dorsum of the foot, the sole being preternaturally hollow, there is a *dislocation of the metatarsus upwards.* The internal cuneiform bone may be displaced with the metatarsus forming a marked prominence on the dorsum behind the base of the first metatarsal bone, and extending nearer the ankle than the outer part of the dorsal prominence. If, however, the dorsal prominence be formed by the anterior bones of the tarsus, being abrupt in front instead of behind, as in the former case, and the bases of the metatarsal bones be found lying beneath the tarsus and projecting into the sole, there is a *dislocation of the metatarsus downwards.*

(4) If the middle line of the front of the foot be not in a line with the axis of the leg, ankle, and instep, but be displaced to one or other side, and if the base of the metatarsal bone, towards which it is displaced, be unusually prominent, while the bone on the opposite side of the metatarsus is sunk in and cannot be felt so readily as usual, and if the front of the bone of the tarsus with which it articulates (cuboid or cuneiform) project, there is a *dislocation of the metatarsus laterally.*

(5) If a firm evidently bony projection be found on the dorsum of the foot, corresponding in position and shape to the scaphoid or one of the cuneiform bones, and the corresponding toes or toe be found shortened, the diagnosis of *dislocation of the scaphoid or cuneiform bone* must be made. Similarly, if the little toe be found shortened, the base of its metatarsal bone unduly prominent, and approximated to the outer malleolus, with a depression immediately behind it, and below this depression a bony mass be felt in the sole making the middle of the outer border of the sole project, a *dislocation of the cuboid* bone would be diagnosed.

(6) If at either of the phalangeal joints there be a deformity (a projection upwards of the base of the phalanx) with fixity of the articulation, there is a *dislocation of a phalanx.* This displacement may be partial or complete, purely dorsal or partly lateral also.

CHAPTER XV.

THE GENERAL DIAGNOSIS OF SWELLINGS AND TUMOURS.

WHEN examining a swelling or tumour for the purpose of arriving at a knowledge of its nature, there are certain general facts to be ascertained and investigated in every case; it is from a knowledge of its exact physical characters that, in most cases, we are able to arrive at a recognition of its vital character. In this chapter it is proposed to examine the bearing of the various features of swellings upon the diagnosis of their nature, and to state the general rules by which the surgeon may be guided in the diagnosis of tumours.

I. The **history of its first appearance** is the first fact to be ascertained in respect of any swelling. This may present several varieties.

(A) **Congenital tumours.**—These include *malformations*, such as meningocele, encephalocele, spina bifida, attached fœtus, included fœtus, congenital dislocations, hydrocele, and hernia; *cystic tumours*, such as dermoid cyst, serous cyst of neck, axilla, perineum, etc., blood cyst, cystic hygroma; *solid tumours*, such as lipoma, fibrous tumour of gum, scalp, skin, sacral and coccygeal tumours; *hypertrophies*, seen particularly in the limbs; *vascular growths*, or the different varieties of nævus; and *thickenings* around bones in cases of intra-uterine fracture.

(B**Swellings arising suddenly.**— Such a swelling can only be caused by (1) the *displacement of parts*, as in dislocations, herniæ, and pneumatocele; (2) *the rapid effusion of blood*, as in traumatic aneurism, hæmatocele, hæmatoma; or (3) *the escape of the contents of the hollow viscera*, as in extravasation of urine.

(1) **The displacement of parts** will be recognised by three signs (*a*) the absence of the part from its normal situation, as *e.g.* the head of the humerus immediately below the acromion, or of the head of the radius below the external condyle of the humerus; (*b*) by the continuity of the swelling with the part supposed to be displaced, as *e.g.* when the swelling produced by a displaced bone moves when the other end of the bone is rotated, or its connection is traced by the finger passed along it, or by certain special signs, as the reducibility and impulse in a hernia, and the respiratory modifications of a pneumatocele (*see* page 145); and (*c*) by the outline and general characters of the swelling resembling those of the displaced organ, as *e.g.* the rounded head of the humerus, the smooth tympanitic gurgling intestine, or the granular omentum.

