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Paget, James, Sir, 1814-1899.  
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**Publication/Creation**

[London] : [publisher not identified], [1850]

**Persistent URL**

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AN ACCOUNT OF A CASE  
OF  
ANEURISMAL DILATATION OF THE  
POPLITEAL ARTERY,

TREATED WITH PRESSURE.

By JAMES PAGET, Esq.

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*Read on Thursday, December 6, 1850.*

APRIL 1850.—B. C., a gentleman who had been educated as a surgeon, 27 years old, very tall and thin, had enjoyed good health till October, 1845, when some heavy deals fell upon him. They knocked him down and fell across his legs; and he remained about a minute under them, before, with the exertion of great force, he could extricate himself. He was laid up for a week, and then resumed his usual occupation; but he had pain about his knees and legs, and especially in the left knee, and in the muscles of the calf of his left leg, whenever he walked; after over-exertion the pain became so severe that he could hardly stand. He treated these pains as rheumatism; but, about three years after the accident, he found the veins of the left leg becoming varicose: the pain still continuing as it had been in the knee and calf. For this state of the veins he applied bandages to the limb, with some diminution of pain in walking, but with no other advantage. It was just before Christmas, 1849, that he found a pulsating tumor in the ham, which felt somewhat larger than a walnut, and continued increasing till I first saw him, on the 9th of January, 1850.

I found in the left ham a tumor of oval form, having its long axis parallel with that of the limb, and measuring two and a half inches by two. It pulsated very forcibly, and equally on all parts of its circumference, and, with pulsation, felt as if it thrilled. A loud bellows sound was audible with the ear placed over the tumor, or over the artery above it. The pulse in the left dorsal artery of the foot was rather feebler than that in the right; but I could detect no difference in time be-

tween them. The skin over the swelling was tense; but its tissue, like that of all the adjacent parts, appeared completely healthy. There was, indeed, no other appearance of disease, either local or general.

The treatment of the case could not be commenced till the 31st of January, when first pressure was applied to the femoral artery, with two tourniquets made according to the description of Dr. Carte. These were placed on different portions of the length of the artery, and were alternately tightened and relaxed; but so much pain was produced, that the patient removed them after nine hours, and the plan was not resumed till the 2nd of February. From this day to the 10th of April, pressure was made on some part of the artery, and steadily maintained. During the whole seventy-five days, the blood only once flowed through the artery, the patient having fallen asleep, and the tourniquet having slipped and remained loose for four hours.

The pressure, as already stated, was made, in the first instance, with tourniquets constructed according to the plan of Dr. Carte, deriving their force from the tension of elastic caoutchouc bands. But although they were never tightened more than enough to stop, or reduce to a minimum, the pulsation in the tumor, yet they caused such pain, that after the fourth week, the patient would only use the Italian tourniquets. These, made with large pads to fit the outer and back part of the thigh, completely sufficed for the pressure, could be more easily applied, rested more securely, and produced less pain than the other instruments, however used.



The compressing pad was placed at different times over nearly every part of the length of the femoral artery. When one place grew tender, another was chosen; and, on an average, about two hours was the longest time during which the pressure could be borne. At the end of this time, the pressed tissues became extremely painful; only slight and short relief could be obtained by a little relaxation of the tourniquet; and it was very soon necessary to apply another, and take off all pressure from the painful place. The situation on which pressure could be longest endured was directly below Poupart's ligament; yet even here, pain was so constantly produced by continuing the pressure for more than two hours, that during the weeks he was under this treatment he assured me that he only once slept for more than two hours at a time. During the first month, indeed, he rarely slept for more than an hour, without being awakened by the pain of the pressure. He was thus considerably reduced in strength and flesh; but he suffered no other sign of illness. He remained always in bed, and lived with great moderation.

From the 2nd of February, when the pressure was commenced, to the 16th of the same month, the size of the aneurismal swelling gradually decreased. In this time it became about one-third less than it had been, and no other change was observed in it. After this time it retained its size for ten or twelve days: no progress was made, though the pressure and all the other particulars of the treatment were steadily pursued. Again, after this pause, the swelling diminished, gradually contracting for several days; and thus it decreased to about half the size it had presented when the treatment was begun. About the 10th of March the progress of improvement was again checked, we could not tell why, and for ten or fourteen days no change was discernible. At this time it was particularly noticed, that if the pressure in the femoral artery were slightly relaxed, so that the swelling might, for a few beats, pulsate freely, then, on again compressing the artery more firmly, the swelling would gradually, but considerably diminish, as if by contracting. This fact, together with the decreasing firmness and tension of the swelling, and other considerations to be presently mentioned, all tended to suggest that the swelling

was formed of only the dilated arterial walls, with little or no clot within them.

