Chir. Knowledge,' vol. ii. Mr. Wilson.

tion of the patient, a tourniquet was constantly kept in readiness. Having resided seven days in hospital, he insisted upon being removed to his lodgings. The oozing of serum continued for some days after, nor was the pain diminished.

On the 6th of May (nine days from first appearance of serum), when in bed, he had suddenly the sensation of a fluid running down his leg; upon examination, he found that the integuments of the tumour in the ham had given way, and that the blood was rushing out from the wound in such quantity that, in the space of five minutes, four pounds were lost. During this time he fainted repeatedly. On the 8th the wound was become much enlarged, discharging lumps of coagulum occasionally during fourteen days. By this time the knee was nearly reduced to its natural size, and the wound suppurating.

He was now admitted a second time into the Westminster Hospital. The discharge continued copious for fourteen weeks, and varied in appearance according to the state of health of patient. At the end of four months the wound was completely cicatrized; he had a serviceable limb.

The two aneurismal tumours on left femoral were treated by moderate and uniform pressure, made by a flannel roller, continued for two months; they approached so nearly to each other as to form, apparently, one tumour, without any pulsation. Before the patient quitted the hospital (January 10th, 1798) it was so very much diminished in size, as to be scarcely discerned when his breeches were on. It was perfectly soft, and gave no uneasiness. This left extremity is considerably less than its natural size. The right is the most serviceable limb, although it is shorter by two inches, the effect of the mischief in the ham.

Case 29.—*Ruptured aneurism; difficult diagnosis; exploratory operation refused; apparently recovering; sudden hæmorrhage; death.*[1]

Anne Foley, æt. 40, admitted into North Infirmary, Cork, under Dr. Hobart, with tumour behind knee of five months' standing; had suffered intense pain. The tumour rapidly increased in size, and the leg and foot became greatly swollen, the ankle being at one time more swollen than the knee. At one time she fell forward on the floor, as she was trying to hobble through the room; this fall strained the veins, particularly one running up the thigh, which became hard and black. One night she noticed, rather suddenly, a remarkable sensation in the limb, as if the whole swelling was being drawn up from the ankle into the knee.

On admission, the tumour was principally situated above the knee-joint, on the posterior aspect of the femur; a process of it seemed to extend below the knee, deep into the upper part of the calf of the leg; and another upwards along the course of the biceps muscle, nearly half way up the thigh. The principal mass can be well defined in its lower margin, which is round and prominent; above, its extent is not so clearly marked; and laterally, it seems to embrace the entire of the circumference of the limb. On touching it lightly there is no sense of fluctuation, but on pressing heavily with the thumbs, a sensation of deep-seated fluid is communicated. Surface

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[1] 'Dublin Journal,' 1858, vol. xxv, p. 443.

smooth and slightly polished from tension of skin; circumference of limb sixteen inches and a half. Complains of desperate pain about the knee. On applying the stethoscope no sound could be heard.

On sixth day tumour explored, blood alone, of dark colour, coming away.

It appears she was in the South Infirmary, Cork, some time back, when the tumour was much smaller; there was no pulsation in it then, and it seemed rather to be an enlarged gland, or some form of encysted tumour.

On ninth day a large trocar and canula introduced, and a free discharge of very dark blood. Supposed to be fungus hæmatodes. Patient refused any operative measures. Decomposition of contents ensued, and a copious discharge of dark, bloody stuff through the puncture, most offensive, and the tumour became greatly reduced in size; suppuration ensued; health affected.

On twenty-fourth day after admission, sudden profuse arterial hæmorrhage set in, and patient died.

Examination of limb.—Large clot occupying ham, quite soft, as if recently formed; on evacuating clots and pus, a round tumour, the size of a billiard ball, was seen lying near the bone; this was tolerably firm at its upper part, where it was whitish, and seemed like partially organized fibrin, but the lower part was soft and dark coloured. On passing a probe down the sound femoral artery, it suddenly stopped near tumour, and on laying open the vessel, a papilla-shaped piece of fibrin was seen protruding into the side of it next the tumour, into which a probe could be freely passed at either side of the papilla. The greater part of the sac was strong; but at the lower part it was dark-coloured and soft. The tumour contained a cavity of the size of a hen's egg, smooth, its lining membrane continuous with that of the artery.

Case 30.—*Ruptured popliteal aneurism; compression for* 134 *hours during twenty days; recovery. Subsequent injury and readmission; recovery.*[1]

Harriet L—, dressmaker, æt. 23, good general health, admitted into City of Dublin Hospital, under Dr. Hargrave, with enormously diffused popliteal aneurism. She first observed a tumour in the ham four months previously, and it has been constantly increasing. The only cause she could assign for it, was a hurt she received from a door; she was in the act of running out of a room, when some person, in play, forcibly shut the door, and caught the thigh between it and the frame. About a week subsequently to this, she perceived a small tumour, of the size of a marble, in the place where the sharp edge of the door had struck her; this part she now points out as the upper and most prominent portion of the present tumour. It gradually and steadily increased and pulsated. When it became as large as a walnut, the pulsations were so strong as to lift the thigh and leg off, when placed across the opposite one; as the swelling increased, the leg became benumbed, and before admission it was often blue and cold, and slightly œdematous. The whole limb was affected with painful twitchings.

On admission, a large, pulsating tumour was observed to occupy the lower part of the thigh, for six inches above the patella, and extending spirally, backwards and

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[1] 'Edinb. Med. and Surg. Journal,' 1851, vol. lxxvi, p. 506.

downwards, as far as the head of the tibia ; the exact shape of the tumour could not be ascertained, but it appeared to be irregularly quadrilateral, longer in the vertical than in the horizontal direction; the upper part best defined and most prominent. There was no discoloration of the integuments over it: temperature natural; leg flexed at an obtuse angle on the thigh ; outline of the patella lost, and natural shape of the joint destroyed. Three inches above the patella the circumference of the limb was seventeen inches and a half, round the patella sixteen inches and a half; the corresponding parts on the opposite limb measured respectively sixteen inches and a half and fourteen inches and a half. A distinct bruit, best marked in the upper part, was audible all over the tumour, synchronous with the systole of the heart. The tumour could be diminished by making firm pressure on the femoral, *but this diminution was very slight.* Indistinct fluctuation could be perceived. Ice applied to tumour.

Compression commenced on fifth day, but could not be borne for continuance. She was under treatment for twenty days, that is, from the first application of the compression until all pulsation had ceased in the tumour, during which period the absolute pressure did not amount altogether to more than 134 hours, or five days and a half. Some difficulties were encountered; the pressure could not be applied on any part of the thigh, owing to its being full, soft, and flabby, offering no support or counter-resistance to the instrument, unless it was carried to its maximum, to arrest the pulsation in the tumour, and which could not be endured, when tried, but for a very short period; it also caused the aneurism to be more distended, and the limb to be considerably congested. The inguinal region was the only site, which was not very favorable, not only small enlarged lymphatic gland, but the remains of a cicatrix, and very sensitive.

She left the hospital about the eleventh week, the limb natural in size and temperature ; a part of the tumour remained unabsorbed and solid.

She was brought into the hospital the night following, in a state of great excitement from intoxication and pain ; the limb was greatly swollen from above the knee down to the ankles, and very hot. She screamed violently, and she felt as if her leg had burst, referring to the calf of the leg as giving most pain. It appears, from her account, she had been in the park all the day (Saturday) ; that she had walked a considerable distance, and jumped across a stream ; that she went to the theatre in the evening, and returning from thence drank six glasses of brandy; she remembers nothing further.

For four or five days she suffered much pain in calf of leg, the temperature of which was considerably lower than that of the other leg.

Under the application of a flannel roller, from toes to middle of thigh, and rest, she gradually recovered, and left in three weeks at her own request, the limb being, in function and appearance, as perfect as the other.

Case 31.—*Unsuccessful treatment by compression forcibly used ; sloughing, &c. ; parts healed ; aneurism gave way ; careful and moderate compression ; recovery.*[1]

Peter Beale, æt. 22, formerly private in 5th Fusileers, stated that during a march

[1] 'Dub. Med. Press,' 1853, vol. xxix, p. 338.

of twenty-three miles over a mountain road in the Mauritius, he experienced a strain (his foot turning in a car track), which was followed in five or six days by a swelling in right ham about the size of a pigeon's egg. He was placed in the hospital on the following day, remaining there nine months. Compression for ten days three inches below Poupart's ligament; a deep slough formed, and cicatrized (cicatrix one and a half inch by one inch); instrument moved to one inch lower down, when a similar slough formed. No effect on tumour.

Returned to England, and remained in Hospital at Chatham five months; here pressure was again tried for thirteen days; the pressure over middle of thigh caused a deep slough, and that over groin a superficial one. When ulcers healed he was discharged, the tumour having rather increased in size.

Admitted six months after latter occurrence, into the Queen's County Infirmary under Dr. Jacob. Within the last three weeks the tumour has increased very much, altogether preventing his walking. He complained of severe pain in the tumour and leg. It extends at present from about three or four inches above the knee on posterior part to the upper part of the middle third of the leg; it measures round *the upper part nineteen inches, the lower part seventeen and a half inches; length of tumour six inches.* The size can be slightly diminished by pressure on the artery in the thigh, but the tumour returns to its original size immediately on its being removed. By auscultation a bruit de soufflet is audible, principally on the outer side, over the head of the fibula, and on the inner side behind the head of the tibia. The tumour extends at each side above and around the condyles of the femur. The knee joint is bent, the leg being nearly at a right angle to the thigh, and cannot be made straight. Was left quiet in bed for twenty-two days; tumour remaining much the same. Compression was now commenced, and limb bandaged from toes to where compression made.

The daily account of the difficulties to be surmounted, the changes taking place in the sac, the formidable complication of pneumonia, low diarrhœa, and phlebitis of the opposite limb, are fully detailed.

Perseverance with compression notwithstanding. Part of the effused blood decomposed, requiring opening, and evacuation of twenty ounces of fetid, grumous blood; one at posterior inferior part of tumour; and another opening on external side below knee. Soon afterwards a quantity of fibrine came away from the opening in ham, having a laminated appearance; the different layers can be separated from each other.

Compression nineteen days; the weight used was eight ounces ten or twelve times a day, gradually decreased to twenty-sixth day. Discharged cured five months after admission; the limb nearly straight, and he was able to walk well.

CASE 32.—*Ruptured aneurism: compression for two months; recovery; attack of erysipelas; bursting of sac externally; no arterial hæmorrhage; secondary attack of erysipelas; death.*

J. B—, æt. 38, admitted October 30th, under Mr. Hutton, into Newcastle Infirmary,

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[1] 'Med. Gaz.,' 1852, vol. i, p. 566.

blacksmith, pale, sallow-looking, hard liver and drinker. Right popliteal aneurism of six months. At present, foot and leg, up to above knee, are much swollen and cold. The knee is a good deal bent and fixed. The limb around the tumour measures twenty and three-quarter inches: the opposite limb at same part twelve and a half inches. Compression with Weiss's tourniquet, substituted afterwards for Bellingham's. Continued for two months.

On removal of compression no pulsation in tumour, which is not diminished in size, but has a soft, elastic feel. One month after this, erysipelas attacked limb, which is much swollen. The tumour is soft, and fluctuates. On February 12th, tumour burst, and twelve ounces of dark matter, like coffee grounds, discharged; no hæmorrhage. On 23rd, several portions of firm coagula evacuated.

March 18th, sits up and walks about. 21st, again attacked by erysipelas and difficult breathing. Death on 22nd.

Examination of limb.—Femoral artery previously injected with plaster of Paris. On dissection, femoral artery found injected down to sac; the sac itself filled with injection, lacerated in several places, and injection extravasated into surrounding tissues. Posterior tibial partially injected.