(2) **The rapid effusion of blood** will be distinguished (*a*) by the absence of the above signs, and also of those associated with the escape of the contents of the hollow viscera; (*b*) by the evidence of the fluid nature of the swelling, shown either by fluctuation or by its infiltrating character, for a rapid infiltration can only be by fluid; (*c*) by signs of bruising or blood staining; (*d*) by the general signs of loss of blood (in some cases); (*e*) in some few cases by evidence of the disturbance of the circulation in the part; and (*f*) by increase in size of the swelling going on for a time at least; this is one of the most important signs of all. Where the effused blood is more or less limited and

circumscribed, but yet forms a distinct tumour, it is called a *hæmatoma;* in such cases the blood is usually poured out from smaller vessels. When, however, it is poured out from a single large vessel, and is not circumscribed but infiltrates the cellular planes of the part, it is spoken of as a *ruptured artery* or *ruptured aneurism.* These may be thus distinguished:

If the swelling be more or less well defined and circumscribed, at first, and perhaps subsequently, fluctuating, without pulsation, bruit, or thrill, and there be no interruption of the pulse in the arteries beyond, and especially if it have resulted from direct violence, it may be diagnosed as a *hæmatoma.*

If the swelling be ill-defined, very tense, of great size, not fluctuating, but more or less boggy at the edges, and the limb beyond be found cold, œdematous, livid, and numb, and the arteries pulseless, and if there be severe pain in the part, with fainting and the other general signs of a severe loss of blood, it is a *diffused aneurism.* A bruit may be heard in such a swelling, at times a thrill may be felt, and if the parts around the fluid blood are much compressed and condensed into a spurious sac, pulsation may be detected, while if the artery be but partially ruptured there may be a faint pulse in the arteries beyond. Often the patient experiences a sensation as of something snapping or giving way, followed by a hot rushing feeling.

If such a swelling have formed as the result of a severe twist, and there be no previous history of any affection of the vessel, it must be diagnosed as a *ruptured artery.* But if the swelling have occurred spontaneously, or from some slight violence, and there be a history of aneurism, or of a swelling or sense of beating in the part, or of pain supposed to be "neuralgic," or of venous engorgement below, then it must be diagnosed to be a *ruptured aneurism.* If unrelieved, this condition speedily runs on to *moist gangrene.*

(3) **Extravasation of urine** is characterised by the position and limits of the swelling; by its occurrence in connection with the act of micturition, and by the œdematous nature of the swelling. (*See* page 502.)

(C) **Swellings arising acutely or rapidly.**—In all cases these are due to an accumulation of excess of the animal fluids or of air in the swelling part, for only these can thus rapidly collect.

Acute inflammation, as it occurs in the cellular tissue, glands, periosteum, tonsil, tongue, larynx, tunica vaginalis, bursæ, synovial membranes, etc., is the most frequent cause of such rapid swelling. It also occurs when a sudden or rapidly-formed obstruction to the venous circulation leads to *passive œdema* of a part, as in thrombosis and compression of veins, and it may occur when some profound change in the character of the blood leads to increased transudation of serum, as in acute nephritis. A swelling is rapidly formed, too, when *small blood-vessels are injured* and blood is poured out, as in some bruises; and in cases of *obstruction of the ducts of actively secreting glands*, the secretion poured out in considerable quantity may accumulate behind the obstruction and lead to a rapid swelling. A good example of this is met with in so-called "milk congestion," where a mammary lobe is distended with its own secretion, and also in acute retention of urine. *Emphysema* of the chest, neck, and face may cause rapid swelling in the fasciæ of these parts. The *coagulation of blood in a vein* (thrombosis) may cause a slight swelling by the clot distending the vein.

Acute inflammation will be readily distinguished by its characteristic local signs: (*a*) redness, when the inflamed part is superficial, (*b*) heat, (*c*) pain, usually severe, and (*d*) tenderness; and (*e*) by general fever.

