

It is only rarely that the nature of this affection is not at once apparent. The case in which any difficulty of diagnosis is met with is that of a saccular pouching of the saphena vein close to the saphenous opening. (See page 530.)

The signs of a *distended urinary bladder* are the same, whether acute or chronic, except that the pain and tenderness are much more marked in the former case. (See page 292.)

If the swelling be found occupying the right hypochondrium, reaching up under the ribs, rounded in outline, not adherent to the abdominal-wall, and if there be a history of gall-stones or of attacks of pain with jaundice, the diagnosis of a *dilated gall-bladder* may be made.

CHAPTER XVIII.

THE DIAGNOSIS OF PULSATING SWELLINGS.

THERE is no problem of greater importance to the surgeon than the correct diagnosis of a pulsating tumour; in most instances its solution is easy if only care be taken, but from time to time cases present themselves which test to the utmost diagnostic skill and knowledge, if indeed a diagnosis be possible at all. The point upon which it is necessary to insist, first of all, is the necessity of not relying upon any single symptom, but of making a careful and complete examination of the case, and of weighing all the signs. The tumours which pulsate may be thus enumerated:

Fusiform aneurism.
Sacculated aneurism.
Varicose aneurism.
Cirsoid aneurism.
Aneurismal varix.
"Pulsating tumour."
Encephalocele.

Tumours over arteries, including abscess, cyst, and solid tumours.
Ruptured artery or ruptured aneurism.
Tumours situated over aneurisms, especially abscess.

The most important point to be determined in every such case is whether there be an aneurism present or not; and then if an aneurism be present, whether the entire tumour be aneurismal. We will first refer to the examination that should be made, pointing out the bearing upon the diagnosis of each fact elicited, and then, putting these together, will mention the distinguishing features of each of the pulsating swellings.

1. **Notice the position** of the swelling; whether it corresponds to the known course of an artery of large or medium size, or whether far removed from such. Fusiform and sacculated aneurisms, and tumours with communicated pulsation are only found over arteries of some size. Cirsoid aneurism and "pulsating tumours" may occur in these situations, but also quite removed from main arteries, *e.g.* a pulsating swelling in the ham may be an aneurism, a "pulsating tumour," or a tumour with communicated pulsation; a similar swelling on the outer side of the lower end of the femur can only be a "pulsating tumour," or a cirsoid aneurism.

2. **Feel the pulsation** and determine (*a*) whether the tumour is filled out at each beat of the heart, and is expanded in all its diameters, or whether it is simply thrust forwards. For this purpose, place a finger of each hand on opposite sides of the swelling, and notice whether they are thrust apart by the impulse or are simply raised; or the same thing may sometimes be plainly demonstrated by fixing a piece of strapping with a slit in its middle over the swelling, when, if the impulse be expansile, the slit will open out with each beat of the heart. An *expansile impulse* is caused by the forcing of more blood into the swelling, and is therefore a sign common to aneurisms of all kinds, aneurismal varix and "pulsating tumours" which are so vascular that the change of tension of their numerous vessels affects

the entire mass. A non-expansile or a *heaving impulse* shows that it is communicated, and not intrinsic. Should an aneurism become shut off from the artery which remains pervious, its pulsation, which was formerly expansile, would become heaving.

(b) Notice whether the pulsation is felt as a wave passing through the swelling, or is simultaneous in every part; the former is characteristic of aneurism, the latter of "pulsating tumour;" too much reliance must not be placed upon this sign, and it is of positive rather than of negative value.

(c) Then examine to see *if the pulsation be uniform* throughout the whole swelling; this is usually the case in aneurism. If the pulse be only or mainly felt along the line of the artery, and not in the lateral expansions of the swelling, it indicates that the tumour is lying over the artery, and not communicating with it; while if the pulsation be felt in parts of the swelling only, but these parts do not correspond with the line of the artery, it would be strong evidence in favour of the swelling being a "pulsating tumour," as it often happens that only parts of these tumours present this sign.

(d) Lastly, notice whether the *pulsation can be abolished* in the swelling by any manipulation which does not interfere with the circulation in the main vessel, such as lateral or vertical movement of the swelling, or, if the swelling be in the abdomen, turning the patient on his hands and knees with the belly-wall lax, and allowing the tumour to fall away from the aorta. The pulsation in an aneurism or "pulsating tumour" is quite unaffected by the position of the part; that in a case of communicated pulse may be greatly altered by changes in its position which vary the pressure with which it rests upon the artery; and it may therefore be asserted that whenever, in any particular position of the parts, the tumour loses its

pulsation while the flow of blood through the artery, as shown by the pulse below, is not stopped, it is demonstrative proof that it is a case of communicated or extrinsic impulse only.