Case 33.—*Aneurism undergoing cure by compression; bursting of artery above sac; sudden external hæmorrhage; death.*[1]

A man, æt. 25, of temperate habits, has been in the army, and undergone much hardship in the Crimea before Sebastopol, and now discharged, admitted under Dr. Murray into Belfast General Hospital. Eight weeks before admission, the formation of a tumour in the left popliteal space attracted his attention; this rapidly increased in size, and ultimately became as large as a cricket ball; foot and leg œdematous. On the third day compression employed. After twelve days' use the pulsations in the ham were very much lessened; in fact, not more than distinctly perceptible; at the same time, the tumour was quite hard, and of its original magnitude. The œdematous condition of the foot and leg now became extremely troublesome (a pulsating tumour was also now noticed at the upper extremity of the sternum). On fifteenth day impulse scarcely perceptible, and on seventeenth day circulation could no longer be detected. On twenty-first day, several bullæ, which had formed on instep, on different parts of leg and popliteal region, burst, and a large quantity of serum, tinged with blood, passed from the limb; more or less continued to ooze from various points for the next six days. On the evening of the twenty-seventh day the case terminated fatally, with extreme rapidity, in the following manner: During the evening he had been restless and fretful; after remaining perfectly quiet for a short time, he screamed for the nurse, who ran to his assistance, and found his bed deluged in blood; he gave a few long-drawn inspirations, and ceased to live.

When the body was being removed to the dead-house, a large cyst was observed hanging loosely from a jagged, irregular cavity in the ham; it was seven ounces in weight, and of firm consistence; the lower part of the popliteal artery could not be traced in it, but at its upper or proximate end, a portion of vessel, one inch and a half

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[1] 'Dublin Journal,' vol. xxiv, 1857, p. 451.

long, was found; its upper margin was sharp and well defined, as if cut with a knife.

Permission to examine the body refused.

It was evident from the atheromatous condition of the artery, that death had been caused by rupture of the diseased coats above the site of the aneurismal tumour, and that the extravasated blood had dissected the hardened mass which constituted the clots.

Query.—Had not artery given way as early as seventeenth day, or even before that, producing the troublesome redness, and the condition of the integument observed on the twenty-first day.

Case 34.—*Ruptured aneurism; compression for six days; ligature of femoral; protracted recovery.*[1]

Private Thomas Brown, æt. 32, six foot, powerful, muscular; dissipated habits, under care of Dr. Mitchell; he stated, that he had been troubled with pain in left popliteal space for twelve months, but it was not until after a field-day on March 28th, that he observed any tumour; the pain at this time underwent an aggravation. The pulsation, when aneurism first discovered, was more distinct than it became within a few days, the swelling was smaller and better defined, and expansion on pulsation more general and forcible.

On admission into hospital, Plymouth, on 30th, there was a large, diffused, hard swelling on inner side of left popliteal space, extending half way up thigh, and round to inner and fore part of thigh, but not ascending so high in this direction. The swelling at every part had a pulsatory movement, synchronous with pulse; arrested by compression of femoral, when slight subsidence of swelling observed; whizzing sound heard by stethoscope; great pain in site of tumour; slight swelling of leg; pulsation of tibials, weak.

Compression for six days. Ligature of femoral in consequence of increase in size of swelling, and no diminution of pulsation; leg and thigh became much swollen; ligature did not come away for five months; protracted recovery. Rejoined regiment with hardly a vestige of the tumour; limb rather weak.

Case 35.—*Aneurism treated by forcible flexure and compression for thirteen days; failure; rupture into knee-joint; ligature of femoral; recovery.*[2]

Navigator, æt. 46, fine manly, highly nourished, admitted into the Middlesex Hospital under Mr. Moore with very large aneurism in right ham five and a half inches long, of six weeks standing, without any particular cause.

Treated by flexure of the limb; in addition compression; continued for thirteen days, when knee found to be altered in shape, and patella raised on loosing tourniquet; pulsation in joint; filling and emptying as pressure made on artery. Aneurism had burst into joint. Ligature of femoral came away on twenty-first day; recovery.

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[1] 'Med. Times. and Gaz.,' 1853, vol. ii, p. 648.

[2] 'British Med. Journal,' 1859, p. 479.

Case 36.—*Ruptured aneurismal sac; extensive extravasation; ligature of femoral; gangrene; death.*

J. H—, æt. 30, male, admitted under Mr. Key, at Guy's Hospital; popliteal aneurism of six weeks; noticed a numbness in leg two years. Four days after admission great increase of size; on fifth day alarming swelling; integuments tense, and slightly discoloured; limb twice size of opposite; swelling reached to groin; and integuments of yellow tinge; parts below knee natural; very little feeling in parts; limb heavy. Bursted sac. Femoral artery tied. In evening temperature rather higher than natural; pulse 80, and feeble, and kept up next day. Second day after operation, pale, anxious, muttering, hiccough, vomiting, hot skin, pulse 120, tongue dry, dark brown; temperature of limb diminished; limb was tense, pale, œdematous. In the evening temperature much less; coldness extending from foot up the leg; cuticle beginning to separate; hot flannel and warmth. Third day foot more discoloured; three large vesications filled with dark coloured fluid in foot and ankle; toes cold, and of dusky hue. Thigh remains swollen, and retains its natural heat. Tongue brown; hiccough; pulse feeble, 108. Fourth day, pale, cold perspiration; coldness increased; vesication more distended. Seventh day, thigh somewhat decreased; hiccough ceased; perspiration continues; foot gangrenous. Tenth day much weaker, cold sweats: gangrene not extended. Died on twelfth day. No examination of limb.

Case 37.—*Ruptured aneurism from violence; slow and gradual extravasation; ligature of femoral at eighth week; recovery; ligature of opposite artery for aneurism successful.*[1]

James Brady, æt. 38, strong, healthy; formerly infantry soldier. Admitted Nov. 1833, under Mr. Collis, Surgeon to Meath Hospital.

In the year 1818 he felt a pain in both hams, and soon after perceived a tumour in each popliteal space. These became somewhat larger when exposed to fatigue or cold; from the commencement a throbbing was felt in the tumours, but the patient was never prevented from attending to the duties of his occupation. These tumours continued stationary until August 1833, when his right leg was much and severely bruised between two cows, whilst employed as cattle driver. The tumour in this limb shortly after increased and became painful; the throbbing augmented. The leg and thigh became swollen, and the foot numb and cold.

He came to the hospital in this state six weeks ago, but refused to remain in the house at that time. He shortly resumed his labours, and exercised his limbs considerably; the tumour soon increased; his leg and foot became swollen and œdematous; he complained of numbness and a want of sensibility in the limb. The tumour in the ham became more diffused, and the pain and an uneasy sense of constriction in the limb deprived him totally of rest. In this state he was admitted; the veins upon the surface of the limb very distinct; a slight erysipelatous blush over the inside of the knee; pulsation much diffused over the tumour; general health but little affected.

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[1] 'Dublin Journal,' vol. v, p. 29.

He was kept quiet in bed; pain diminished, and external inflammation subsided, but the tumour became daily more tense and extended; ligature of femoral on tenth day; recovery.

One month after above operation, ligature of femoral for left popliteal aneurism, which had all along remained of same size. Recovery.

Case 38.—*Ruptured aneurism; burst externally; ligature of femoral; gangrene; rapid death.*[1]

A Chinese, æt. 56, a cake-maker. Admitted into hospital at Canton, under Dr. Hobson, for popliteal aneurism of two months' duration. The tumour occupied a large extent of surface, and was rapidly increasing; the leg was œdematous, and he complained of pain. The tumour beats strongly, and is hot and painful; pressure could not be borne; it was arranged to tie the femoral after he had received the sanction of his friends. On the third day it had much increased, red and much more tender, and the skin exceedingly thin. A tourniquet was lightly applied, in case of any accident; in the evening the aneurism suddenly burst, and blood projected to a great distance; about two pounds of blood were lost. Ligature of femoral immediately performed. Gangrene set in on the fourth day, but he was so low as to preclude all hopes of amputation. Death on fifth day.

Case 39.—*Ruptured aneurism; ligature of femoral; recovery.*[2]

Jeremiah Tomkins, æt. 35, a labourer in the coal trade, and accustomed to drink freely. Admitted into University College under Mr. Quain. About five weeks previously he first noticed a swelling towards the inner and back part of the thigh, at about the junction of the middle with the lower third of this part of the limb. It throbbed and was tender, notwithstanding which he did not desist from work until a fortnight before his admission. The swelling continuing to increase, he now felt pain in his knee, extending down the back of his leg to the ankle and foot, and also up to the hip. Three days ago, he observed an increase in the swelling of the parts about the knee, especially in the popliteal space, but extending down to the ankle and foot, and attended with numbness and inability to move the leg.

On admission, in the popliteal space, or rather just above this and over the course of the femoral artery, was a hard, firm, moveable mass, discoloured over a portion of its surface, and marked by enlarged superficial veins. The patient experienced throbbing pain in it; the leg was considerably swollen, the foot benumbed, and the knee, which was stiff, was the seat of a pricking sensation. The patient, before his entrance into the hospital, had been salivated, on the supposition that his complaint was rheumatism. The case was ascertained to be a secondary diffused aneurism. The original circumscribed aneurism was situated at the commencement of the popliteal artery; and the swelling of the limb below this point, and especially in the popliteal space, had augmented very much during the last two days. The tumour, which was tender and painful on pressure, could be felt with the hand to

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[1] 'Med. Times,' vol. xx, p. 288.

[2] 'Med. Gazette,' vol. xxviii, p. 234.

be attended with a weak pulsation in it; there was some little discoloration of its surface. When the leg was touched or pinched, the patient was scarcely conscious of what was done, so great was the degree of numbness in it.

Femoral artery tied in upper third. Ligature came away on seventeenth day. Recovery.

Remarks by Samuel Cooper.—Directly I placed my hands on the swelling, its solid feel at once made me certain that the case was not an abscess; also the history of its throbbings in the early stage; its sudden increase when it became diffused, and the reduction in the force of pulsations, accompanying this latter very important change.

The sensation imparted to the surgeon's hand, when it was applied to the swelling at the moment of pressure being removed from the artery in the groin; for then the fresh and sudden rush of blood to the tumour could be distinctly perceived in it, leaving no doubt of the swelling arising from and communicating with the artery.

Case 40.—*Ruptured aneurism; ligature of femoral; recovery.*[1]

A man, æt. 36, admitted into Guy's Hospital under Mr. Birkett, had discovered the swelling in the ham only three weeks, and had never had any pain or rheumatism. Pressure was applied for four weeks, with apparent benefit, when the tumour suddenly enlarged, and the sac had, without doubt, given way. There was at first distinct pulsation, but this gradually became weaker. A ligature on the femoral was at once applied; on the ninth day it came away, and convalescence ensued, &c., &c.

Case 41.—*Aneurism; ineffectual compression; rupture of sac; ligature of femoral; gangrene; amputation; recovery.*[2]

B. W—, æt. 34. Strong, healthy. Admitted with popliteal aneurism of eleven weeks' duration, into Norwich Hospital, under Mr. Norgate. Size of small hen's egg; ineffectual attempts at compression, badly managed, for five days; then rapid increase in size; patient writhing with pain all over knee, ham, and leg; coldness of foot. Tumour extended up inner aspect of thigh to two inches; general pulsation; very slight œdema of leg.

Ligature of femoral; gangrene followed; amputation; recovery.

Examination of limb.—Aneurism of globular form, five inches by four; rupture thereof; extravasation under knee and integuments; pressure on sural vessels and

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[1] See 'Guy's Hospital Reports,' Series III., vol. vi, p 63.

[2] 'Dublin Med. Press,' 1851. Lancet.

the articular; veins and nerves subject to great pressure, and lying in a groove of the tumour.

Case 42.—*Aneurism, punctured; diffused and extravasated blood; ligature of femoral; gangrene; amputation; death.*

A farm labourer, æt. 25, admitted into Guy's, under Mr. Callaroy, who three months previously discovered a pulsating tumour in his right popliteal space, his attention having been drawn to the spot by a pain shooting down the leg. He continued, however, at his work for one month, when he sought advice. He was directed to apply a poultice to the part; and as this gave no relief, a puncture was made into it with a lancet; nothing, however, then escaped, but the following day some hæmorrhage coming on, he was sent to Guy's Hospital with a tourniquet on his femoral artery. When admitted, the whole of the popliteal region and leg was swollen with extravasated blood, and had no pulsation in it whatever, nor did the history of the case correctly reveal its true nature; a ligature was at once applied to the femoral artery. Gangrene, however, rapidly followed the operation, and on the twelfth day amputation was performed; and twelve days subsequently the man died from exhaustion.

On examining limb, an enormous diffused aneurism, the whole tissues of leg and thigh infiltrated with blood, causing pressure on the venous circulation of limb.