Œdema is recognised by the pitting of the swollen part on pressure; when a swelling is wholly œdematous, it can be entirely obliterated at any one spot by properly applied pressure. If due to venous obstruction it is limited in area, and there is generally more or less lividity of the surface and distension of the veins; if due to altered blood condition, it is general in distribution, and there is no lividity, but on the contrary marked pallor.

Extravasation of blood is distinguished (*a*) by the discoloration of the part, which cannot be altered by pressure, and which undergoes the characteristic colour-changes of a bruise; (*b*) by the ill-defined character of the swelling; and (*c*) by the history of an injury or strain.

A distended gland is recognised (*a*) by the position of the swelling (at the site of a gland), and (*b*) by the outline of the swelling corresponding exactly to that of the gland; this is observed in milk congestion and in distension of the submaxillary gland from salivary calculus, when each lobule of the gland can be felt; a distended bladder is recognised by the same general characters.

A venous thrombus is characterised by (*a*) its position, in the course of a vein; (*b*) its shape, cylindrical, with or without rounded projections corresponding to pouchings of the vein; (*c*) its firmness; (*d*) and when mobile at all, by the mobility being limited to the transverse direction. The manipulation of a suspected thrombus must be very gentle and careful, lest a part of it be detached.

(D) **Swellings slowly formed** or *chronic swellings*. Such swellings may be caused by accumulation of the fluids of the part, or by an increase of the formed elements, or by both. Chronic swellings are caused by (*a*) *chronic inflammation*; (*b*) *œdema* due to gradually produced alteration in the

character of the blood or obstruction to the venous circulation; (*c*) *active congestion*, or increased supply of blood to a part, *e.g.* exophthalmic goître; (*d*) *yielding of vessels to intravascular pressure*, *e.g.* aneurism, varix; (*e*) *accumulation of secretion* in a closed sac, or behind an obstructed gland-duct, *e.g.* cystic goître, bursal cysts, sebaceous cysts, galactocele; (*f*) *gradual displacement* of organs, *e.g.* spinal curvature, exophthalmos, many herniæ; (*g*) *hypertrophy*, *e.g.* of mamma, tonsil, prostate; (*h*) *tumours* proper, or *new growths*.

Chronic inflammation is generally characterised by (*a*) gradual increase of the swelling, (*b*) its infiltrating character, (*c*) pain especially elicited by pressure or by use of the part, and (*d*), in some cases, local heat, (*e*) alteration in the consistence of the tissue, either induration or softening, (*f*) impaired function of the part, (*g*) in some cases pyrexia. To distinguish between the results of chronic inflammation and hypertrophy is oftentimes a matter of very great difficulty.

Œdema, when chronic, has the same characters as when acute. (*See* page 243.) The so-called "solid œdema" does not pit on pressure, and is allied to chronic inflammation.

Active congestion is a frequent cause of physiological swelling, but is rarely a pathological cause. Its characteristics are (*a*) moderate enlargement, (*b*) variations in the size of the swelling from time to time, (*c*) enlargement and increased pulsation of the supplying arteries, (*d*) redness of the part if superficial, (*e*) sometimes a murmur. These signs are found in exophthalmic goître. (*See* page 434).

Dilatation of an artery is to be recognised (*a*) by the position of the swelling in the course of and fixed to an artery, (*b*) by the tumour having an expansile pulsation in it synchronous with the ventricular

systole, often accompanied by a murmur and a thrill, and (*c*) by weakening and delay of the pulse in the artery beyond. (*See* page 264, *et seq.*)

Dilatation of a vein is known by the (*a*) position of the swelling in the course of a vein or veins; it is most common in the lower limbs, scrotum, and anus; (*b*) the elongated and often tortuous, or even sacculated character of the swelling; (*c*) its compressibility and reducibility; (*d*) where superficial, the livid colour of the enlargement. It is frequently accompanied with œdema; when there is a direct communication between an artery and the dilated vein, the latter exhibits pulsation, bruit, and thrill. (*See* Aneurismal varix.)

