

by a lessening or total obliteration of the natural wrinkles of the part. **Edema** is caused by (a) *acute inflammation*, (b) *venous obstruction*, (c) *hydræmia*, (d) *urinary infiltration*. If *inflammatory*, it is localised, and accompanied by the usual signs of inflammation, *i.e.* pain, tenderness, heat, and fever, and usually redness; much surrounding œdema is sometimes an useful indication that the inflammation has run on to suppuration. When due to *venous obstruction* it is generally localised, and attended with some lividity of the surface or venous distension, and the obstruction may be obvious, as a tight bandage, an aneurism or other tumour, or pulmonary or cardiac disease. If due to *hydræmia* it is always associated with marked anæmia, is painless, and when severe is more or less general. The peculiar limits of urinary infiltration sufficiently characterise that form of œdema. The limits and extent of œdema should always be carefully ascertained; where local it owns a local cause, and *vice versa*. Swellings caused by fluid yield, of course, a dull percussion note.

Swellings which are dull on percussion, and neither fluctuate nor pit on pressure, are solid.

**Solid tumours** may be soft, easily yielding to pressure, sometimes requiring care to distinguish from fluid tumours. Examples of such are seen in lipoma and myxoma. Or they may be of any consistence firmer than this, up to the incompressible hardness of bone. Of the firm tumours may be mentioned fibroma, adenoma, and many sarcomata; of the very firm, but still slightly elastic and compressible tumours are enchondroma and scirrhus; cartilaginous tumours only yield very slightly to pressure, and the recoil is very rapid; of the absolutely hard unyielding swellings we have osteoma, calcified tumours such as phleboliths, and swellings due to calculi. In examining the consistence of a solid tumour, a

peculiar crackling may be met with; where this is very dry and high-pitched, like the sensation produced by compressing a cracked egg, it is known as "egg-shell crackling," and is caused by the yielding of a very thin plate or shell of bone over a softer tumour. A similar sensation, but less dry, and of a lower pitch, is produced by the like yielding of a thin plate of cartilage. This sign is a useful indication of the expansion of the bone by a tumour growing in its interior (sarcoma or enchondroma), and if it affect the articular end of a bone, while at the same time it expands the cartilage-covered surface of the bone, the softer sensation may be felt. The author has recently noticed this in a case of soft sarcoma growing from the outer condyle of the femur. A very similar sensation may be felt in cases of subperiosteal cephal-hæmatoma, where the pericranium becomes thickened by soft callus, and bends like stiff parchment under the finger.

As already stated, swellings may vary in consistence in different parts or at different times, and a knowledge of this fact may aid in the diagnosis. The association of firmer and softer solid material in one swelling indicates sometimes that a soft tumour, growing within a hard substance, has at one or more places burst through the enveloping tissue; this is sometimes observed in the growth of central sarcoma of bone. At other times it shows that the soft tissue has undergone some indurating change, as when a sarcoma chondrifies or ossifies; while in other swellings it indicates that the tumour is composed of quite different constituents, as intestine and omentum in a single hernial sac. Still more common is the association of solid and fluid parts in one swelling. Where, with signs of inflammation, part or parts of a solid swelling become fluctuating, suppuration may be recognised. Where, on the other hand, such a change

takes place without any indication of inflammation, a degenerative softening of the tumour, or a growth of a cyst or cysts, is the cause; and the distinction between these may be difficult, but the more tense and the more globular the collection of fluid the more likely is it to be a true cyst, and not a collection of soft detritus. The causes of the changes in the consistence of tumours have already been mentioned. The association of cystic and solid matter in a tumour is characteristic of cystic hygroma, cystic sarcocele, and many other tumours; variation in their consistence, while a frequent feature of malignant tumours, especially sarcomata, is rarely seen in benign growths. (For the diagnosis of solid tumours, see pages 279 *et seq.*)

VI. **The form of a tumour** must be carefully observed, as it not unfrequently aids very materially in the diagnosis.

(1) *A tumour or swelling may have the form of one of the normal structures of the body*, and so prove its relation with such structure; many examples of this might be cited, but the fact is of practical diagnostic value in the following instances: enlargement of lymphatic glands, enlargement of the salivary glands, varix, thrombosis, phleboliths, arteritis, fusiform aneurism, synovitis, bursitis, hydrocele, sarcocele, misplaced testicle or ovary, movable kidney, enlarged liver or spleen, distended bladder or uterus, and various dislocations.

(2) *A globular shape* of a neoplasm indicates the uniform yielding of the implicated tissues to the pressure of the growth, or the general implication of all tissues equally in a rapidly-growing tumour. Thus we find that cysts of all kinds tend to assume a globular outline, so also do sacculated aneurisms; diseased joints when the fibrous structures are softened and are no longer able to maintain the normal outline of the part, while soft sarcoma and carcinoma

frequently assume a globular shape. The globular form of dermoid or sebaceous cysts generally distinguishes these swellings from ovoid fatty tumours and hemispherical abscesses.