Case 43.—*Ruptured aneurism; difficult diagnosis; explored by lancet; ligature of femoral; hæmorrhage; amputation; recovery.*[1]

Related as one of similar nature to Case 36. Tumour of considerable size, and without pulsation; no accurate history; (? abscess or blood); opened by lancet, or diagnosis; blood escaped; aperture closed; artery tied in middle of thigh.

On following day tumour unreduced in size, and as tense as before the operation. Hæmorrhage from wound, increased to alarming extent; patient sinking; amputation performed; recovery.

Case 44.—*Large aneurism; time of rupture indefinite: ligature of femoral; progress towards cure; erysipelas; suppuration about sac; three abscesses communicating with sac, one of which entered knee-joint; amputation of limb; death.*[2]

James Ferguson, æt. 30, sailor. General health good. Admitted with popliteal aneurism in left ham of eight weeks' duration, under Mr. Allan, Royal Infirmary, Edinburgh. It formed an elastic circumscribed tumour, which was so large as not only to fill up, but to project beyond, the space defined by the hamstrings, and which afforded to the touch a distinct thrilling sensation. The integuments above

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[1] Chirurgus of Plymouth, in the 'Lancet' of Nov. 1824.

[2] 'Edinburgh Journal of Med. Science,' vol. i, p. 331.

the tumour were tense, but not red or painful. The pulsation of the femoral artery was strong, but that of the anterior and posterior tibial arteries indistinct. The motions of the knee-joint were much impaired, and he kept his leg continually in a semi-bent position. He experienced at times in the leg severe shooting pains. There was occasional œdema, and a tingling sensation in the foot.

Three days after admission, ligature of femoral. From this time up to tenth day went on favorably, when he felt considerable pain, extending up the leg towards the wound, with some starting; a blush of inflammation around wound; some febrile disturbance, succeeded by erysipelas and constitutional irritation; he also complained of pain about the knee, attended with burning heat, but no swelling. The tumour had diminished to size of duck's egg. For a fortnight he continued feverish, and the pain in the knee increased, attended with swelling and great heat.

On thirty-third day after operation, the aneurismal tumour felt very soft, and there was a distinct sense of fluctuation round the joint. Two small incisions were made at the most distinct fluctuating points, from which bloody matter was discharged. On the following day several ounces of pus were discharged. Suppuration appeared to be within the joint; irritative fever; health declining. Amputation. Death eight days after.

Examination of limb.—The popliteal vein and nerve were seen running over the external or posterior part of the tumour; the vein was found obliterated. The tumour lay fairly in the hollow behind the condyles of the femur. Upon opening the tumour it was found filled with loose, coagulated blood, and the artery was seen entering its upper and passing out at its lower part. The points at which the artery entered and passed out were situate towards the outer side of the sac, and were two inches apart; both of the openings within it had smooth, rounded edges; the upper one was of the size of goose-quill, and the lower one that of crow-quill. No laceration of the internal coats of the artery could be perceived, but it looked as if all the coats on the side next the knee-joint had been dilated. Upon further examination three distinct abscesses were discovered, all of which were deep-seated and communicated with each other. The largest was situated between the aneurismal sac and the inner hamstring, and was bounded by the bone and capsule of knee-joint; betwixt it and the aneurism there were two openings, each of which would admit the point of the little finger. These openings were at the inner side of the sac, about its middle, and coagulated blood was seen projecting from one of them into the abscess. Another abscess, about half the size of former, occupied the situation of popliteus muscle in connexion with external condyle; it opened into the knee-joint at its outer side. The third abscess was on the fore part of the femur, immediately above the knee, and exterior to the capsule, and it communicated laterally with both the other abscesses. Pus was contained in the cavity of the knee-joint.

Case 45.—*Ruptured sac; exploration; ligature of femoral; secondary hæmorrhage; amputation; recovery.*[1]

J. B—, stonemason, æt. 30, admitted into Westminster Hospital, under Sir A. Carlisle. Three months ago first perceived swelling in ham, about size of walnut,

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[1] 'Lancet,' December, 1826.

attended with pain and pulsation. Leg soon began to swell, but not rapidly, and then the pulsation ceased.

On admission, leg twice its natural size, exceedingly tense, and of dark-brown colour, with sense of fluctuation; countenance pallid; pulse 120, very weak. On third day tenseness increased; limb measured half inch more around calf; not much pain. Consultation held—Sir A. Carlisle thought it was diffused abscess; Messrs. Lynn and Guthrie, aneurism. It was determined to wait.

On seventh day, leg larger; more discoloured and tense; exploration; incision of two inches; large quantity of coagulum escaped, and then arterial blood. Femoral artery tied at usual place; coagulum removed by finger; flow of arterial blood from lower part of wound ensued; amputation at once performed; patient going on well.

Examination of limb.—Aneurismal sac lower than usual; anterior and posterior tibial and femoral arteries passed out from sac; extravasation of blood down leg.

Case 46.—*Ruptured aneurismal sac; operation declined for eleven days; ligature of femoral; gangrene; amputation; recovery.*[1]

Mr. Lucas, æt. 48, private patient of Mr. Samuel Cooper; an organ-builder. A large, robust man, of gouty habit. Extensive tumour occupying ham, and extending over sides of condyles of femur towards patella, and reaching under the gastrocnemius. Pulsations remarkably strong, and equally manifest both to sight and touch. Integuments of back part of it were at one point somewhat red and inflamed, foot torpid, and limb from knee downwards of great size, from effects of œdema.

The disease existed five years without suspicion, the patient considering lameness to arise from gouty or rheumatic affection of knee. He had continued to follow his trade up to the present period.

Operation of ligature of femoral urgently advised. Patient desired its postponement for a week or ten days, until he had completed some urgent business. Three or four days afterwards he was severely attacked by gout in right foot and both wrists, which lasted two weeks, and on its subsidence *the throbbing of the aneurismal tumour had diminished considerably, without alteration in appearance of swelling and limb, except a slight purple discoloration above inner malleolus*, somewhat resembling an ecchymosis. Numbness of foot ensued. Five days after this period the foot became all on a sudden extremely cold; no sensibility in toes, but some at ankle and instep; no pulsation whatever in swelling, and no material increase in swelling of leg. Consultation with Mr. Lawrence. By direct auscultation bellows-murmur heard; hence still a current of blood in aneurismal sac; foot and lower part of leg warm.

Operation of tying femoral again urged, but declined. Two days after this, risk of gangrene not lessened; tumour as tense and large as ever; swelling of whole leg undiminished; bellows-murmur still audible; apparent return of natural heat from use of hot fomentation, and frequency of pulse increasing. Femoral artery tied;

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[1] 'Med.-Chir. Trans.,' vol. xvi.

fifth day after operation gangrene supervened; pulse 130; restlessness and anxiety skin of portion of leg black and livid.

Amputation; bone sawn through an inch and a half below ligature of femoral.

From this time everything went on favorably, and in course of six weeks patient recovered.

Examination of limb.—Sac of unusual size; lower and most deeply seated part of sac under gastrocnemii had given way, blood finding its way under gastrocnemius as far as heel.

Case 47.—*Popliteal aneurism, one year; gradual compression, four days; rupture of sac; ligature; gangrene; amputation; cure.*[1]

William Lawrence, æt. 36, tailor, in bad health. On admission, under Mr. Jolley, tumour occupied whole of popliteal space; compression for four days. Dark spot appeared on tumour, and leg very œdematous; sac burst. Ten days after admission (five days after leaving off pressure), lost one pint of blood. Hæmorrhage on following day; much exhaustion; ligature of femoral on fourth day from first bursting; amputation declined; six days after, gangrene set in, and, on following day, amputation. Recovery.

Examination of limb.—Twice natural size, livid, gangrenous.

Case 48.—*Ruptured aneurism; rapid enlargement; burst into knee; amputation; recovery.*[2]

John Flood, æt. 50, admitted into Richmond Hospital, Dublin, under Mr. Adams. A man of colour, born at Vincenty, has spent his life much at sea. The greater part of the time of his last voyage he was unable to get out of his berth, in consequence of his having a swelling in his right ham. It appeared about four months ago, but became painful and large two weeks back. He was admitted into the hospital a few hours after the ship's arrival.

The popliteal tumour felt remarkably tense, and was tender to the touch, and shining, and upon a superficial examination no pulsation could be felt in the tumour; but when firm pressure was made for some moments by the fingers, these last had a movement and impulse communicated to them corresponding to the patient's pulse; when the stethoscope was applied with some pressure on the swelling, a distinct, but rather muffled, *bruit de soufflet* was audible. When the femoral artery was compressed, all pulsation and *soufflet* ceased, the shining tension of the skin lost, and the popliteal swelling flaccid and soft. There was no pulsation to be felt at any time in any of the arteries of the limb below the popliteal. The leg and foot, as well as the knee, were œdematous. The knee-joint was greatly enlarged. He complained of severe pain in the posterior part of the tumour, and extending thence down the limb.

Compression endeavoured to be attempted, but could not be borne. On the third day the tumour seemed more tense and hot, and two ecchymosed patches appeared on the inner aspect of the tumour.

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[1] 'Monthly Journal of Medical Science,' 1847, vol. vii, p. 903.

[2] 'Medical Times,' vol. xix, p 268.

Amputation on third day, performed under chloroform. Recovery.

Examination of limb.—Some blood effused under the integument, and derived from an opening about size of shilling on the inner side of the aneurismal sac. The sac was nine inches long and five broad, and had ranged along its posterior and central part, the internal popliteal nerve, and the external popliteal also. Here also were the popliteal artery and vein. The aneurism had sprung from the front of the vessel, and the communicating aperture was an inch and a half long. The aneurism had burst through the posterior ligament into the knee-joint, which latter was full of congealed blood and serum.

Case 49.—*Ruptured sac; compression could not be borne; amputation; recovery.*[1]

W. B—, admitted into Royal Berkshire Hospital, under Mr. Bulley. Stated that, eleven months previously, after carrying a heavy sack of wheat up some steps, he experienced a tingling sensation in front of right knee, and noticed a small swelling in ham; these symptoms disappeared in a few days. Nine months after this he again noticed the swelling, and that it throbbed, accompanied with pricking sensations up the thigh. From this time it gradually increased, reaching size of pigeon's egg. On the morning of his admission he was engaged in hoeing turnips; he felt something give way in the ham, and experienced rushing sensation down the leg and up the thigh in the course of the femoral artery. The limb became disabled, and the leg and foot numb and œdematous. The popliteal swelling rapidly increased in size.

Pressure was attempted, and could not be carried out.

Amputation performed. Recovery.

Examination of limb.—Large quantity of extravasated blood under gastrocnemius and in popliteal space. Longitudinal rent in small aneurism, connected with popliteal artery.

Case 50.—*Aneurism, cured by compression in forty hours; rupture of artery above sac twenty-one days after; severe local and constitutional symptoms; amputation deferred to twenty-third day; recovery.*[2]

Soldier, æt. 25, admitted into the Military Hospital, Dublin, under the care of Dr. Clayton. A popliteal aneurism, of the size of an orange, only noticed for two weeks, was cured in forty hours by compression. About twenty days afterwards, the tumour was reduced from the size of an orange to that of an egg; it was very hard and indolent, without pulsation. The knee became flexible, and all affection disappeared. On the following day the artery burst suddenly above the tumour; a vast effusion, of a diffused character, immediately took place. The countenance became desponding, the patient irritable and anxious. The whole ham was distended, there was forcible pulsation, and the tumour larger than ever, and there was no assignable cause. The measurement of the right knee was fifteen inches and a half, that of healthy knee thirteen inches. There was increase of the local and constitutional symptoms, which was rapid; acute inflammation of the knee-joint ensued, as

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[1] 'Association Medical Journal,' vol. i.

[2] See Tuffnell 'On Aneurism,' p. 125.

also œdema of the leg; the integuments assumed a crimson blush, attended with great pain down the leg, rigors, &c. Amputation was performed on the twenty-third day after the accident, and recovery took place.

On examining the limb, the muscles of the calf were dissected by the blood; the tibia and femur exposed, but there was no communication with the joint; there was a solid aneurismal sac, of the size of a pullet's egg, consisting of a mass of fibrine, situated at junction of middle with lower third of vessel; the ruptured artery was just above it. The limb was eight inches in circumference, the leg œdematous, and the lesion consisted of a large, diffused aneurism, occupying the whole of the space; the rupture occurred on the anterior surface of the artery, under the gastrocnemius and hamstring muscles, at the bend of the joint.