Accumulation of secretion is recognised (*a*) by the occurrence of the tumour in the position of, or actually in, a gland or closed sac; (*b*) by its more or less globular outline; (*c*) by the fluidity of its contents as evidenced by fluctuation; (*d*) by the absence of the usual signs of inflammation; (*e*) by the nature of the contents of the swelling as shown by an exploratory puncture.

Displacement of organs. (*See* page 240.)

Hypertrophy occurs most often congenitally, or in early life, but a notable exception is found in the prostate. Its general features are (*a*) a uniform painless enlargement of the part or organ, which after attaining a certain size may remain stationary; (*b*) unaltered consistence; (*c*) the function of the part is not interfered with, except in some cases from its mere bulk; (*d*) absence of heat, redness, and degenerative changes.

New growths vary very much in their features, but they are to be generally recognised by (*a*) their continuous growth, which may be slow or rapid; some tumours may become stationary; (*b*) the abrupt limitation of their outline; (*c*) absence of local heat, redness,

pain, œdema, and absence of fever; exceptions in all these particulars are met with; (*d*) apparently spontaneous formation in most cases; (*e*) resistance to treatment other than excision.

(E) **Traumatic swellings.**—In many cases a swelling more or less directly follows an injury. Injury can cause swelling (*a*) by *displacement of parts*, as in herniæ, fractures, and dislocations; (*b*) by *rupture of vessels*, as in fractures, bruises, and hæmatoma; (*c*) by exciting *inflammation*, acute or chronic, as in acute orchitis from a blow, and in chronic arthritis from a fall; (*d*) by the effusion of plastic lymph in the process of repair, as the callus around a fracture; (*e*) and probably by exciting the *development of a new growth*.

(F) **Intermittent swellings.** — Intermittent appearance is a not infrequent characteristic of swellings caused by *displaced viscera* or *structures*, as herniæ, rectal polypus, prolapsus ani and prolapsus uteri; by *slight œdema*, as in the swelling of the ankles, noticed only in the evening; and by *venous distensions*, as in varices appearing only during pregnancy, and piles.

II. The **progress or subsequent course** of the tumour is the second fact of importance to ascertain. Attention should be paid to several particulars.

(1) **A tumour may remain stationary** even for years; this of course indicates an entire absence of formative activity, and is chiefly of importance as evidence of the absence of "malignity" or of active inflammation. A tumour long stationary may again enlarge, as when inflammation attacks a caseated gland; or if a simple tumour become "malignant," as when a wart develops into an epithelioma. This always indicates a change in the nature of the swelling.

(2) **A tumour may diminish** in size. This, too, is a favourable sign. *If gradual*, it indicates

absorption of the elements of the swelling, whether fluid, as blood, serum, and pus, or solid, as granulation tissue, fibrin, bone; or a shrinkage from some retrograde nutritive change, as in the caseation and calcification of inflamed glands, and the contraction of "withering scirrhus." The gradual shrinking of a swelling is a fact in favour of its being either an effusion of blood or lymph, the result of an injury or of inflammation. If it occur *suddenly*, it indicates the escape of the contents of the swelling, usually fluid, as in some cases of hydronephrosis or pyonephrosis; other examples are afforded by the disappearance of a bladder tumour on catheterisation, and of the uterine tumour after parturition.

(3) **A tumour may suddenly increase** in size. This is caused by the onset of *acute inflammation* in or around it, *e.g.* inflamed pile; by *effusion of blood* into it, as in the conversion of a hydrocele into a hydrohæmatocele; or by increased *displacement of organs*, as in hernia.

(4) **A tumour may continuously increase,** and this increase may be slow or rapid. The rate of increase depends upon the relation between the intensity of the cause of the enlargement, and the hindrances to that enlargement. Where the *swelling increases slowly*, it is due either to a *feeble tendency to enlargement*, as in chronic inflammation and in the more benign tumours, lipoma, etc., or to *considerable resistance to enlargement*, as in aneurism, varix, and intraosseous tumours and inflammations. Where the swelling *increases rapidly* it indicates a *great inherent power of growth* in the tumour, as in acute inflammation, soft malignant tumours, and some cysts; or a *feeble resistance* to enlargement, as in œdema of cellular tissue. A continuous enlargement of a solid tumour without alteration in consistence is an important characteristic of malignant disease.