3. Compress the main artery of the limb above the swelling.—This will in every case stop the pulsation, and by itself tells us nothing. But now notice (a) whether the *swelling spontaneously collapses*; if so it plainly indicates a free communication between the artery and the swelling.

(b) Then compress the tumour, and notice if and to what extent it *yields to the pressure*. Compressibility (or reducibility) of a tumour shows that the tumour is partly fluid, and that it communicates with a vessel or some other cavity; such a tumour may be an aneurism, aneurismal varix, pulsating synovial cyst (if near a joint), or meningo-encephalocele (if in connection with the head); the amount of the tumour that is irreducible will form a guide to the amount of solid matter in the tumour, whether blood-clot or brain; if the tumour be entirely unyielding to pressure or wholly irreducible, it may still be an aneurism nearly or wholly solidified, or a "pulsating tumour," or a tumour with communicated pulsation not opening into a cavity.

(c) Then remove the compression from the artery, and notice how the *pulsation returns* in the swelling. If the tumour be again filled out in two or three strong bounding beats it indicates an escape of blood from the vessel into a partially empty cavity, such as an aneurismal sac. If, on the other hand, the pulsation at once returns as before, gently, without forcible bounds, and simultaneously over the whole swelling, it indicates that it is due solely to the movement of blood in the arteries, and that the pulsation is either communicated or that of a "pulsating tumour." It is to be remembered that in the cases of aneurism

which are not compressible pulsation may return at once with its usual force. Should the tumour be reduced by pressure but return to its normal size while the compression of the artery is still kept up, it shows that the swelling is not an aneurism; this may be observed in cases of reducible pulsating synovial cysts. Some cases of encephalocele have an impulse and are partially reducible within the cranial cavity, the pulsation becoming more marked as the reduction is accomplished.

4. **Compress the artery beyond the swelling**, and if an aneurism, its size and tension will be to some extent increased; a "pulsating tumour" will be unaffected by such pressure.

5. Examine carefully in all these cases to determine whether there is any **mobility of the swelling apart from the neighbouring artery**. Arteries admit of a limited amount of lateral movement, but of none in their length, and therefore having relaxed as far as possible all the fasciæ and muscles of the region, the surgeon should try whether the swelling under consideration is movable in the line of the artery. When this mobility is present it is very strong evidence of the pulsation being communicated; on the other hand, some swellings with communicated impulse are quite immovable, *e.g.* abscesses over arteries. "Pulsating tumours" are immovable because of their growth from bone. As examples of the great diagnostic value of this sign may be mentioned the rise and fall of a thyroid swelling during deglutition, which absolutely distinguishes it from a carotid aneurism, and the mobility of enlarged glands in the ham when the knee is flexed; some abdominal tumours may be moved from over an artery, and so lose their pulsation.

6. **Attempt to reduce by compression** the swelling without compression of the main artery above.

This manipulation, like all the others, must be carried out with great gentleness and care. If successful it shows that the reduced part of the swelling is not an aneurism, and also that it is fluid, and further, that it communicates with a cavity such as the cranium or a joint. By this sign, then, we can diagnose a synovial cyst communicating with the knee-joint and with communicated pulsation, from a popliteal aneurism, or an encephalocele from a "pulsating tumour" of the cranium. Part of a pulsating swelling may be thus reducible in the case of two tumours of different nature blended into one swelling.

7. Examine for a bruit and a thrill, feel the pulse beyond the swelling, and the outline of the swelling whether defined or not; examine the condition of the superficial arteries and the heart (*see* page 265), and enquire carefully into the history of the affection.

It is necessary to remind the surgeon that all manipulations of an aneurismal tumour should be conducted with the utmost gentleness and care, and that when once the diagnosis of an aneurism has been made no further manipulations of the part are justifiable; it is not intended that all the above procedures are to be gone through in every case of pulsating swelling. The surgeon has to answer the question, Is the swelling an aneurism? and it is only when that question cannot be at once answered in the affirmative that such varied and prolonged manipulations are necessary to clear up the diagnosis.

It may be well to state here that an *aneurism may lose its pulsation* (a) from solidification of its contents, (b) from occlusion of the mouth of the sac by coagulum, (c) by compression of the artery above by the sac, (d) or by its rupture and diffusion, which may take place slowly, the blood clotting in the tissues, or rapidly and even suddenly, the blood infiltrating the tissues far and wide.

We will now briefly describe the diagnostic signs of the individual pulsating swellings.