Case 51.—*Ruptured aneurism; compression of femoral; favorable for sixteen days, when increase of tumour and threatening gangrene; left hospital suddenly, and returned intoxicated on second day; amputation; result not stated.*[1]

Coal-porter, æt. 28, admitted into Meath Hospital, under Mr. Smily. Two years previously he received a hurt in the knee, and six weeks before admission got a blow of a stick on the ham. To the latter injury he paid no attention, but continued his usual employment, and with this limb dug out a large ship-load of coals. He followed his business, and at the same time continued his irregular course of life, drinking large quantities of whisky, sometimes as many as twenty glasses in a day. He was first seen at his lodgings, in a state of intoxication, and next morning sent to the hospital. So reckless was he and regardless of injury, that he did not apply for any assistance till two days before admission, and the ham was then swollen to a great size, and the entire popliteal region filled up, and he stated that it had been so nearly from the time that he got the blow.

On admission, February 18th, the leg was in a very morbid state, the veins turgid, the limb livid, and the patient in a very bad condition for any treatment. He was kept quiet, and evaporating lotion applied for seven days. March 3d, the compression of femoral attempted. On third day tumour was much diminished and impulse lessened, but patient suffered much pain. He went on favorably for the following sixteen days, till March 19th, when he complained of severe pain during the night, and on the next morning the tumour was found more diffused and the limb swollen and congested. He now suffered intensely, and on 22d of March vesication formed on ankle and leg; gangrene feared. On 24th he suddenly left the hospital, but returned on 26th in state of intoxication. The limb, strange to say, was not in a worse condition than at first, the stimulant having conduced to favour the circulation.

The tumour went on increasing, and on April 5th the blood came quite near the skin, which was discoloured and corrugated, and tightly stretched over the blood. The tibia was pushed forward, and there was effusion into the joint; the skin covering the tumour was thin, and threatened to break; and so distended and red were the veins, that gangrene was momentarily expected. Patient's sufferings very acute, so much so that he became delirious.

Amputation performed.

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[1] 'Dublin Hospital Gazette,' 1856.

Examination of limb.—Although considerable effusion into knee-joint, it consisted of synovial fluid only. The original sac size of hen's egg. Sac had given way posteriorly.

Case 52.—*Aneurism; compression not able to be borne; ligature of femoral refused; bursting of sac; threatening gangrene; amputation; recovery.*[1]

James W—, æt. 36, joiner, weak and delicate, predisposed to phthisis. Admitted into the Liverpool Workhouse, under Mr. Leather, with popliteal aneurism of eleven months' duration. It was of size of goose's egg. His health was very much impaired, and there was a good deal of constitutional disturbance. Compression attempted, and could not be borne. Ligature of the femoral was ultimately refused. After several days, there occurred a sudden increase both of pain and swelling, the latter becoming diffused. The pain became most agonizing about the knee and leg. Œdema of leg and foot supervened; diminished sensation; reduction of temperature, manifesting disposition to gangrene.

Amputation performed. Recovery.

Examination of limb.—Immense quantity of effused blood under the integuments and in whole of popliteal space. Coats of aneurism found very thin and in some parts quite transparent. The upper portions of the posterior tibial and peroneal arteries were greatly dilated and sacculated, and lower down atheromatous deposit was detected.

Case 53.—*Ruptured aneurism; compression for one week, with benefit; rupture of sac; increase and severity of local symptoms; threatening gangrene; amputation; death from pyæmia.*[2]

Labouring man, æt. 65, admitted into Meath Hospital, under Dr. Collis; looked much older; hair perfectly white; addicted to intemperance. About three months previous to admission, whilst going down stairs, his foot slipped, and he felt something give way in the back part of his leg. He recovered from the effects, and continued his work until three weeks ago, when tumour in ham enlarged in bulk, and painful.

On admission, there was a popliteal aneurism filling lower half of popliteal space. After the lapse of a week, pressure was commenced. Mechanical pressure by various apparatus, and by carefully adjusted weights, was tried, and even digital compression was attentively and patiently persevered in for upwards of a week. The effect of this at first seemed to cause a coagulum to be formed in sac. The pulsation in the sac became decidedly less distinct; and on its outer side (after the lapse of five days' continuous pressure) a distinctly pulsating vessel was discovered, presenting all the indicative characters of a collateral arterial channel. But now the man complained of severe pains in the limb, while the tumour had become more firm and solid to the touch. The limb also became greatly engorged, and the foot œdematous; vesication began to appear on the dorsum of foot, not of a gangrenous cha-

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[1] 'Med. Times and Gazette,' vol. xxxviii, p. 139.

[2] 'Dub. Hosp. Gaz.,' 1859.

racter. These symptoms gradually increased—viz., solidity of tumour, engorgement of limb, and lessening of pulsation—continuing for a week, when at last the limb became enormously engorged, the skin presenting a mottled appearance, whilst the foot had become swollen out of shape, and the integuments distended almost to bursting with effused serum. Amputation performed. Death on twenty-ninth day. Symptoms of pyæmia.

Examination of limb.—Large quantity of extravasated blood effused under the gastrocnemius and soleus, extending to the ankle-joint; enormous deposits of black clots of recently effused blood, and a mass of coagula in various stages of fibrinous organization.

Original aneurismal sac of size of goose's egg, and seated below joint. The rupture of the artery had taken place at a point about one inch from its bifurcation, and had its seat on the anterior aspect of the vessel. The main artery ran along the outer side of the tumour; it was this which gave the sensation of a large vessel, apparently developed in this situation. Interior of aneurismal sac found lined with lymph, so highly organized as to be with difficulty separable or distinguishable from proper inner coat of artery. It was only in some places, where this coating of lymph was less dense, that it could be detached, and its adventitious character detected.

The sac had given way at first on its upper surface, and had become diffused, the blood escaping into the areolar tissue of the popliteal space. The blood had there dissected its way slowly under the muscles down the limb.

With reference to the above case, Dr. Carte and Mr. Tuffnell remark that the cases in which the rent occurs on the anterior surface of the vessel are never successfully treated, either by ligature or by pressure.

Mr. Tuffnell also observes that all cases in which the *anterior* wall gives way, the tumour has its seat more on the *inner* side of the limb.

Case 54.—*Diffused aneurism of left ham, communicating with knee-joint; compression of femoral; then digital compression, ninety-four hours; amputation; death.*[1]

Louis Pauger, cultivator, æt. 32; accustomed to drink much cider, coffee, and brandy; vigorous constitution; excellent health. For six weeks felt a swelling in left ham, but continued work for a month, when limb swelled and became painful; it increased rapidly, and he came to Paris, and was admitted into the Clinical Hospital, under M. Nelaton.

An aneurism occupied left popliteal space, soft and fluctuating, of size of fist, pulsating; *bruit de soufflet* only heard at upper and inner part. Left leg œdematous from toes to knee. Limb in semi-flexion, and could not be extended. Large effusion into synovial membrane of knee, fluctuating, but no pulsation whatever. Posterior tibials feebly pulsating.

Another aneurism occupied right ham, size of egg; indolent. This was left alone.

[1] Broca, 'Anévrismes et de leur Traitement,' p. 766, Case 45.

Compression for seventeen days; difficult to accomplish, in consequence of bend of knee. Opium during whole time.

Tumour had become a little firmer, and evidently some clots had formed. Digital compression was now made, and kept up constantly and effectually for ninety-four hours; it was well supported for first day, but on following night he had intense pains in whole limb, lasting three hours; these occurred again on the second night, so as to cause him to cry out for pain, and had a short access of delirium. The œdematous enlargement of the leg made notable progress, and in order to modify it a bandage was applied from toe to knee.

At end of the digital compression (ninety-four hours) the tumour was entirely deprived of pulsation, solid, knotty, less projecting behind, but much larger at its upper part; at the side of the knee pulsation very manifest. No *bruit de soufflet*.

Was now left at rest for five days; had passing pain in leg, lasting only half an hour. The pulsation diminished daily, but the tumour did not lessen.

On the ninth night after leaving off digital compression very violent pain in calf, and in morning, intense fever; acute pain; slough of size of five-franc piece over popliteal tumour. Leg, considerable tension and œdema.

Amputation performed. Death on sixth day, with symptoms of purulent infection.

Examination of limb.—Aneurism much larger than supposed, entirely filling and distending popliteal space. Blood-extravasations in sheath of semi-membranosus and under fascia down calf; mass of effusion between artery and joint. Sac at inferior and posterior part of artery capable of containing a nut; ruptured in front, thus forming a fresh tumour of blood, lying between artery and knee-joint; there was a fusiform dilatation of lateral part of popliteal artery. Knee-joint full of blood and red clots, communicating by three small, rounded openings through posterior ligament. Bone not exposed.

Popliteal vein completely obliterated.

Case 55.—*Ruptured aneurism on left side; amputation; recovery. Right aneurism, after exertion, increased in size; ligature on artery in Hunter's canal; recovery.*[1]

William Spencer, æt. 32, admitted under the care of Mr. Joseph Harris, of Whitehaven Hospital; corporal in Cumberland Militia; tall, muscular.

He had a firm, inelastic swelling, extending from middle of left thigh down to the toes, and attended with most excruciating pain. He gave the following account of his case:—Fifteen months ago he wore, for two months together, a pair of tight leathern breeches, which made his legs swell and become so painful that he was obliged to leave them off. About one month after this, after walking ten miles on a very hot day, he felt uneasiness in hams of both legs; in the course of the night observed a swelling in each ham, that of left pulsating. This left one gradually increased until it had diffused itself, and attained present condition. The right aneurism is of the size of a nutmeg.

The left leg was amputated. Recovery.

Examination of limb.—Eleven pounds and a half of coagulated blood diffused among muscles. Aneurismal sac in ham had burst.

Three months after amputation right aneurism began to swell and increase in size,

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[1] 'Transactions of a Society for the Improvement of Medicaland Chirurgical Knowledge.'

and one day, after violent exertion upon crutches, he had considerable pain in it, with increase, so as to stretch both hamstrings; there was also diffused swelling over knee-joint.

Hunter's operation performed. Ligature came away on eleventh day. Recovery.

Case 56.[1]

A middle-aged man was received into St. Bartholomew's Hospital, under Mr. Lawrence, with a large tumour filling up the whole ham, and extending on both sides of the femur towards the front of the limb. It had begun behind; had existed for five months; had grown latterly with great rapidity, and manifestly increased during a few days, for which we had the opportunity of observing it in the hospital. It had a firm, fleshy feel, being a little softer at one of its anterior protuberances than in other parts. It gave him great pain, though it was not tender on being handled; it had caused considerable œdema of the leg and foot, and had rendered the limb completely useless. The surgeons of the hospital in consultation on this case, viewing it as a large and rapidly increasing fleshy tumour, determined that amputation of the limb was the only remedy that could be proposed. This I performed high up, having first plunged an abscess-lancet into the softest part of the tumour, to the whole depth of the blade, without giving issue to any fluid.

The examination of the amputated limb disclosed to us the very unexpected circumstance that this tumour was a popliteal aneurism, containing an immense mass of firm, bloody coagulum, not of that light-brown laminated kind which lines old aneurismal sacs, nor of the loose and soft texture that belongs to recently clotted blood.

The coats of the popliteal artery, and a continuation of them, such as aneurisms ordinarily exhibit, formed the back part of the sac; while the front and sides were made up of the thigh-bone, the back of the knee-joint, and the neighbouring muscles. The fleshy and tendinous fibres of the vasti were exposed on clearing out the coagulum, which not only covered the back part of the femur, but had also advanced on each side towards the front, so as nearly to have insulated the bone. The periosteum was removed at several points (the popliteal vein was obliterated).

When the patient was more closely questioned, after this examination of the limb, he stated that the swelling had continued of moderate size until five weeks previous to admission into the hospital, when it suddenly enlarged, and that it had increased considerably from that time. The pulsation, which the tumour no doubt had possessed at an early period, had altogether escaped his notice.

Remarks by Mr. Lawrence.—I conclude that the case had been originally a popliteal aneurism of the usual kind; that the sac had given way in front, so as to convert it from a circumscribed into a diffused aneurism, and thus to present to us the deceptive appearance of an immense sarcomatous tumour. Since this case has happened, I have heard of two or three other somewhat similar cases.