(5) **A swelling may enlarge intermittently.**—This is met with in (*a*) *displacement of viscera;* when under the influence of strain further displacement occurs from time to time, as in hernia, prolapsus ani, spina bifida, meningocele; (*b*) *successive attacks of inflammation*, as in some cases of adenitis and tonsillitis; (*c*) *vascular enlargements*, either active or passive, as in exophthalmic goître (where it is due to intermittent arterial dilatation), varix, and venous nævus (where it is due to intermittent venous obstruction), *e.g.* successive pregnancies, coughing, or crying.

(6) **A tumour may change its position.**—This is observed in fatty tumours, which have been known to travel in the subcutaneous tissue of the back from the shoulders towards the buttock; the movement is never in a direction contrary to gravity. More often we see that as a tumour enlarges, it appears to change its position, owing to the growth taking place in one special direction. Thus an inguinal hernia may at first cause a swelling in the groin, but as it enlarges it passes into the scrotum, and so distends that sac that the small inguinal swelling is obscured. In certain abscesses the same thing is noticed; thus an ilio-psoas abscess may first bulge above the fold of the groin, and then later on point in the thigh by a swelling so prominent as to render less evident the one higher up.

(7) **The direction in which a tumour enlarges** is often a matter of considerable diagnostic value. It is an indication either of the direction of least resistance to the growing tumour, and so shows its relation to some of the stronger and more resistant fasciæ of the part, as in psoas and iliac abscess, hernia, extravasation of urine, synovitis, bursitis, and many other tumours; or it indicates the affection of some particular tissue, as in diffuse lipoma, where the fatty tissue alone is involved, in adenoma,

where lymphatic glands alone are enlarged, and in varicose veins.

(8) **A tumour may enlarge in one or both of two ways,** either by the continuous growth or expansion of the primary swelling, or by the development of separate swellings, which then become incorporated with the original growth. The first is exemplified in the growth of aneurisms, cysts, and most solid tumours. The second is seen in some cases of malignant tumour, where detached nodules may form in the skin or in lymphatic glands, and, enlarging, coalesce into one mass; and in some chronic inflammations, as in the glandular enlargements in adénie, in osseous nodes, and in gummata.

(9) **A tumour, as it enlarges, may ulcerate.** Of this two varieties are to be distinguished. In some cases the skin over a large tumour ulcerates, either from distension or from constant friction. In such cases the skin thinned (not adherent to the tumour if it have not sprung from the skin, as in molluscum fibrosum), the swelling is always very large, and not attended with fungus or deep ulceration of the mass. We see this occasionally in the case of large herniæ, or hernia for which an improperly powerful truss has been worn; in large fatty tumours, and other very large growths. In the other class of cases, the ulceration is caused by molecular disintegration of the tissue of the tumour itself, and is therefore independent, in many cases, of the size of the mass, and is an important indication of the vital condition of the tumour. Such ulcers are deep, or at any rate not limited to the skin, but involve the tumour itself; the skin, or mucous membrane, is adherent to and involved in the mass, and often there is more or less fungous protrusion of the mass. We see illustrations of this in cases of epithelioma, and other carcinomata, sarcomata, gummata, lupus, scrofulides, actinomycosis, etc.

A sarcomatous fungus is often distinguishable from a cancerous one by the fact that the edge of the ulcerated skin is not infiltrated by or adherent to the tumour; carcinoma always involves the skin around the fungus.