(3) *A tumour may be lobulated*, and this may be characteristic. Thus the fine lobulation caused by the distension of the acini of the mamma in milk congestion, or of the lobules of the submaxillary gland in obstruction of the duct by a calculus, are quite characteristic of glandular distension. The flattened ovoid lobulation of a fatty tumour is also distinctive; and the presence of omentum in a hernial sac is usually easily determined by its granular and loosely lobulated feel. Coarser lobulation of tumours may be due to yielding of the surrounding tissue in certain directions only, as in some ganglia; to cystic formation, as in cystic sarcoma of the mamma and testicle; or to an inherent mode of growth of the tumour, as in enchondroma, which has a special tendency to form botryoidal masses. Lobulation may also be explained by the anatomical relation of the swelling, as in psoas abscess.

(4) The *retraction* of a tumour is an important feature, indicating a contraction of the tissue; it is a special feature of scirrhus carcinoma.

(5) Other characteristic forms are the *warty* or *villous*, the *pedunculated* or *polypoid*.

VII. **Translucency** of a swelling shows that it consists of a collection of transparent fluid, serous or synovial; and it is, therefore, a diagnostic sign of great importance. To test for translucency, the tumour should be grasped so that it is made tense and the skin is stretched tightly over it; a good light is then to be held close to it on one side, while the observer's eye is on the opposite side, the rays of light which pass over the surface of the swelling being shut off by the hand or some suitable screen; if translucent,

the light is seen through the swelling more or less intensely. Some prefer to look through a stethoscope, a roll of paper, or some similar tube. Translucency may be missed by carelessness in carrying out this manœuvre; thus, a scrotal swelling may be so held that the patient's penis, or the sound testicle, or the surgeon's hand is placed between the light and it, and the rays of light effectually interrupted; or one part only of a swelling, which is partly solid and partly fluid, such as an hydrosarcocele, may be examined. On the other hand, it may be wrongly detected, if the observer be not careful to shut off from his eye all the rays of light except those passing into the swelling, thus, if a stethoscope or other tube be used and the end be not placed quite firmly and uniformly on the swelling, light passing into the tube under its tilted end may be mistaken for that passing through the swelling. Tumours usually translucent may be opaque through great thickening of their coverings, as in some old cases of hydrocele; or through a change in their fluid, as when hæmorrhage occurs into a hydrocele, or a spina bifida becomes filled with organisable lymph, or a serous cyst becomes inflamed and suppurates. When testing for translucency, it is well always to examine the whole swelling, both because a translucent part may otherwise be overlooked, and also to localise exactly any opaque portions. In this way the position and approximate size of the testicle in a hydrocele, or the presence and position of the spinal cord or nerves in a spina bifida, may be determined. While translucency is positive evidence of the presence of a clear fluid in the swelling, serous or synovial, the surgeon must remember that opacity is not by itself evidence of the absence of such fluid.

Transparency of the coverings of a tumour, the result of thinning, is sometimes of use in diagnosis when the colour and appearance of the swelling seen

through are characteristic, as *e.g.* in the pointing of an abscess, many cases of spina bifida with very thin sacs, nævi, sebaceous cysts, and dilated veins.

**VIII. The colour and vascular condition of the skin** covering a swelling are often noteworthy.

(1) The skin may be *white* and blanched, as in œdema from Bright's disease, or anæmia.

(2) The skin may be *reddened*, and if so, care must be taken to distinguish between certain varieties of this discoloration. If the colour be neither banished nor altered by pressure, it is due to escape of blood from the vessels, the result being spoken of as petechiæ if in small isolated spots, or as a bruise or an ecchymosis if more diffused; such a condition aids in the diagnosis of purpura, scurvy, hæmatoma, bruise, or the rupture of an artery or a vein. If, however, the colour disappear on pressure, it shows that this is due to blood circulating in the vessels, and the rapidity with which it returns corresponds with the activity of the circulation in the part. When the red colour is uniform and the individual dilated vessels cannot be detected, this condition is due to capillary dilatation, is very often inflammatory in nature, and hence may aid in the diagnosis of the tumour, as in the case of an acute abscess; such inflammatory redness of the skin, however, may be of secondary origin, *e.g.* the intertrigo over a large scrotal or umbilical hernia, or large pendulous fatty tumour. If the colour be not thus uniform, but the individual vessels can be seen with clear spaces between them, the hyperæmia is limited to vessels larger than capillaries, and is certainly not inflammatory; if of a purple tint it is probably due to obstruction to the venous circulation. Where, however, this dilatation of vessels larger than capillaries containing blood of a bright red colour is seen over malignant tumours it indicates the

involvement of the skin in the morbid growth; this is seen very characteristically in some cases of cancer of the breast. When the bright capillary inflammatory redness is associated with œdema it is a useful sign of suppuration; the redness of inflammation is always accompanied by increased local heat. (See page 20.)