The very large quantity of the coagulum, and the state of the thigh-bone, may create a doubt whether tying the femoral

[1] 'Med.-Chir. Trans.,' vol. viii, p. 497.

artery would have been a successful method of treating this case. However, had I suspected the nature of the affection, I should certainly have made the trial; and should have undertaken it with a confident expectation of success, grounded on experience of the efficacy and extent of those natural processes by which such effusions are absorbed, and such cavities obliterated. I have stated this case to put others on their guard, and shall be happy if what I have said should in any instance prevent so serious a mutilation as that which my patient suffered.

Case 57.—*Ruptured aneurism; difficult diagnosis; exploration; amputation; death.*[1]

Insane Portuguese, æt. 40, admitted into London Hospital, under Mr. Luke, with supposed popliteal aneurism of an urgent nature. There was a large tumour, circumscribed at its upper part, extending from the middle of the inside of the right thigh to the inner part of the knee-joint. The skin covering the swelling was discoloured, and there was a deceptive feeling of fluctuation; but no pulsation was perceived, either by the touch or by means of the stethoscope. Compression with the hands did not in the least reduce the volume of the swelling. The whole limb below the disease was extensively œdematous; consequently the anterior and posterior tibials could not be felt. No information of the history of the case could be elicited from the man, or from those who first brought him to the hospital, except that the swelling first commenced about two months back. Mr. Luke explored the tumour with a grooved needle, and a small quantity of dark-coloured blood escaped. On the following day a consultation was held, and after further exploration, amputation was performed. Did well for first week; sloughs formed on back, and health began to give way. Death in one month.

Examination of limb.—Tumour consists of a large cyst, formed by muscles and surrounding soft structures, condensed, containing a large mass of dark coagulated blood under muscles and in cellular tissue of popliteal region, at bottom of which and low in space, opening in artery as large as calibre of vessel itself, surrounded by remains of a sac with an irregular margin.

Case 58.—*Ruptured aneurism; rapid gangrene; amputation; recovery.*[2]

A healthy sailor, æt. 30, admitted into the Bristol Infirmary. Had experienced a little pain in his right ham for some days, when he noticed there a pulsating tumour, the size of a walnut. On the fourth day from this, he felt something burst in it, during an ordinary fit of sneezing, and his leg immediately swelled and became painful. The swelling and pain increased, and in two or three days gangrene commenced in the instep and foot, and quickly spread upwards, accompanied with

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[1] 'Med. Gaz.,' vol. vii, p. 446.

[2] 'Medico-Chir. Review,' vol. xi, p. 513.

severe constitutional irritation. Amputation was performed on the seventh day from the bursting of the aneurism; the case did well.

On examining the limb, an aneurismal sac was discovered, capable of containing four or five ounces of blood, originating from the middle of the popliteal artery posteriorly, about one inch of which opened into it. It was imperfectly formed behind, and presented there two openings, each readily admitting a couple of fingers; through these the contents had escaped. An abundance of blood was extravasated between the muscles and beneath the integuments in all directions. The sac elsewhere was firm and strong, and lined with thick and dense laminæ of fibrine. The popliteal vein was filled by a firm coagulum for the space of two inches, quite obstructing it.

Case 59.—*Ruptured aneurism; no tumour or pulsation, but general enlargement of limb; difficult diagnosis; exploration; amputation.*[1]

A cattle-drover, æt. 32, admitted into the Bristol Infirmary with the left lower extremity twice the size of the other, the swelling reaching to the lower third of thigh; the foot and surface of the leg œdematous, with distinct fluctuation as of matter underneath; considerable pain, but not much tenderness in different parts of the leg; general health greatly impaired; restless nights; hectic and other symptoms of constitutional irritation. He had been for many years in the habit of walking great distances, and had travelled upwards of 100 miles in two days, very shortly before he was taken ill. The disease commenced two months before admission with considerable pain in the calf of the leg, which shortly confined him to bed, and was followed by œdematous swelling about the ankle. The pain and the swelling increased, and his health became disturbed with their advance.

He was not sensible of any sudden bursting, neither at any time was he conscious of the existence of a distinct tumour or pulsation. It was determined to explore the most fluctuating part, and an opening accordingly was made about the middle of the calf, but nothing escaped. By introducing the finger, an abundance of soft coagulum could be felt, occupying a large cavity within. Amputation was now immediately performed. The man afterwards was in a fair way to recovery.

On examining the limb, an aneurismal sac, large enough to hold twelve or fourteen ounces of blood, arose from the posterior part of the middle of the popliteal artery, about two inches of which communicated with it. Anteriorly and laterally it was distinct and strong, but very defective posteriorly, where numerous breaches existed, through which its contents could find a ready issue. The sac, such as it was, contained a quantity of old coagulum, but not much laminated fibrine. The popliteal vein was pervious throughout. An immense quantity of extravasated blood was found in various parts of the leg, particularly between the muscles; and here and there a little circumscribed purulent effusion.

Case 60.—*Ruptured aneurism; difficult diagnosis; exploration by lancet; slight secondary hæmorrhage; amputation; exhaustion; death.*[2]

John Morgan, æt. 32, seaman, admitted on board the "Grampus" Hospital-

[1] 'Medico-Chir. Review,' vol. xi, p. 513.

[2] Ibid., vol. xiv, p. 438.

ship, on Sept. 28th, 1830; his appearance emaciated and exsanguine; his countenance sallow and anxious. He complained of pain in the situation of a tumour, about fourteen inches in circumference, occupying the lower third and inner side of the *right* thigh, presenting its greatest bulk in that situation, and gradually decreasing forwards to the ham and the outer side of the thigh. The circumference of the tumour had a defined, bordered margin; the summit was tense, elastic, and gave to the touch an evident sense of fluctuation; the integuments retained their natural colour; the leg was somewhat œdematous, and remained flexed, without the power of extension. The patient denied that any morbid appearance or uneasiness had existed in the part previous to seven weeks since, when, without any assignable cause, the whole leg and foot became swelled and tense, and ultimately settled into the present tumour. Upon the most careful examination no pulsation could be detected in the enlarged surface, except to a slight degree in that position which lay immediately over the popliteal artery. Pressure upon the femoral artery produced no diminution in the bulk of the tumour, nor could any sound be detected upon application of the stethoscope. The patient had no recollection of any pulsating tumour having ever appeared in the ham.

He had had some severe rigors, and evidently suffered much constitutionally. Under these doubtful circumstances, the limb was placed on a pillow, resting on its outer side, and evaporating lotions applied.

On the following day, the tumour being in no way diminished, but rather more tense, it was determined to explore; a lancet was introduced into its substance, to the depth of an inch, and in a valvular direction, but with no other result than the escape of a few drops of dark blood. The wound was closed by adhesive plaister, and the limb left alone.

On the next day, at noon, the patient having moved the limb roughly, and placed it over the side of his bed, about an ounce of fluid blood, unattended by arterial jet, passed from the aperture made in the tumour the day previous, and was easily checked by slight pressure with lint.

The two following days were passed without any change in the appearance of the tumour, with the exception of a slight apparent extension towards the upper part of the thigh. A probe, introduced into the lancet-orifice in the tumour, passed its entire length in every direction without resistance, and without hæmorrhage.

On the sixth day, the swelling had extended considerably up the thigh, occupying its lower half, was much more tense at its original seat, and gave a more evident sense of fluctuation immediately above the patella. Amputation of the thigh was now had recourse to. After some vicissitudes of rallying and exhaustion, he sank the next day at 11 p.m.

Upon examining the limb, between two and three pints of dark blood, partly coagulated and partly fluid, were found occupying the lower half of the thigh, nearly insulating the lower third of the shaft of the femur, which to the extent of four inches was denuded of periosteum, and presented a honeycombed appearance. The chief volume of effused blood occupied the situation of the muscles, and in many parts was in contact with the integument, chiefly so immediately above the patella. A fine aneurismal sac, about the size of a pullet's egg, was found on the anterior surface of the popliteal artery; the sac, at its upper third and anterior surface, was rent to the extent of two inches in a transverse direction. Immediately above the torn sac, and externally, appearing to form a portion of it, was a second dilatation of the artery, forming a sac the size of a small walnut, lined with a thick

layer of coagulum, and communicating with the larger and torn sac by an opening in size not exceeding the third of the natural calibre of the femoral artery. The cellular tissue of the leg and foot was loaded with serum.

Case 61.—*Ruptured aneurism; amputation at first refused, and consented to seven days after; secondary hæmorrhage; death.*[1]

E. K—, æt. 34, of delicate appearance, under the care of Mr. Tegart, of Dublin. He had been a rough rider in a Lancer regiment, and latterly in the police-force. He presented himself with a popliteal aneurism in the left limb. Had symptoms of organic disease of heart and whole arterial system. On the eleventh day after admission, the patient felt something burst in his ham, after which he suffered great pain. The aneurism had become diffused, and nothing now remained but amputation, to which he refused to submit.

He continued to suffer much pain for a few days, and on the seventh day after the first attack he was found in great agony, a second rush of blood having taken place.

The calf and entire back of the leg was enlarged, tense, and swollen almost to bursting; it was hard and shining, presenting, in many parts, a dark and mottled appearance; the heat of the limb was diminished, and no pulsation could be felt in the anterior tibial artery; pulse jerking and rapid; great action of heart, and much anxiety of countenance. He now implored to have the limb amputated, which was performed. Secondary hæmorrhage occurred, and was uncontrollable. He died in forty-eight hours.

Examination of limb.—Extensive extravasation of blood down to tendo Achillis; large masses of coagula under gastrocnemius; slit in sac, one inch long, by which artery communicated in sac; small round aperture at bottom of sac, where it bursted.

See drawing B. c. 220, Houston; 'Catalogue of Museum, Royal College of Surgeons, Ireland,' vol. ii, p. 123; showing an extensive extravasation of blood among the muscles of the leg, the result of bursting of a small aneurism of the popliteal artery.

Case 62.—*Ruptured aneurism; difficult diagnosis; exploration; amputation; recovery.*[2]

S. L—, æt. 37, agricultural labourer, admitted under Mr. Mackmurdo into St. Thomas's Hospital. Has been generally healthy. About twelve months since he received a blow on fore part of knee, causing pain, but this gradually subsided; and, on one occasion whilst walking, he suddenly felt something give way in the ham, and his knee became at once stiff and painful. Eight months after this he observed a swelling, about size of orange, in ham; no pulsation at first, but afterwards very evident; tumour increased rapidly, and pulsation ceased. A lancet had been introduced, and a small teacupful of blood escaped; wound closed.

On admission, there was enormous swelling of ham and inner part of knee,

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[1] Porter on 'Aneurism,' p. 88.

[2] 'Lancet,' Sept., 1846.

slightly elastic; integuments a little discoloured; surface smooth; foot and ankle œdematous; no bruit to be heard; femoral artery apparently healthy.

Exploration made, and dark-coloured blood escaped; diagnosis doubtful as to its being fungus hæmatodes or aneurism.

On following day a sudden increase took place in swelling, integuments having a bluish appearance, very thin and tense, and very hot; oozing from punctures; circumference of limb above knee, two feet; no pulsation or sound; pain of most acute character. Suffered so much, requested to have limb amputated; performed one week after admission. Recovered health slowly; aneurisms in other parts of body.

On examining leg, swelling chiefly composed of imperfect, irregularly-formed coagulum; femoral artery from above could be traced into an aneurismal sac of size of pigeon's egg, and seated close to the perforation of triceps; artery nearly impervious. The sac at anterior and lower part imperfect, but aperture did not appear to be of recent origin. Distal end of artery three inches below sac.

Case 63.—*Aneurism punctured by lancet; extravasation rapid; sudden hæmorrhage through wound on third day; amputation; secondary hæmorrhage; recovery.*[1]

James O'Brien, æt. 36, a delicate leucophlegmatic-looking man, of independent circumstances. Has been of intemperate habits, but for last six years been a strict teetotaller. Admitted into Limerick Infirmary, under Dr. Wilkinson, with a popliteal aneurism (right), of size and form of goose-egg, of six months' duration, and entirely filling up the space. It was more prominent on its upper and outer side, where an opening had been made with a lancet, three days previously, by a country practitioner; which operation, he says, was followed by slight bleeding, a bandage being applied. He was advised to come into the infirmary.

The surface of the tumour is of a purplish-reddish colour, without any pulsation; and on examination with the stethoscope, we could not detect any *soufflet;* under moderate pressure it is quite compressible, but on its removal it rapidly resumes its original form and bulk. Complains of some pain in the ham and leg, which is slightly swollen; the foot is œdematous, and of a mottled-white colour; the entire limb is flexed on the pelvis, the femoral artery acting most violently; pulse, 100 in a minute.