(10) **A swelling may alter in consistence,** becoming firmer or softer. *Increased firmness* may be due to (*a*) increased tension, in which case it always accompanies enlargement of the swelling, *e.g.* hydrocele, strangulated or obstructed hernia; (*b*) to solidification of fluid contents, as the coagulation of the blood in a hæmatoma or an aneurism, or the separation of fibrin in an aneurism; (*c*) to organisation of a softer cellular exudation or growth, *e.g.* ossification of callus, of a node or of an enchondroma; (*d*) to absorption of the fluid parts of swellings, *e.g.* resolution of inflammation; (*e*) or to calcification of a thrombus. In the last four instances, except in some cases of aneurism, the induration is accompanied with shrinking of the swelling. *Softening of a swelling* is due to (*a*) liquefaction of its solid parts, as in the formation and progress of an abscess, and in the disintegration of tumours; (*b*) to destruction of firm, resisting structures, as bone and fascia, as in the growth of central tumours of bone, etc.; these are attended with increased size; (*c*) or to lessened tension from absorption, as in serous and synovial effusions, etc.; this is associated with lessened bulk of the swelling, and indicates resolution of the swelling, and at once eliminates many forms of tumour.

III. **The position of a swelling** is a fact of great importance for diagnosis. By "position" is meant the regional localisation of a swelling, *e.g.* on the head, in the axilla, the back, the scrotum, the ham, etc. The possible affections of a region are limited in kind by the structures there existing.

(1) The position of a swelling is of *negative value*

in the exclusion of certain tumours. Thus, a swelling in the ham cannot be a strangulated hernia, or a spina bifida.

(2) It is also of great *positive value* in deciding the nature of a tumour, as examples of which I need only mention such cases as housemaid's knee, enlarged glands, varicocele, syphilitic ulceration, and enlarged testicle. The importance of this part of our subject is exemplified in the chapters devoted to the diagnosis of local affections.

IV. **The connections of a swelling,** by which is meant its relations with the individual component tissues and structures of a part, is a fact without which a diagnosis cannot be complete. While some pathological processes, such as inflammation, may attack any tissue, others, such as tumour and cyst formations, are limited to certain tissues and organs; and different varieties of inflammation are met with in different tissues.

The *connection of a tumour* is determined (*a*) by its exact *position*, as in psoas and lumbar abscess, extravasation of urine, tenosynovitis, bursitis, varix, etc.; (*b*) by *its shape*, corresponding to that of the structures affected, as in the case of synovial effusions. tenosynovitis, epididymitis, glandular enlargements, varix, thrombosis; (*c*) by its *adhesion* to one or more of the tissues of a part, as shown by the immobility of the tumour apart from the tissue or organ affected, and *vice versâ*; this is a sign of considerable importance and of wide application.

Nearly all the normal tissues of the body allow of a certain amount of movement one upon the other; muscles move over each other and over bones; the skin is movable over muscles, deep fascia, and, bone. The exceptions are in the case of the structures forming the scalp, the mucous covering of the hard palate, the gums, the teeth, the skin of the

palm and sole, the sheaths of muscles, and the periosteum, which are not movable over the subjacent parts. Adhesion of a swelling to a tissue may be *real*, as in the case of an exostosis, a gumma in muscle, or a wart on the skin; or it may be only *apparent*, as in the case of parosteal tumours, hydrocele, and fatty tumour, the swelling being so firmly bound down that it has no independent movement. The adhesion may be *primary*, the tumour actually springing from the tissue, as in the case of aneurism, sebaceous cyst, gumma, exostosis; or it may be *secondary*, occasioned only by the growth of the tumour, as in abscesses gradually reaching the surface, and in malignant tumours of all kinds, which, by their infiltrating mode of growth, become adherent to surrounding tissues as they enlarge. The adhesion or connection of a swelling with more than one tissue is an especial feature of inflammatory and malignant tumours.

Adhesion to the *skin* is sometimes obvious at a glance, as in the case of cutaneous warts. In the case of deeper swellings, it is to be tested by attempting to glide the skin over the swelling which is held fixed, and by pinching the skin up in a fold over every part of the surface. It must be borne in mind that a tumour of large size by mere tension considerably lessens the natural mobility of skin.