To be carefully distinguished from the above forms of redness is the *nœvoid condition*, the appearance of which is quite characteristic; the colour varies from bright to dark red, the affected skin is slightly raised, always sharply defined, and often presents an uneven appearance from the looped and pouched arrangement of the vessels; further, this condition of skin is congenital, or appears soon after birth. Such a state of the skin indicates that any subjacent swelling is either a *nævus* or some other form of congenital tumour.

(3) The skin may be *pigmented*. This is met with as a congenital deformity in hairy moles, or results from the degeneration of *nævi*; in each case there are a long history, dating back to birth or infancy, a deep colour, sharp outline, and often an abnormal growth of hair or of the papillæ of the part, while in each case it would point to a *nœvoid* or congenital nature of any subjacent tumour. Pigmentation also results from prolonged congestion, and is then less defined and shades away at the edge, unlike a hairy mole. Possibly the characteristic discoloration of the skin in Addison's disease might be met with over a tumour; it would have no diagnostic significance *quoad* tumour. The hairy or pigmented moles frequently become the seat of epithelioma, and this fact might aid in the diagnosis of commencing epithelioma.

(4) The skin may be so thinned as to allow the colour and form of the parts within to be seen.

(5) The skin may be quite unaffected.

IX. **Pulsation** is sometimes present in tumours,

and is of the utmost importance as a symptom, for in all cases the special connection with the arterial system that it indicates requires careful investigation. It must be noted at the outset that only when the passage of blood into a part meets with a certain amount of resistance is pulsation to be observed; thus, when an aneurism or an artery ruptures subcutaneously and the blood is diffused in the loose tissue of the part there may be no pulsation in the swelling. Pulsation in a swelling may be due to (a) the direct communication of an artery with the swelling, as in aneurism, aneurismal varix, pulsating proptosis; (b) to the presence of numerous pulsating arteries in the tumour, as in aneurism by anastomosis, and in very vascular sarcoma, hence called "pulsating tumour;" (c) to the presence of an artery in close contact with the swelling, to which it transmits its pulsation, as in some cases of enlargement of popliteal glands, and of tumours of the thyroid gland and some abdominal tumours. The fact of chief importance in connection with any tumour that pulsates is to determine whether an artery directly communicates with it, whether it is an aneurism. (For the diagnosis of pulsating tumours, see pages 296 *et seq.*)

X. We will here speak of the *other phenomena connected with the vascular system* that may be met with in tumours. Of these, the first is

(1) **A bruit**, or murmur, a sound audible when the ear is applied directly to or with a stethoscope over a swelling. It may be caused either by the rush of blood into an aneurism, and in some cases also out of the sac, or by the partial compression of an artery by a swelling placed over it, and this particularly in certain blood states. It is heard simultaneously with the pulse, but may be also diastolic in cases of aneurism. It varies much in character, being described by such terms as soft, loud, blowing, rough, musical, etc. In aneurisms it is generally of a blowing character; in

partial compression of an artery it is usually a dull toneless sound, or "thud," or it may be rough in character. The points to notice in regard to a bruit are (a) the time of its occurrence; (b) if it be intensified by pressure; (c) if it be heard of equal intensity all over the swelling, and with the pressure of the stethoscope in any direction; (d) if heard at a distance. Only in aneurismal tumours do we hear both a systolic and a diastolic bruit. An aneurismal bruit is not intensified by pressure; one due to compression of the artery is intensified by moderate pressure in the direction of the artery; an aneurismal bruit is heard equally well all over the tumour; an arterial bruit is heard loudest, and perhaps only, just along the line of the artery; an aneurismal bruit is often conducted along the diseased artery, or is heard at a distance, as over the back in aortic aneurism; a "compression murmur" is not thus conducted.

(2) **A thrill** is a vibrating sensation, detected by the fingers lightly placed over the part; it is caused by the forcible passage of blood through a small orifice. It is felt in many cases of aneurism and in cases of direct communication between an artery and a vein. In aneurism it is limited to the tumour, and its presence depends upon the relative size and conformation of the mouth of the sac, and possibly, too, upon the condition of the interior of the sac. In aneurismal varix the thrill is often very intense, and is particularly characterised by its wide extent, being conducted and felt in some cases along the veins of a whole extremity. In certain conditions of the arterial wall and possibly also of the circulating blood, a thrill can be produced by compression of an artery against a firm tumour or a bone; this thrill is increased by gentle pressure.