1. If, in a person with signs of general arterial degeneration, an elongated pulsating swelling be found in the position of one of the large arteries, which tapers at each end into the artery, and the pulsation in which diminishes towards each end and has only a slight lateral extent, it is a *fusiform aneurism*.

2. An irregular compressible swelling, obviously formed of tortuous and sacculated tubes, with marked expansile pulsation, and loud systolic bruit, is a *cirroid aneurism*. This affection is most common in the scalp and the hands, though it may occur in deeper situations, as the orbit and iliac fossa. Sometimes congenital, it is more common before than after thirty years of age. As it grows it extends superficially, and does not exhibit a tendency to form a globular tumour. The skin covering the swelling is hotter than the surrounding skin; it may be thickened, but is often thinned, inflamed or ulcerated. The arteries leading to the swelling are often found dilated and tortuous.

3. If the vein or veins of a part be found greatly dilated, with expansile pulsation, well-marked thrill, and a loud rasping or hissing continuous murmur, increased in intensity at each cardiac systole, this murmur being conducted along the veins for some distance, it is an *aneurismal varia*. If, in addition to these signs, there be a more or less distinct tumour at the spot where the murmur is most intense, fixed to, but distinct from, the artery and vein, with expansile pulsation, compressible, it is a *varicose aneurism*. These diseases generally follow an injury, though at an interval of many years. The bruit is not uncommonly so loud as to be audible to the patient, and sometimes even to bystanders. The two affections are also known as *arterio-venous aneurism*.

4. A congenital sessile tumour fixed to some part of the skull, more or less globular in shape, becoming fuller and tenser during strong expiratory efforts, partially reducible within the skull, fluctuating, with more or less well-marked expansile pulsation, is an *encephalocele*. These tumours are most frequent over the middle of the occipital bone, then at the root of the nose, or at either fontanelle; but they may occur in connection with the base of the skull projecting into the pharynx. Pulsation may be absent owing to the amount of fluid in the sac (meningo-encephalocele), and they are very generally, but not always, associated with hydrocephalus. (*See page 385.*)

5. A circumscribed globular or ovoid tumour over a large or medium-sized artery, immovable apart from this vessel, with expansile pulsation in every part, unmodified by position, collapsing to some extent when the artery above is compressed, and then yielding to pressure, filling out again when the compression is removed with a single, or two or three strong bounding pulsations, becoming a little tenser and fuller when the artery below is compressed, with a well-marked bruit conducted along the artery, and a thrill, the pulse in the artery beyond the swelling being retarded, smaller and of less tension than in the corresponding vessel of the sound side, is a *sacculated aneurism*. Should there be a history of an injury or strain, of alcoholism, syphilis, or gout, or of a sense of something giving way at the seat of the swelling; and should the heart show signs of hypertrophy while the arteries show signs of general degenerative disease, this diagnosis will be confirmed. An aneurism may not be compressible if there be a great deposit of clot in its cavity, although there will be slight modification of tension produced by compression of the artery above or below. Bruit and thrill may both be absent, but not often. If punctured, bright-red blood spurts

out in jets as from a wounded artery. If it be noticed that the aneurismal tumour becomes more clearly defined; firmer, with a less superficial and a less clearly expansile fluctuation, while it is less compressible and reducible, it indicates the *gradual obliteration* of its cavity by clot. When the tumour is firm, incompressible, and exhibits a heaving and not an expansile pulse, it shows that the *aneurism is entirely obliterated*, but the artery on which it is placed is pervious. Such a tumour, if seen for the first time in this condition, would have to be distinguished by its fixity to the artery from an independent solid tumour over the vessel. When all pulsation ceases in the firm contracting tumour, it shows that the artery also is obliterated. Should it be found that the tumour grows somewhat rapidly, and that its outline becomes less defined and its pulsation less distinct, a small rupture of the sac or *bursting of the aneurism* may be recognised. But if either spontaneously, or after some injury or strain, the tumour become greatly and rapidly increased in size, with an entire loss of its clearly-marked outline, an alteration in the tone of its murmur, and it be incompressible and unaltered in tension by compression of the artery above, with great weakening or loss of its pulsation, loss of pulse in the arteries below, ecchymosis of the skin, with rapid œdematous swelling, it is to be recognised as a *ruptured or diffused aneurism*.