Connection with the *subcutaneous tissue* is shown by the mobility of the tumour under the skin and over the muscles, or other deeper tissues. The best example of such a tumour is the common lipoma, or fatty tumour. As the skin is normally connected with the subcutaneous fat by fine fibrous processes continuous with the dissepiments of the fat, such tumours show a slight dimpling of the skin over the tumour when it is pinched up.

Adhesion to the *deep fascia* of a part may be

determined by the mobility of a tumour over the subjacent muscle and under the skin, by its being less movable than a tumour in the loose subcutaneous tissue, and by its being fixed when the deep fascia is made tense, and more movable when it is relaxed.

Adhesion to *muscle* is detected by putting the suspected muscle in action, when the tumour will move with the muscle; and, further, by noticing that while the tumour is movable over bone, it is deeper than the skin and subcutaneous fat, and perhaps not adherent to them. The mobility of the tumour is much greater when the muscle is relaxed than when it is firmly contracted.

Adhesion to a *vessel* is diagnosed by noticing that the tumour, while movable over skin, muscle, and bone, is yet not freely movable along the line of a vessel, although it may be movable transversely.

The mobility of *nerve-swellings*, or neuromata, is characteristic; for while it is free in the direction transverse to the long axis of the swelling or of the nerve, there is no mobility in the length of the nerve. This is similar to what is observed in connection with vessels, but is more striking, as the mobility of neuromata in the transverse direction is greater than is that of aneurisms, thrombi, or phleboliths.

Adhesion to *bone* is determined by the immobility of the tumour apart from the bone. Apparent mobility of a fixed tumour may be caused by its elasticity, or by the mobility of structures over it, as, for example, in the case of an exostosis of the femur with a large movable bursa developed upon it. Care in examination will, of course, preclude error from either of these sources.

The adhesion of a tumour to *a gland*, *e.g.* the breast, is determined by seizing the gland in one hand and the tumour in the other, and attempting to move

one without the other. This sign is of great importance in the diagnosis of mammary tumours, particularly in the separation of simple and malignant growths.

The range of mobility of a swelling or lump may determine its position; as, for instance, in the case of a loose body in a joint, bursa, or the tunica vaginalis.

Mobility during certain acts may determine the connection of a tumour with some tissue or organ only moving them. A good illustration of this is the rise and fall of a goître during deglutition.

V. **The consistence of a tumour** may be uniform or varied; it is important to distinguish between gaseous, liquid, and solid swellings. Gas may be present in a tumour (*a*) being contained in one of the gas-containing viscera (lungs, stomach, intestines), as in pneumatocele and hernia; or (*b*) having escaped from one of these viscera, as in cutaneous emphysema; or (*c*) having arisen from decomposition, as in some cases of moist gangrene. In gangrene the *bubbles of gas may be seen* in the superficial bullæ and veins. Where the gas is contained in the connective tissue spaces it gives a *fine dry crackling* sensation, and the swelling yields when compressed; this is best observed in subcutaneous emphysema, and is less well shown in some cases of moist gangrene. Where the gas is mixed with liquid, its manipulation gives *a gurgling sound*, which is often perceived in the reduction of a hernia. But the most important physical sign of the presence of gas is a *tympanitic percussion note;* this is only obtained when the gas is present in sufficient proportion, as in pneumatocele, subcutaneous emphysema, tympanites, and enterocele.

The presence of fluid in a tumour is determined by one of three signs, fluctuation, fluctuation wave, and pitting on pressure. As these are signs

of much importance, special attention must be devoted to them.