On the 21st of March, the diminution of the tumor again commenced, and this time continued, till, by the 18th of April, it was reduced to the size of a hazel nut, and felt as a dilatation of the artery, measuring about an inch in length and half an inch in diameter. It had still a full pulsation, and was still devoid of the firmness and solidity characteristic of a sac filled with laminated clot.

When now, after eleven weeks confinement, no further diminution of the swelling appeared, the patient, thoroughly tired of so long and tedious a treatment, wished to move about. The plan of applying pressure was therefore changed to the employment of the tourniquet during the night only; and, instead of it during the day, a large firm linen pad was placed over the dilated portion of the artery, and held with pressure on it by means of elastic straps round the knee. These sufficed to check any tendency to increase; and by the 21st of May, a slight improvement was perceptible; the swelling feeling rather smaller and pulsating less forcibly.

The same mode of pressure was continued for nearly six weeks, the elastic straps and pad being worn in the day, and the tourniquet at night, and the artery being, probably, almost always pervious: still no change whatever ensued in the aneurism.

The patient had regained his general health and strength; but in the last week of June he suffered with severe tooth-ache and inflammation of the gums, and with this he became so ill, that he was obliged to lie in bed. On the 28th of June, after wearing the tourniquet all night, he found, in the morning, that the swelling in the ham had ceased to pulsate. No pulsation either could be felt in the anterior and posterior tibial arteries. Till this time, no change had been observed for nearly two months; but the closure of the aneurism now appeared complete.

On the 1st of July, I could feel no pulse at the ham; and there was only a small tumor, very ill defined, and such as one might have overlooked. I was doubtful about any pulsation of the arteries of the leg or foot. The patient was better as to his general health than he had been for the previous week, but



was much reduced by his illness during this time.

On the 14th November, his father, a surgeon, wrote to me—"There is a tumor, about the size of a small nutmeg, where the aneurism was, but it does not pulsate. There is no pulsation in the femoral artery, from the middle of the thigh to below the tumor; but both the anterior and the posterior tibial arteries pulsate at the foot. The limb is not so strong as it was before the aneurism was found, and it is cold and numb till it is warmed by exercise. The only help it needs is warmth when not in use."

In commenting upon this case, one may notice, first, that the disease was, probably, an example of aneurismal dilatation, or, as Mr. Luke has named it, tubular aneurism; an aneurism of the cylindric or fusiform variety described by Cruveilhier,—that is, a dilatation affecting, almost uniformly, the whole circumference of the artery in a certain portion of its length. Such dilatations are, indeed, I believe, very rare in the popliteal artery;\* yet that such an one existed here is made very probable by many things observed in the case, and especially by the great diminution of size of the aneurism while under treatment.

The cure of popliteal and other similar aneurisms, whether treated by pressure or ligature, is usually accomplished much more by the filling of the sac with blood-clot, than by the contraction of the sac. Hence, usually, after the pulsation has ceased, the swelling, with comparatively little diminution of size, remains firm and nearly solid, till slowly its size is diminished by the absorption and shrinking of its contents. Thus, to mention but a few instances:—In a case of brachial aneurism, I found that the swelling, six months after ligature of the artery, retained two-thirds of its former size; in a popliteal aneurism, there was not more than this amount of diminution eighteen months after obliteration of the femoral artery by ligature;† in the first case of popliteal aneurism for which Mr. Hunter performed his operation, a tumor, as large as a hen's egg, remained fifteen months

after the application of the ligature;\* and in another of his cases the specimen in our museum† shows that even after fifty years the whole aneurismal swelling was not removed. So, too, in the case I have related, though the swelling diminished greatly under treatment, yet no perceptible diminution has taken place during the seven months that have followed the cessation of pulsation.‡

I believe these cases are only examples of a general rule,—namely, that popliteal aneurisms being usually lateral and saccular dilatations of only part of the circumference of the artery, the obstruction of the passage of blood through them leads to its coagulation in and within the sac, but is attended with very little coincident contraction of the sac. Wherefore, even after the pulsation has ceased, the greater part of the swelling remains, and, consisting principally of blood-clot, requires considerable time for its removal.

On the other hand, when, as I believe in the case here related, a popliteal aneurism consists in a dilatation of the whole circumference of the artery, we may believe that there is the same indisposition to the formation of clot as in the similar dilatations of the arch of the aorta, and of other great arteries in which no part of the dilatation is far remote from the main stream of blood. In all these cases it is matter of common and just observation, that fibrinous deposits are scanty and rare; and therefore, in the similar dilatations of the smaller arteries, we might expect that the effect of any continued obstruction of the trunk would be the gradual contraction of the dilated portion, rather than its filling up with clot.