While consulting about his case in an adjoining ward, we were hastily summoned by the nurse, who said he was bleeding to death. On reaching his bedside we found him quite faint, with a large jet of blood coming *per saltum*, in a full stream, through the external wound. It was restrained by pressure with the finger on the external opening, and a tourniquet was applied. We conceived that amputation of the limb was the only safe course to adopt, but which view was opposed by a medical gentleman present, who advocated the tying of the femoral artery in Scarpa's space, which we dissented from on two grounds. In the first place, we contended that the femoral artery was in all likelihood so diseased, that the obliteration of its canal could not take place, and secondary hæmorrhage would follow, either at the part where the ligature was applied, or where the sac had been opened; it being in fact now circumstanced like to a wounded vessel, in which a ligature is of little use, unless applied at the bleeding points; and that, were we to follow his advice of tying it at a distance, the collateral circulation would in a short time be restored, and hæmorrhage from the sac through the opening would be the result. Our second reason

[1] 'Dublin Journal,' New Series, vol. iii, p. 519.

was, the dread of mortification ensuing before the collateral circulation had sufficient time to become fully established; but this was looked upon as minor in point of magnitude to the former, from the length of time which the aneurism took to form, consequently allowing the collateral circulation to be more or less established.

The limb was removed by amputation, and only had three vessels to secure. Secondary hæmorrhage on the following day; stump laid open; cold and compression applied, but with no success. Two moderately-sized vessels secured. Made a slow recovery.

On examining the limb, and on cutting into the sac, we found it filled with fibrine, deposited in laminæ, and as firm as muscular fibre. The opening which communicated with the sac was situated in the articular surface of the popliteal artery, but a little towards its outward margin.

Case 64.—*Aneurism cured by compression, twenty-five days after rupture; bursting through skin; gangrene; arrested below knee; amputation; death.*[1]

Michael B—, æt. 36. Strong, healthy Irishman; a plasterer's labourer. Admitted into Liverpool Royal Infirmary, under Mr. Stubbs, with popliteal aneurism of three weeks' standing; of size of orange. Compression employed, and successful at end of twenty-seven days. Left the hospital, and continued quite well. About twenty-five days after this, while in bed, he found his knee had become suddenly enlarged and painful, which continued in this state for six days, when hæmorrhage to a considerable extent took place from the ham. He was re-admitted into the hospital on the third day. Face and body generally emaciated; aspect ghastly; pulse rapid; voice feeble. Much enlargement of knee; integuments firm and stretched, and livid; foot and lower part of leg cold and gangrenous; thigh œdematous. By administration of stimulants he rallied, and in the course of a few days he improved, and gangrene arrested a few inches below knee.

Amputation was performed on fifteenth day; did not rally, and died six days after operation.

Examination of limb.—Parts in ham disorganized; unable to discover whether coats of original aneurism had given way, or whether the rupture had taken place elsewhere.

Case 65.—*Aneurism; compression of femoral for one week, with arrest of pulsation; sudden rupture; rapid gangrene; amputation; secondary hæmorrhage; death.*[2]

London Hospital, under Mr. Luke, a man, æt. 38, under care on account of a popliteal aneurism, from which he had suffered for eight months. The tumour was of considerable size, but did not quite fill the whole space. It extended upwards and outwards. He was in good health, and seemed a favorable subject for compression treatment.

Pressure was commenced and kept up without material inconvenience for a month, at the end of which time pulsation had all but ceased. At this juncture the tumour suddenly increased in size; the leg became œdematous, and shortly afterwards lividity of the foot was apparent. Mortification of the foot setting in, it was decided to amputate.

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[1] 'Med. Times,' vol. xxxi, p. 89.

[2] 'Med. Times and Gazette,' January, 1856.

The operation was performed (through the thigh) on the third day from the commencement of the gangrene. Death, from secondary hæmorrhage, followed about two weeks after operation.

Examination of limb, after removal, showed that the sac had given way at one point where it was very thin; the tumour was filled by laminated coagula, and the channel of the artery through it was very small.

Case 66.—*Aneurismal dilatation of posterior tibial vein; rupture thereof; slow extravasation; exploration; hæmorrhage; amputation; recovery.*[1]

George M—, æt. 28, a tide-waiter, admitted into Guy's Hospital under Mr. Cock. About eleven years ago he received a stab with a knife in the popliteal space; and two weeks after, in consequence of secondary hæmorrhage, the femoral artery was tied. The ligature came away on twelfth day, and patient recovered. He regained the full use of his leg, and never experienced the slightest inconvenience; neither has he ever been aware of the existence at any time of any tumour or swelling. He, however, was the subject of varicose veins two years after the operation. After recovering from an attack of fever, and about five weeks ago, when endeavouring for the first time to walk about, he discovered that his leg was stiff, painful, and swollen, which gradually increased.

On admission, there was general enlargement and œdema from the knee down to the toes. The cellular effusion was greatest about the instep and ankle. The principal enlargement was at the back of the leg, where the calf was bulged out into a prominence extending from the knee to rather more than half-way down, tense and tender. Deep-seated fluctuation was very distinct, and it was evident that a large collection of fluid existed under the gastrocnemius muscle. He had been the subject, during the last few weeks, of occasional rigors, with exacerbations of pain and fever; and there was every reason to suppose that a large collection of pus had formed between the superficial and deep-seated muscles.

The femoral artery could be felt pulsating along the upper part of the thigh. The anterior and posterior tibial arteries could be felt to beat vigorously, after displacing the subjacent œdema by pressure; not the slightest sense of pulsation, not the faintest sound or murmur, could be detected in the tumour of the calf; it was totally uninfluenced by arresting the flow of blood through the artery at the groin.

An incision was made into the cavity near the upper and inner part of the leg; a flow of blood followed the withdrawal of the lancet, until between two and three ounces had been spontaneously discharged; the blood was dark, grumous, and pitchy in its character, did not coagulate, and had evidently been extravasated for a considerable period. Its evacuation sensibly diminished the tension of the swelling, and the pain was relieved.

On the following day, a copious discharge of pus took place, and in a few minutes nearly a pint had flowed away. This was followed by a marked improvement in the symptoms, both locally and generally, for the next ten days. The pus continued to be discharged, and the patient had begun to rally in health and strength. The leg returned to its natural size and shape.

Fifteen days after the puncture had been made, when the state of the patient

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[1] 'Med.-Chir. Trans.,' vol. xxxiv, p. 328. This case hardly belongs to the series, but it bears upon the subject of ruptured aneurisms in the popliteal space.

promised a speedy convalescence, arterial hæmorrhage suddenly took place from the wound; and before competent assistance could be afforded, he had lost nearly three pints of blood. The entire cavity of the original abscess was tense, and distended to more than its original size, whilst its walls had evidently given way, and blood was gradually effusing itself upwards through the popliteal space into the thigh. The entire leg had a swollen, shiny, and livid appearance.

Amputation, a short distance above the knee, was immediately performed. Recovery.

On examining the limb, the gastrocnemius was expanded and very thin, as also the soleus, which was exceedingly stretched and distended; beneath these was a large diffused collection of blood, extending half-way down the leg; a large aneurismal sac, formed by a dilatation of the posterior tibial vein, was discovered, and this had given way by an ulcerated opening at the upper part, near the entrance of the vessel.

Remarks by Mr. Cock.—"Three methods of treatment suggested themselves. The first was to place a ligature on the upper part of the femoral or external iliac artery; the second was to lay open the cavity of the leg, evacuate its contents, search for the vessel which afforded the hæmorrhage, and if possible, secure it; the third was to amputate above the knee. We came to the conclusion that a ligature on the upper femoral or iliac artery would probably throw us on to the horns of a dilemma; that, from the free collateral circulation resulting from the former operation, it might at best afford but a temporary check to the bleeding; whilst, on the other hand, if the supply of blood to the leg became materially diminished in its then present state, gangrene would follow as a most inevitable result. This proposition was, therefore, abandoned. The second shared the same fate, as we considered that the operation of laying open the cavity and searching for the vessel was, as regarded the collapsed state of the patient, too severe in its character, and, considering our ignorance of the source of hæmorrhage, too uncertain in its results to be attempted. Our last resource was amputation, and the leg was removed a short distance above the knee."

CASE 67.—*Ruptured aneurism of the popliteal artery; gangrene; amputation; secondary hæmorrhage; ligature of femoral; recurrent hæmorrhage; re-amputation; death.*[1]

A coal-porter, æt. 50, admitted into King's College Hospital, under Mr. Fergusson.

[1] 'Pathological Transactions,' vol. ix, p. 122.

While carrying a sack of coals up the ladder of a waggon, his right foot slipped and he fell, twisting his knee upon the lower rail. When seen, eight hours after the injury, the knee and ham were very intensely swollen, and discoloured by ecchymosis, and very painful to the touch. He complained of much pain in the limb, and a feeling of numbness extending down to the toes. Pulsation was not very apparent in the swelling at this time; but on questioning the patient a day or two afterwards, he stated, that twenty years ago he experienced a similar injury to the same knee, and that ever since it had been weaker than the other; and he thought that a swelling had remained behind the knee up to the present time, but had not grown larger, nor caused him much annoyance of late. About this, however, he was not very clear or decided.

It gradually became evident, by the increase of the swelling, the more decided pulsations throughout the tumour, especially towards the inner side, and by the absence of pulsation in the tibial arteries, that the popliteal artery had given way, either from the previous existence of an aneurism, or from ossification of its coats. The numbness of the toes and pain in the leg increased, gangrenous discoloration followed, and upon the toes and heel patches of vesication and the more decided evidences of sphacelus were apparent. These gradually extended over the whole foot. On the fourth day, sensation was lost up to the middle of the leg; and at the site of the injury, and over the calf, several dark-coloured vesications had formed, and assumed a decidedly sphacelated appearance. The leg, at and below the knee, was much swollen and œdematous. No line of demarcation becoming apparent, and the patient's health beginning to give way, it was deemed advisable to perform amputation above the injured point. He was attacked with violent delirium five days after the operation, which was combated by stimulants and support. On the twenty-first day secondary hæmorrhage ensued, which could only be arrested by ligature on the superficial femoral artery. Seven days after, bleeding recurred, and re-amputation was performed higher up; but he died exhausted ninety-six days after first amputation.

On *examination of limb*, as detailed in 'Pathological Transactions,' the specimen shows an aneurism of the popliteal artery at the point of departure of the several branches. It is of an elongated shape, and of the size of a large pear, inclining to the inner side of the popliteal space, with the internal popliteal nerve stretched across it. The walls are remarkably thin, especially at the lower end of the tumour, under the bifurfaction of the gastrocnemius muscle. At this point the walls of the sac had given away, by the formation of a ragged, irregular opening about an inch long. A few delicate layers of fibrine lined the interior of the sac at its upper part; the rest was filled by a loose coagulum. The effused blood had made its way down the leg between the gastrocnemius and soleus muscles, and had thence escaped into the subcutaneous textures on the back of the leg, giving rise to much gangrenous ecchymosis, which was very apparent on the surface, and raised the cuticle into large vesications. Under the tendon of the semi-membranosus muscle, the blood had passed into the bursa which is found there, and evidently communicated with the synovial cavity of the knee-joint at the inner condyle.

CASE 68.—*Double aneurism; left treated by compression for nearly six months, when ligature of femoral artery is*

process of cure; right aneurism treated by ligature of femoral; sac gave way at end of second week; gangrene; death.[1]

Arthur J—, æt. 36, strong, healthy, admitted into King's College Hospital under Mr. Bowman with double popliteal aneurism.

Left large in size, soft and fluid; of two months' duration; no cause. Pressure on femoral, badly borne, but steadily persevered with; it was commenced in November, continued through December, January, February, and March, when diminution in size, and more solid feel. In April kneading of aneurism; but a few days after this, ligature of femoral. Wound healed. Still feeble pulsation in aneurism.

May 5th, patient drew up left leg so as to bend knee; immediately jet of blood through small opening. Re-application of ligature on femoral at site of former operation, free suppuration followed.