(3) **The arterial pulse** on the distal side of a tumour should always be noticed. In the case

of an aneurism, the pulse in the vessel beyond is delayed and rendered smaller and of less tension than in the corresponding artery of the other side. These differences are usually quite perceptible to the finger, but the alteration of tension can be best demonstrated by a carefully taken sphygmographic tracing. Sometimes, beyond an aneurism, the usual arterial pulse is entirely lost from embolism or thrombosis, or from the tumour obliterating the mouth of an artery. The complete subcutaneous rupture of an artery is always attended with the abolition of the arterial pulse below. An examination of the superficial arteries is of use to throw light upon the general condition of these vessels; the superficial temporal, brachial, radial, and common femoral arteries are those most easily seen and felt, and if they be tortuous, with a visible pulsation causing their locomotion, and the tubes be hard and incompressible, and especially if, when the finger is gently passed along them, it detect slight unevenness in them, it may be taken as evidence that the arteries of the body generally have undergone the degenerative changes known as atheroma and calcification.

(4) **The heart.**—Associated with arterial degeneration and the consequent increased difficulty in the circulation, and especially when to this an aneurismal dilatation of an artery is added, we have hypertrophy (rarely dilatation) of the heart. In cases, therefore, in which the diagnosis of aneurism is obscure the existence of cardiac hypertrophy, especially when no other cause for it, such as valvular disease, can be detected, the fact is in favour of the tumour being aneurismal.

(5) **Venous pulsation**, or pulsation in a vein, is observed in the rare cases of a direct communication between an artery and a vein, and is a very characteristic symptom. In the jugular veins it is also seen in cases of tricuspid regurgitation.

(6) **Venous engorgement**, as indicated by the dilated veins coursing over the part, or by its general lividity, is an important indication of an intimate connection of a swelling with the vascular system. It is well, however, to remember that the association may be entirely accidental, as in the case of a fatty tumour on the thigh and varicose veins of the leg; enquiry as to the time of appearance of the swelling and of the venous distension will generally be sufficient to eliminate this error. The direct connection of venous distension and swellings is fourfold. (a) *Venous distension may be the entire swelling.* In this case the swelling will have the outline of dilated, convoluted, and sacculated tubes, and will especially be characterised by being entirely compressible, unless the contained blood has at some spot or spots coagulated. (b) *The venous distension and the swelling may be produced by one common cause*, as e.g. obstructive or regurgitant heart disease; in this case the swelling is oedematous. (c) *The venous distension may be produced by the swelling obstructing the return of blood*, either by compression or obliteration of a vein or veins by the growth, or by a communication between an artery and a vein, the flow of the arterial blood into the vein impeding the venous return; examples of the former are seen in popliteal and other aneurisms, mediastinal and other growths, etc. In these cases the venous distension is on the distal side of the swelling, and may be accompanied by more or less oedema. (d) In other cases it is due to *increased blood supply necessitating enlargement of the efferent veins.* This is observed in very vascular growths, where the original calibre of the veins is not sufficient to carry off the great amount of blood conveyed to the part. In such cases the venous distension is noticed over and on the cardiac side of the swelling. As these growths may also obstruct the deep veins, some part of the venous

engorgement may be explained by this fact. These very vascular new growths are nearly always malignant, either sarcoma or carcinoma, and the blue veins coursing over a swelling are therefore of positive diagnostic value. Such veins are seen in some cases of chronic abscess, from destruction or compression of deeper veins.

**XI. Some tumours are reducible**, either wholly or in part, really or apparently. A tumour is *really* reduced when its contents are more or less completely emptied out of its capsule into one of the normal cavities of the bodies or into the vessels of the part. Examples of this are seen in hernia, some forms of hydrocele, varix, aneurism, and meningocele. A tumour is only *apparently* reduced when it disappears from its original position, but is not emptied out, and still remains of its original size. Examples of this we see in the reduction of hernia *en bloc*, in some cases of tumour of the spermatic cord, and of cryptorchismus, in psoas abscess, where the femoral pouch can be emptied into the abdominal, and in effusion into the bursa beneath the semimembranosus tendon, when this does not communicate with the knee joint. In the limbs the reducible contents of tumours are always fluid (blood, pus, synovia); in swellings in connection with the trunk the contents may be solid or fluid, as in hernia and varicocele. Reducible tumours are also subject to temporary increase of their usual bulk, and the conditions under which they become over full or emptied often aid materially in diagnosis. Position, pressure, and effort or strain, are the means usually employed to cause these variations in tumours.

(1) *Position.*—It is only the most easily reducible swellings, and particularly varices, that are affected by position. In the dependent position dilated veins, whether in the limbs or scrotum, fill out, and when