Other considerations strengthen this opinion of the nature of the case here related; especially, first, that as the enlargement of the artery after the injury was very slow, there was probably no rupture or serious damage of its coats, but that such a change as might lead to their slow and extensive impairment of structure; and, 2ndly, that the sensation derived from the touch of the dilatation was always that of a sac tensely filled with fluid

\* Specimens may be seen in the Pathological Museum of the College of Surgeons, No. 1638; and in that of Saint Bartholomew's Hospital, Ser. 13, No. 53.

† Museum of Saint Bartholomew's Hospital, Series xiii. No. 114.

\* Museum of the College of Surgeons, No. 3472.

† Series xiii. F. 4.

‡ In six cases, recorded by Dr. Crisp (*Treatise on Diseases of the Blood-vessels*, p. 201), in which aneurisms were examined by dissection, at periods varying from four to eighteen years after cure by ligature, four still presented remains of the sac; in two no trace of it appeared.



and containing no clots such as are almost constantly found in saccular aneurisms,—*i. e.*, partial or lateral dilatations of the arterial walls.

The results of the treatment of this case, by pressure on the trunk of the artery above the aneurism, may next deserve comment. Considering that the patient was instructed in surgery, and well understood the plan on which the treatment was to be conducted, that he had himself chosen this plan of treatment, and submitted to it without interruption, and that it was attended with no local injury, or other inconvenience from pressure ill applied, few cases could be found in which the plan was more fairly employed. Yet eleven weeks of confinement to bed, of painful restraint, and of weariness from interrupted sleep, included an amount of suffering which I could not recommend any patient to undergo, in preference to the operation of ligature of the femoral artery.

In recording this case, however, it is far from my purpose to detract from the reputation which the application of pressure, for the cure of aneurism, has lately gained. The characters of the surgeons in Dublin, by whom chiefly this method has been promoted, are too eminent to allow me to doubt that its success is often admirable alike for safety and for speed. I am disposed to think that the slowness of recovery, in the case here related, may have been due to the peculiarity in the form of the aneurismal dilatation:

In all the instances of popliteal aneurism cured by pressure, to which I have been able to refer, it appears probable that the cure was effected mainly or solely by the coagulation of the blood in the sac. Here that event did not take place until after many weeks; and the recovery, accomplished mainly, and in the first instance, by the contraction of the dilated walls, could not be otherwise than slow. The postponement of coagulation in the dilated part of the artery may be, as already stated, most probably assigned to the uniformity of the dilatation; and in all such cases we might anticipate, from the rarity of clot-formation in tubular aneurisms of the aorta, that pressure, if employed, would need to be maintained for a long time, and that, even when the natural diameter of the artery is nearly regained, it would be apt to be again dilated, unless, at

last, obliteration by clots should occur. But, might not the same events follow the application of the ligature? May we not suspect that the instances in which, after apparent cure, popliteal aneurisms have reappeared, have been cases of aneurismal dilatation, or tubular aneurism, in which the temporary recovery has been accomplished by contraction of the sac, without coagulation of the blood? I think that these questions may deserve consideration, and the collection of more facts than can yet be produced in illustration of them. I think we may occasionally expect that some differences may be found in the results of the treatment of aneurisms, according to their form, and especially according to whether they be saccular or tubular,—*i. e.*, lateral or peripheral dilatations of the diseased portion of the artery. Differences of the results of treatment have, indeed, often been noticed; but, so far as I know, they have not been generally explained, or, in any measure, referred to the differences of the forms of aneurism.

The last fact in the history of this case to which I would direct attention, is the sudden and unexpected cessation of the pulsation in the sac, two months after the discontinuance of constant or effective pressure. I offer no explanation of the occurrence; but it has its parallel in one case recorded by Dr. Porter,\* and in another by Mr. Cusack.† In Dr. Porter's case, a physician had a popliteal aneurism for nine months. The swelling was soft and compressible, and pressure in the groin caused the pulsation to cease, and the sac to collapse and appear empty. Pressure was applied on the femoral artery for twenty days, and then the patient refused to submit to it longer. There was now a decided hardness in the seat of the disease; but the pulsation appeared to be nearly as great as before. Four weeks after the pressure was left off, the patient found that the pulsation had ceased, and the cure appeared complete six months afterwards. In Mr. Cusack's case, pulsation ceased in a brachial aneurism very soon after the patient left the hospital, in which pressure had been used, as it was supposed, without advantage.

\* Dublin Medical Quarterly Journal, May, 1846.

† Miller's Principles of Surgery, p. 586. Ed. 1850.