6. If a tumour fixed to a bone have an expansile pulsation which is uniform or present in certain situations only, and is unmodified by position, and if it neither collapse nor be compressible when the artery above is pressed upon, the pulsation returning at once when the pressure is removed, and do not become more tense when the main artery below is compressed, it is a "*pulsating tumour*." If the tumour have been first noticed away from the

site of a main vessel, or have shown pulsation only late in its history, if the bone can be traced over its base or surface for any distance, if there be "egg-shell crackling," or spontaneous fracture of the bone, a fungous protrusion of the tumour through the skin, or other growths in different parts of the body, the diagnosis is rendered much more certain. These tumours are often of irregular outline and of varying consistence at different places; a soft blowing murmur may be heard in them.

7. If a tumour be found over a large artery, with a heaving impulse, neither collapsing nor compressible when the artery above is controlled, nor increasing in tension when the artery below is compressed, and if the impulse at once return in its original force on removing the pressure upon the vessel, and if there be no murmur, or a systolic murmur not of the blowing character met with in aneurisms, and especially if the pulsation be lessened or lost with alteration in the position of the tumour, or it can be moved apart from the artery, it is a *solid tumour over an artery* with communicated pulsation. A bruit and thrill are usually absent in such cases, as well as the characteristic alterations in the arterial pulse beyond the tumour; but each may be met with or may be produced by pressing the tumour more firmly against the vessel. Should the tumour fluctuate, and be incompressible and immovable, with an ill-defined outline, unaltered except in the one matter of pulsation by control of the artery on the cardiac side, and especially if there are signs of inflammation in the part (redness, heat, pain, fever), it is an *abscess over an artery* with communicated pulsation. If, however, the tumour, with these general characters, be found to be compressible and reducible, whether the artery above is controlled or not, and it fill out again gradually are not *per saltum*, a *reducible tumour over an artery*,

which, if in the ham, will probably be found to be a synovial cyst, is to be diagnosed. A cyst over an artery not communicating with a joint or other cavity resembles an abscess, except that it is more defined in outline, very chronic in its course, without signs of inflammation; it may be translucent, or situated in some part, e.g. the thyroid gland, in which cysts are common.

8. If, after an injury or strain, an ill-defined swelling suddenly or rapidly develop over a large artery, with expansile pulsation, rough bruit, and thrill, with gradually increasing tension and cutaneous ecchymosis, and the tumour be not compressible when the artery above is controlled, and there is abolition of the pulse and venous obstruction with œdema below the swelling, it is a *ruptured artery*. If an aneurismal swelling suddenly and rapidly increase, losing its clearly-marked outline, with an alteration in the tone of its murmur, and the other signs mentioned above, it is a *diffused or ruptured aneurism*. If the case be seen for the first time when the aneurism has ruptured, the diagnosis between a ruptured artery and a diffused aneurism will rest upon the history; in the one case an injury or strain, in the other a history of a swelling of some long standing, in which the patient has perhaps noticed a "beating" neuralgic pain down the limb from pressure on the nerves, or venous distension from pressure on the veins, and the vessels may be found atheromatous and the heart hypertrophied. As regards the abolition of the pulse in the arteries below an aneurism, it must be remembered that while this, when taken with other signs, is a most characteristic sign of a ruptured artery or diffused aneurism, alone it must not be depended upon, for it may be caused by the gradual growth of an aneurismal tumour compressing and then obliterating the mouth of an artery, or by plugging of the artery by

a portion of clot displaced from the sac. Where an artery is ruptured completely across, or an aneurism ruptured by a large aperture, the tumour is devoid of pulsation.

9. The diagnosis of abscess or other tumour associated with aneurism is fraught with great difficulties. The presence of an abscess will have to be determined by the usual signs of that affection, the ill-defined swelling, fluctuation, redness, heat, severe pain, and pyrexia. The association of aneurism with it may be suspected from the history of the case, and the suspicion becomes confirmed if a blowing bruit be detected; and if, in addition to that, it be found that the swelling collapses somewhat, and is compressible when the artery above is controlled, and then fills out again with successive thuds when the compression is removed, the diagnosis of *abscess over an aneurism* becomes certain. If one part of a pulsating swelling be found to be more or less clearly marked off from the rest, and to have a heaving and not an expansile impulse, to be unyielding when the artery above is compressed, and to be movable apart from the rest of the swelling, a *solid tumour over an aneurism* is to be recognised. Should a swelling with these general characters be found to fluctuate (there being no signs of inflammation), and especially if it be found compressible quite apart from controlling pressure on the artery above, and that it fills out gradually, a *cyst and aneurism* must be diagnosed. Finally, it is to be pointed out that in every case of swelling over an artery careful auscultation is to be practised to determine whether the soft blowing murmur so characteristic of aneurism is present, and in no case is a diagnosis to be arrived at until aneurism has been excluded. Careful puncture with a fine-grooved needle may be of use in diagnosing the more difficult cases.