Right only noticed on admission. Right femoral tied on May 2d; on 10th, extreme tenderness on pressure in ham and over leg. An intensely painful swelling appeared towards lower end of tibia. The superficial veins over calf purplish and very distinct. On May 16th, suddenly awoke in great trepidation and anxiety, and on following day seized with acute pain in calf and ham. The leg and feet slightly œdematous; integuments dusky. On 21st gangrene set in. Death on following day.

Examination of left: Opening in sac one and three quarters inch oblong; blocked up by fibrine. Femoral well plugged at site of operation.

Examination of right: Femoral well plugged at site of operation. Aneurismal sac had burst—surrounding parts in a very gangrenous state.

Case 69.—*Aneurism undergoing compression of femoral; sudden giving way of sac; ligature of femoral; recovery.*[2]

J. W—, æt. 37, a stonecutter, of spare make, but well proportioned, habitually healthy.

On 17th March, 1848, he was admitted into the hospital under Mr. J. W. Wright, surgeon-major, Grenadier Guards, for popliteal aneurism (left), of the form and size of an orange; he was only aware of the swelling five days previously, and had only then had pain and swelling in the knee.

Four days after admission, compression of femoral resorted to. Favourable progression until eighth day of compression, when patient suddenly seized with acute pain in knee, followed by a quick tumefaction of parts. On examination the popliteal tumour appeared unchanged, but an additional tumour was found on the inner side of the joint, circumscribed, flattened, and pulsating in a slight degree; it was about the size of twice that of the palm of the hand, with considerable prominence.

The femoral artery was tied, under chloroform. Ligature separated on twenty-sixth day. Recovery.

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[1] 'British Med. Journal,' 1857.

[2] 'Med.-Chir. Trans.,' vol. xxxii, p. 167.

Summary of Cases of

No.	Name.	Age.	Occupation, habits, &c.	Duration of aneurism previous to rupture.	Cause of rupture.	Interval between rupture and operation.
28	Richard D—	32	Blacksmith	Five months	Slipped and fell on ground, and bruised ham	—
29	Ann F—	40	—	Five months	Whilst hobbling into room, fell forwards	Experiment
30	Harriet L—	23	Dressmaker good health	Four months	Spontaneous? unknown	—
31	Peter B—	22	Formerly soldier	Two years	Not stated; spontaneous?	Three weeks
32	J. B—	38	Blacksmith; intemperate, pale, sallow	Six months	—	—
33	Man	25	Temperate; formerly in army in Crimea	Eleven weeks, aneurism in process of cure by compression	Rupture of artery above sac	—
34	Thomas B—	32	Soldier; muscular, intemperate	Twelve months	—	Eight days
35	—	46	Navigator; well nourished, fine man	Six weeks	None	—
36	John H—	30	—	Six weeks ? Two years	None	One day
37	James B—	38	Formerly soldier; strong, healthy	Fifteen years	Leg bruised between two cows, and much subsequent exertion.	Two to three months
38	Chinese	56	Cake-maker	Two months	—	
39	Jeremiah T—	35	Labourer in coal trade	Five weeks	None; gradual	Several days

Ruptured Popliteal Aneurism.

Operation, &c., performed.	Effects, and secondary operation.	Result.	Surgeon.	Hospital, &c.
Operation refused	Bursting of tumour externally; hæmorrhage	Recovery	Reported by W. Wilson	Westminster Hospital.
Exploration on sixth day; operation refused	Suppuration; sudden profuse hæmorrhage	Death twenty-four days after admission	Dr. Hobart	Cork Infirmary
Intermittent compression for 134 hours during twenty days	Tumour became solid, and she left hospital on eleventh week; on second day again ruptured and recovery by pressure	Recovery	Hargrave	City of Dublin Hospital.
Compression carefully employed	—	Recovery	Dr. Jacob	Queen's County Infirmary.
Compression	Curative attempts; attacks of erysipelas; tumour burst, but no hæmorrhage; exhaustion	Death	Hutton	Newcastle.
Aneurism undergoing compression; indefinite symptoms	Sudden hæmorrhage from bursting through skin	Death; artery ruptured above sac	Dr. Murray	Belfast Infirmary.
Compression for six days, ineffectual ligature of femoral	Ligature did not come away for five months	Recovery protracted	Dr. Mitchell	Plymouth Military Hospital.
Forcible flexure of knee for thirteen days, failure; ligature of femoral	Ligature came away on twenty-first day	Recovery	Moore	Middlesex Hospital
Femoral tied	Gangrene rapid	Death on twelfth day	Key	Guy's Hospital.
Ligature of femoral, also popliteal aneurism in the other, and tied and did well.	—	Recovery	Collis	Meath Hospital.
Operation proposed and refused; bursting thereof externally on third day; ligature of femoral	Gangrene on fourth day; great exhaustion	Death on fifth day	Hobson	Canton Hospital.
Ligature of femoral	Ligature came away on seventeenth day	Recovery	Quain	University College Hospital.

No.	Name.	Age.	Occupation, habits, &c.	Duration of aneurism previous to rupture.	Cause of rupture.	Interval between rupture and operation.
40	Male	36	—	Seven weeks; compression for four weeks	None; sudden	Immediate
41	B. W—, male	34	Strong, healthy	Eleven weeks	—	—
42	Male	25	Farm labourer	Three months	Lancet wound	One day
43	Male	—	—	—	—	—
44	James F—	30	Sailor; good health	Eight weeks	—	Eight weeks
45	G. B—	30	Stonemason	Three months	—	Seven days
46	Mr. Lucas	43	Organ-builder; gouty	Five years	Gradual, successive	Seven days
47	William L—	36	Tailor	One year	Compression for four days; sac burst externally, five days after leaving off pressure	Fourth day
48	John F—	50	Seaman; man of colour	Four months	Unknown	Seventeen days
49	William B—	—	—	Eleven months	Engaged in hoeing turnips	—
50	Soldier	25	Irritable; anxious	Two weeks; cured in forty-eight hours by compression	Sudden	Thirty-three days
51	Coal porter	28	Very intemperate	Probably two years	Blow on sac	Six weeks
52	James W—	36	Joiner; weak and phthisical	Eleven months	—	—
53	Labourer	65	Intemperate	Three months	—	Four weeks

Operation, &c., performed.	Effects and secondary operation.	Result.	Surgeon.	Hospital.
Ligature of femoral	—	Recovery	Birkett	Guy's Hospital.
Compression ineffectual; ligature of femoral	Gangrene; amputation	Recovery	Norgate	Norwich Hospital.
Ligature of femoral	Gangrene; amputation twelve days after ligature	Death	Callaway	Guy's Hospital.
Ligature of femoral after exploration of tumour by lancet	Hæmorrhage from wound; amputation	Recovery	Chirurgus	Plymouth.
Ligature of femoral	Erysipelas, bursting of sac, and suppuration; amputation one month after	Death	Allan	Royal Infirmary, Edinburgh.
Exploration by incision; ligature of femoral	Hæmorrhage; amputation	Recovery	Sir A. Carlisle	Westminster Hospital.
Ligature of femoral	Gangrene fifth day; amputation	Recovery	Sam. Cooper	University College Hospital.
Ligature of femoral	Gangrene sixth day after; amputation seventh day	Recovery	Jolley	—
Compression could not be borne; amputation	—	Recovery	Adams	Richmond Hospital, Dublin.
Compression attempted, could not be carried out; amputation	—	Recovery	Bulley	Royal Berkshire Hospital.
Amputation	—	Recovery	Dr. Clayton	Military Infirmary, Dublin.
Compression favorable for sixteen days; suddenly left hospital; gangrene feared	Re-admitted in two days, and amputation on sixth day	Not stated	Smily	Meath Hospital.
Compression ineffectual; ligature of femoral refused	Gangrene; amputation	Recovery	Leather	Liverpool Workhouse.
Compression ineffectual for five days continuously	Amputation	Death in twenty-nine days; pyæmia	Collis	Meath Hospital.

No.	Name.	Age.	Occupation, habits, &c.	Duration of aneurism previous to rupture.	Cause of rupture.	Interval between rupture and operation.
54	Louis P—	32	Cultivator; accustomed to drink	Six weeks	—	—
55	William S—	32	Corporal; tall, muscular	Fifteen months; diffused in right, circumscribed in left	—	—
56	Man	Middle aged	—	Five months	Not known	Five weeks
57	Portuguese	40	Insane	Two months probably	do.	—
58	Sailor	30	Healthy	Noticed only a few days	Fit of sneezing	Seventh day
59	Cattle drover	32	Impaired health; irritability	Two months	Gradual; successive	—
60	John M—	32	Seaman; sallow, emaciated	No recollection	No cause	Eight weeks
61	E. K—	34	Cavalry soldier	Unknown	—	Twelve days
62	S. Z—	37	Agricultural labourer	Twelve months	Introduction of lancet	One day
63	James O'B—	36	Delicate	Six months	Opening by lancet	Three days
64	Michael B—	36	Strong, healthy; labourer	Three weeks; compression twenty-seven days; cure, twenty-five days after his rupture	—	Fifteen days
65	Man	38	In good health	Eight months	Unknown	Three days
66	George M—	28	Tide-waiter	Wound of popliteal artery; ligature of femoral; recovery; eleven years	Gradual; successive	Seven weeks
67	Man	50	Coal porter	Uncertain; ? twenty years	Fell, twisting knee on rail of ladder	Eight days

Operation, &c., performed.	Effects and secondary operation.	Result.	Surgeon.	Hospital.
Compression seventeen days, and digital compression for ninety-four hours after	Amputation	Death on sixth day; pyæmia	Nelaton, quoted by Broca	Clinical Hospital, Paris.
Left, amputation; right, ligature of femoral three months after former	—	Recovery	Harris	Whitehaven Hospital.
Incision and immediate amputation	—	Recovery probable	Lawrence	St. Bartholomew's Hospital.
Exploration; amputation	—	Death in four weeks	Luke	London Hospital.
Amputation	—	Recovery	—	Bristol Infirmary.
Exploration by incision; amputation	—	Recovery	—	do.
Amputation	—	Death	Bennett	Hospital Ship "Grampus."
At first refused any operation; amputation	—	Death	Tegart	Dublin.
Exploration by incision; amputation one week after	—	Recovery	M'Murdo	St. Thomas's Hospital.
Amputation	—	Recovery	Wilkinson	Limerick.
—	Gangrene; amputation	Death on sixth day	Stubbs	Liverpool Infirmary.
—	Gangrene; amputation	Death in two weeks	Luke	London Hospital.
Amputation	—	Recovery	Cock	Guy's Hospital.
Gangrene; amputation	Violent delirium; secondary hæmorrhage on twenty-first day; ligature of femoral; recurrent hæmorrhage; reamputation	Death, ninety-six days after first amputation	Fergusson	King's College.

No.	Name.	Age.	Occupation, habits, &c.	Duration of aneurism previous to rupture.	Cause of rupture.	Interval between rupture and operation.
68	Arthur G—	36	Strong, healthy	Double aneurism. *Left*—two months pressure ineffectual; ligature of femoral; secondary hæmorrhage; re-application of ligature; cure. *Right*—not known; ligature of femoral	—	Eighth day
69	J. M—	37	Shoemaker; spare habit, healthy	Only noticed six days; compression for eight days; ineffectual	Sudden	—

We have already too far encroached upon the limits of the present reports, and we must reluctantly bring to an abrupt close a communication which we would have wished to have extended to a more definite and final conclusion.

But the material brought forward may, we trust, be of sufficient weight to lead to further investigation, and to enable others to prosecute the inquiry, so as to lead to a more correct or accurate means of determining the proper and appropriate method of treatment to be adopted in similar cases. We shall, however, conclude by offering a general summary of the treatment and results of ruptured popliteal artery and aneurismal sac in the 70 cases alluded to in this report.

The most important point for inquiry is, as to whether in these cases we should attempt to save the limb; now, in 16 cases out of 70, viz., 22·82 per cent., recovery with a sound limb took place; hence there are fair grounds and reasons for this line of treatment when thought justifiable, but much discretion must be employed; the amount and rapidity of the extravasation must be taken into consideration, and its influence on the circulation in the limb below, as shown by loss of temperature, loss of sensation, the presence of œdema, and the absence of all pulsation; the age, habits, and constitution of the patient, must also necessarily engross our attention.