Fluctuation is the name sometimes given to two distinct impressions, which should be distinguished as "fluctuation" and "fluctuation wave." To observe "fluctuation" place the balls of the fingers gently but firmly on one side of the swelling, and then with the fingers of the other hand gently press into the tumour; if the tumour be felt to rise under the fingers of the first hand it is due to the presence of fluid, and this sensation is *fluctuation.* The precautions to observe in reference to this sign are: (*a*) always to use two hands; the manipulation should never be conducted with the fingers of one hand only, as it is then very liable to mislead; (*b*) to be careful to fix the tumour with one hand, so that the pressure of the other does not move it *en masse*, but, if liquid, merely displaces a part of its contents; the unpractised observer may easily mistake mobility of a tumour for fluctuation, unless this error be guarded against; (*c*) one hand only should be used to compress the tumour, the other being placed immovably on the swelling; if the two hands are both moved, errors are very easily made; there is, of course, no objection to alternate the hands, but there is no possible advantage in so doing; (*d*) fluctuation should always be obtained in at least two different directions across a swelling; in collections of fluid the displacement occurs equally in all directions; in some solid tumours a sense of fluctuation may be obtained in one direction only, but not in more than one, as across muscle, for example; in narrow elongated collections of fluid, as in tenosynovitis, it may be difficult or even impossible to obtain this sign across the swelling, owing to its narrowness; (*e*) care must be taken not to mistake mere elasticity or compressibility for a sense of fluctuation; this is best avoided

by noticing that the sign is detected by the stationary hand, not by the compressing hand, and it is not the fact that the tumour yields to pressure, but that its contents are displaced and press up the other hand, that constitutes fluctuation. It requires practice and skill to detect fluid in small quantity or at a considerable depth, and where doubt is entertained it should always be removed by puncturing the swelling with a grooved needle, or, better, a syringe.

It may be well to enumerate the errors that may be made in connection with this very important sign.

The surgeon may fail to obtain the sense of fluctuation

(1) Because of the great depth of the fluid;
(2) Because of the small size of the swelling rendering the manipulation very difficult;
(3) Because of the extreme tension of the fluid;
(4) Because of the extreme lack of tension of the fluid.

He may wrongly suppose that he obtains the sense of fluctuation

(1) If the tumour be very elastic;
(2) If the tumour be very soft;
(3) If the tumour be very movable.

For the diagnosis of fluctuating swellings *see* pages 290 *et seq.*

If the fluid of a tumour contain numerous small solid bodies, the displacement of these in obtaining fluctuation may give rise to a very characteristic kind of *fremitus*. This sign enables the surgeon to detect the presence of "melon-seed bodies" in "ganglion." In some cases of hydatid tumour, if the left hand be placed on the swelling and percussed with the right, a fine thrill or fremitus is perceived (called the *hydatid fremitus*), which is attributed to vibrations set up by the impact of the daughter cysts in the mother sac. On listening over a hydatid tumour

when thus percussed a musical sound may sometimes be perceived.

A fluctuation wave is obtained in cases of large collections of fluid, with more or less tense walls, as in unilocular ovarian cyst and ascites. It is obtained by placing the palm of the hand smoothly over one side of the swelling, and then sharply tapping the opposite side of it with a finger or fingers of the other hand, when a distinct wave may be felt, as it were, to strike the palm. This sign should be obtained across more than one diameter of the tumour, and care should be taken not to mistake a mere impulse or wave conveyed along the covering of the tumour for a wave transmitted through it; the former is never such a sharp abrupt impulse as the true fluctuation wave, but it may be entirely eliminated by gently pressing upon the coverings somewhere between the two hands. In the case of the belly this is usually done by getting an assistant to press the edge of his hand on the walls between the hands of the surgeon, and so interrupt any wave passing that way. The character of the fluctuation wave differs somewhat with the consistence of the fluid transmitting it, and so affords some criterion of its nature.

Pitting on pressure.—If, on pressing a finger into a swelling, it yields under it and leave a pit which is gradually filled up again when the pressure is removed, the phenomenon is known as "pitting on pressure." This is due to fluid or gas infiltrating the cellular tissue; when fluid, the swelling is dull on percussion and the pitting is unattended with any other sensation; when due to gas it may be tympanitic on percussion, and it gives a fine crackling sensation to the finger, as already mentioned (page 254); a gaseous swelling is also more elastic than fluid. This condition of fluid infiltration of cellular tissue is known as *œdema*. It may also be recognised, but not so surely,