Operation, &c., performed.	Effects and secondary operation.	Result.	Surgeon.	Hospital.
—	Gangrene	Death	Bowman	King's College.
Ligature of femoral	Ligature separated on twenty-sixth day	Recovery	Wright	—

In 32 cases where amputation was not performed, 16 recovered; 16 died. In 38 cases in which amputation was performed, 21 recovered; 15 died; and in 2 the result not stated. Thus, of 68 cases there were 37 total recoveries, 54·41 per cent; and 31 total deaths, 45·58 per cent.

The following subdivisions fully expose the treatment and results:

Cases in which no operation was performed: 6 cases; 2 recovery, and 4 deaths.

Case 6. Complete rupture; gangrene; spontaneous amputation below knee. Recovery.
„ 9. Complete rupture; sudden hæmorrhage on sixteeenth day. Death.
„ 21A. Partial rupture; secondary hæmorrhage. Death.
„ 24. Partial rupture; secondary hæmorrhage and gangrene. Death.
„ 28. Ruptured aneurismal sac; bursting of tumour externally; hæmorrhage. Recovery.
„ 29. Ruptured aneurismal sac; exploration; suppuration; sudden profuse hæmorrhage. Death.

Cases in which compression was employed: for more elaborate details see page 353.

Case 30. Compression intermittent for 134 hours, during twenty days. Recovery.
„ 31. Compression carefully employed for nineteen days. Recovery.
„ 32. Compression for two months; erysipelas; extravasation, &c. Death.

Case 33. Compression being used with success; when artery gave way above sac, &c. Death.

Cases in which popliteal space was laid open by incision, and ligature placed above and below rupture.

Case 2. Complete rupture; immediate operation; gangrene; amputation. Death.
„ 16. Partial rupture; operation performed on eighth day; gangrene thirty-six hours after. Death in six days.
„ 17. Partial rupture; operation performed in sixth week; ligatures came away on nineteenth day. Recovery.
„ 18. Partial rupture; operation performed at several days; suppuration. Recovery.
„ 19. Partial rupture; operation attempted nine months after, and failed; amputation. Recovery.
„ 20. Partial rupture; operation performed; hæmorrhage; ligature had slipped off; amputation. Death.

Cases in which ligature of the femoral artery was employed: 27 cases.

Case 1.	Complete rupture;	ligature in a few hours;	rapid gangrene.	Death.
„ 7.	Complete rupture;	ligature in a few hours;	gangrene; amputation.	Death.
„ 10.	Partial rupture;	ligature at 5 weeks;	gangrene.	Death.
„ 11.	ditto	ditto	3 weeks; ditto.	Death.
„ 12.	ditto	ditto	6 weeks; ditto.	Death.
„ 23.	ditto	ditto	30 hours; ditto.	Death.
„ 25.	ditto	ditto	8 days; ditto.	Death.
„ 13.	ditto	ditto	3 weeks; fever, diarrhœa, &c.	Recovery.
„ 14.	ditto	ditto	8 weeks; gangrene of foot.	Recovery.
„ 15.	ditto	ditto	3 weeks.	Recovery.
„ 22.	ditto	ditto	5 days.	Recovery.
„ 34.	Ruptured sac;	ditto	8 days.	Recovery.
„ 35.	ditto	ditto		Recovery.
„ 36.	ditto	ditto	1 day; gangrene, rapid.	Death.
„ 37.	ditto	ditto	2 or 3 months.	Recovery.
„ 38.	ditto	ditto	gangrene.	Death.
„ 39.	ditto	ditto	several days.	Recovery.
„ 40.	ditto	ditto	1 day.	Recovery.
„ 68.	ditto	ditto	gangrene.	Death.
„ 69.	ditto	ditto	1 day.	Recovery.
„ 41.	ditto	ditto	gangrene; amputation.	Recovery.
„ 42.	ditto	ditto	1 day; ditto ditto.	Recovery.
„ 43.	ditto	ditto	hæmorrhage; ditto.	Recovery.
„ 44.	ditto	ditto	8 weeks; inflammation and suppuration; amputation.	Death.

Case 45. Ruptured sac; ligature at 7 days; hæmorrhage; amputation. Recovery.
„ 46. ditto ditto 7 days; gangrene; ditto. Recovery.
„ 47. ditto ditto 4 days; ditto ditto. Recovery.

Of these, sixteen recovered; but in six, amputation was had recourse to; eleven died—nine, after gangrene; and two, after amputation.

Cases of amputation: 38, in 70 total cases; being 54·28 per cent.

I. *Primary amputation:* 12 cases; 7 recoveries, and 5 deaths. Recoveries being 57·89 per cent.

Case 3. Complete rupture; immediate amputation. Death.
„ 4. Complete rupture; immediate amputation. Death.
„ 20. Partial rupture; ligature of ruptured vessel without checking hæmorrhage; immediate amputation. Death.
„ 19. Partial rupture; attempts to ligature ruptured vessel; failure; immediate amputation. Recovery.
„ 49. Ruptured sac; compression employed, and could not be borne; amputation. Recovery.
„ 55. Ruptured sac; no previous treatment; amputation. Recovery.
„ 56. Ruptured sac; no previous treatment; amputation. Recovery.
„ 57. Ruptured sac; exploration with lancet; amputation. Death.
„ 59. Ruptured sac; exploration with lancet; amputation. Recovery.
„ 60. Ruptured sac; exploration with lancet; hæmorrhage on following day; amputation. Death.
„ 62. Ruptured sac; exploration with lancet; sudden increase on following day; amputation. Recovery.
„ 63. Ruptured sac; exploration with lancet; alarming hæmorrhage on third day; amputation. Recovery.

II. *Secondary amputation:* 26 cases; 14 recoveries, 10 deaths, 2 not stated. Recoveries, 53·84 per cent.

Case 2. Complete rupture; ligature of femoral; spreading gangrene; amputation on fifth day. Death.
„ 5. Complete rupture; gangrene; attempts at separation; amputation at seven weeks. Recovery.
„ 7. Complete rupture; ligature of femoral; gangrene; amputation at seven weeks. Death.
„ 8. Complete rupture; gangrene; amputation on fifteenth day. Recovery.
„ 26. Partial rupture; secondary hæmorrhage; infiltration; amputation. Recovery.
„ 27. Partial rupture; secondary hæmorrhage; amputation at about ten weeks. Recovery.
„ 21B. Partial rupture; slow progress; amputation at three months. Not stated.
„ 48. Ruptured sac; compression employed; threatening gangrene; amputation. Recovery.

Case 52. Ruptured sac; compression; ligature of femoral; threatening gangrene; amputation. Recovery.

„ 53. Ruptured sac; compression; threatening gangrene; amputation. Death.

„ 54. Ruptured sac; compression; threatening gangrene; amputation. Death.

„ 61. Ruptured sac; no previous treatment; threatening gangrene; amputation. Death.

„ 51. Ruptured sac; compression; threatening gangrene; amputation. Not stated.

„ 41. Ruptured sac; compression; ligature of femoral; spreading gangrene; amputation. Recovery.

„ 42. Ruptured sac; exploration; ligature of femoral; spreading gangrene; amputation. Death.

„ 46. Ruptured sac; ligature of femoral; spreading gangrene; amputation. Recovery.

„ 47. Ruptured sac; compression; ligature of femoral; spreading gangrene; amputation. Recovery.

„ 58. Ruptured sac; no previous treatment; spreading gangrene; amputation. Recovery.

„ 65. Ruptured sac; no previous treatment; spreading gangrene; amputation. Death.

„ 67. Ruptured sac; no previous treatment; spreading gangrene; amputation. Death.

„ 64. Ruptured sac; gangrene arrested and line of demarcation; amputation. Death.

„ 43. Ruptured sac; exploration; ligature of femoral; hæmorrhage; amputation. Recovery.

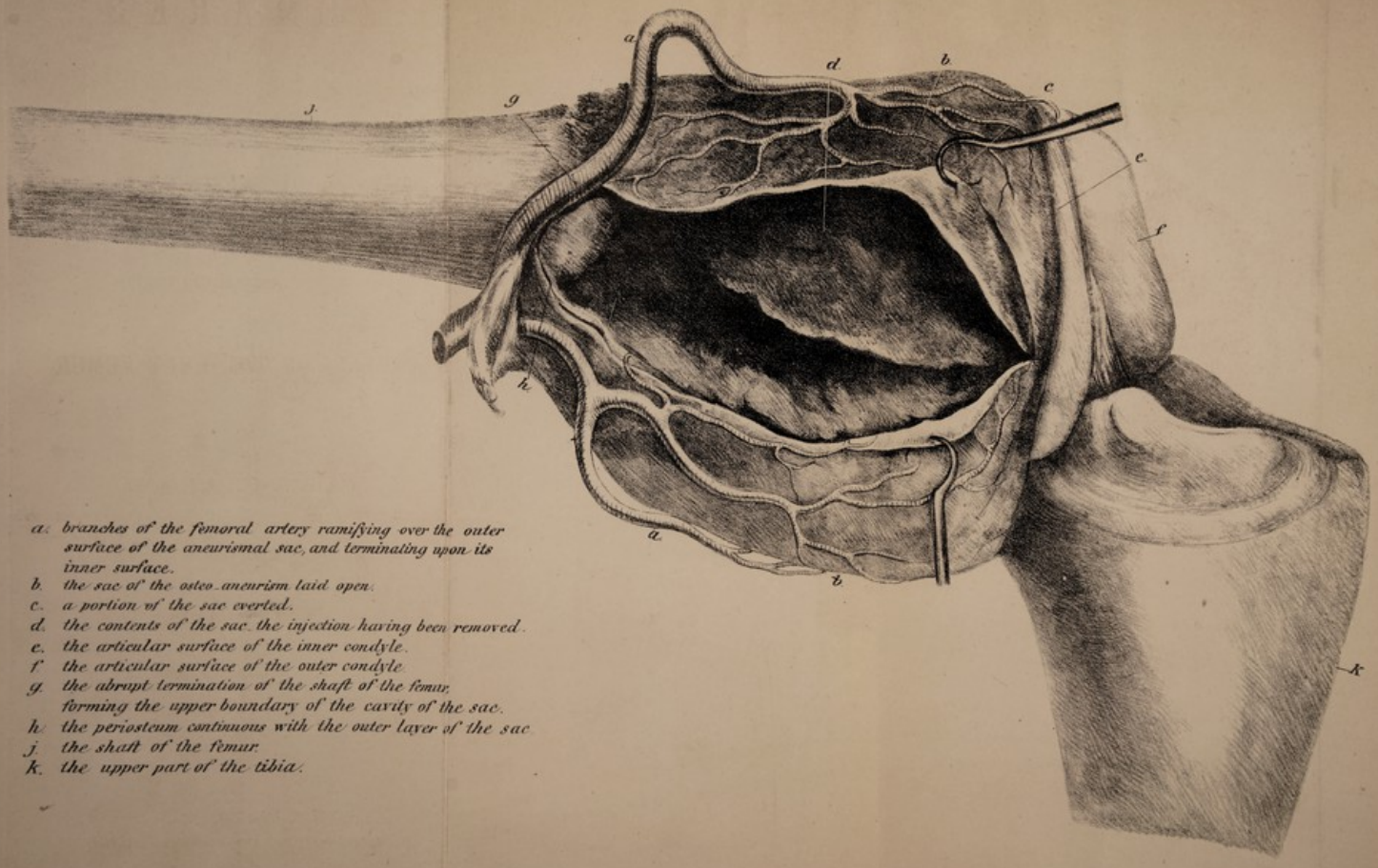
„ 45. Ruptured sac; exploration; ligature of femoral; hæmorrhage; amputation. Recovery.

„ 66. Ruptured sac; exploration by incision; suppuration; hæmorrhage on fifteenth day; amputation. Recovery.

„ 50. Ruptured sac; compression; inflammation; suppuration; knee implicated; amputation. Recovery.

„ 44. Ruptured sac; ligature of femoral; inflammation; suppuration; knee implicated. Death.

Dr CARNOCHAN'S CASE OF OSTEO ANEURISM.



a. branches of the femoral artery ramifying over the outer surface of the aneurismal sac, and terminating upon its inner surface.
b. the sac of the osteo-aneurism laid open.
c. a portion of the sac everted.
d. the contents of the sac, the injection having been removed.
e. the articular surface of the inner condyle.
f. the articular surface of the outer condyle.
g. the abrupt termination of the shaft of the femur, forming the upper boundary of the cavity of the sac.
h. the periosteum continuous with the outer layer of the sac.
j. the shaft of the femur.
K. the upper part of the tibia.