

the part is raised, they at once empty themselves, either wholly or in part. This is, in a measure, due to the action of gravity, and also to the fact that the arterial blood supply to a part is increased by depressing it, and *vice versa*. For this latter reason, aneurisms of the limbs become tenser and fuller when depressed. Some herniæ slip up and down, with alterations in the position of the patient.

It must be observed that œdema may be greatly modified by or only appear in the dependent position. When this is the case, the œdema is certainly passive. It is a well-ascertained fact that vaginal hydrocele may be fuller in the evening than in the morning, although entirely irreducible, the effect being due, it is supposed, to increased exudation during the day. In both these cases, however, the changes take place slowly.

Position has a still further influence upon tumours, due to the altered tension of muscles and fasciæ accompanying changes in position of the limbs. A typical illustration of this is seen in the case of effusion into the bursa between the tendon of the semimembranosus and the inner head of the gastrocnemius. When the knee is flexed, these muscles are lax, and the swelling partially or wholly disappears, the fluid bulging the sac towards the space of the ham; but when the knee is extended, these two muscles are tightly stretched and compressed one over the other; the fluid is driven from between them and distends the superficial part of the bursal sac, causing a prominent swelling behind the inner part of the knee.

(2) *Pressure*.—When exerting pressure we are enabled to judge of the amount of resistance to reduction, to note the manner of reduction, whether sudden or gradual, and any special accompaniments of the process. Venous tumours are always very rapidly reduced by pressure; other fluid tumours, such as

hydrocele and abscess, are steadily reducible, and whether rapidly or slowly depends upon the size of the aperture for reduction and the amount of resistance in the cavity into which they are reduced. If the contents of the tumour be fluid containing numerous small solid particles in suspension, a fine thrill, or sense of friction, is detected by the finger during reduction.

Solid tumours go back with an appreciably sudden motion recognised as a "slip;" while the reduction of intestine is often accompanied by a gurgle. By the use of pressure, too, we are able to judge of the completeness or incompleteness of the reduction, as in the case of partially reducible hernia, or reducible hernia conjoined with an irreducible hydrocele. By following up the reduced swelling, we may generally ascertain with the finger the aperture through which reduction has taken place. Pressure is employed in yet another way, by making it circularly round a limb, or preferably to individual blood-vessels above or below a swelling, and noting its effect. Pressure on the cardiac side of a varix, unless so applied as to cut off the arterial supply to a part, causes the swelling to become fuller; whereas, if a varix be emptied and then pressure be applied to the vein below, it does not refill. Pressure on an artery feeding an aneurism causes a partial shrinking of the swelling, and if applied to the artery below the sac may lead to its increased tension; and further, when the artery leading to an aneurism is compressed, pressure upon the sac causes its reduction. (*See pages 299 et seq.*)

(3) *Effort* or strain causes distension of tumours which consist of the contents of the abdomen or thorax, and of those which are influenced by obstruction to the venous circulation. The production of, and especially the filling out, or impulse, in a hernia during effort, strain, or coughing, is one of its most characteristic symptoms; a similar impulse is observed

in congenital hydrocele, in some tumours of the cord, in psoas and iliac abscess, and in pneumocele. The increased tension of tumours produced by the venous obstruction attendant upon straining efforts is particularly seen in venous nævi, varicocele, and in spinal or cranial meningocele and hernia cerebri, where the venous congestion in the spinal or cranial cavity presses out into the tumour more of the cerebro-spinal fluid. It is important to distinguish a true *impulse*, or filling out of a swelling, from a mere thrust forwards of a tumour or *displacement*. (See page 297.)

XII. The pressure effects of a tumour are always noteworthy, and they sometimes aid in the diagnosis. Reference has already been made to venous engorgement below aneurisms and other tumours compressing main veins. Neuralgic pains may be produced by similar compression of the popliteal or other sensory nerves, an interesting example of which is pain along the obturator nerve, felt in the knee, from the compression of the trunk of the nerve by an obturator hernia; here this symptom is of considerable diagnostic importance. Among other pressure effects of tumours must be mentioned muscular spasm and paralysis, of great importance when occurring in the larynx, and the gradual absorption of surrounding structures, even bone. They are of diagnostic value in indicating the position and relation of the swelling, as in the case of a popliteal aneurism, and also as showing the aggressive nature of a neoplasm, as in cases of tumours of bone.

XIII. Concomitant affections are frequently of special value in the diagnosis of tumours. This association may be twofold. Tumours may accompany other lesions produced by the same disease, both resulting from some common cause; the best examples of this are found in syphilis, where the existence of

the characteristic ulcerations of the skin or mucous membranes, or of the tongue, nodes, necrosis of the bones of the nose or of the skull-cap, etc., greatly simplifies the diagnosis of a gumma. The association of exophthalmos with goitre, and the coincident enlargement of many groups of glands, aids in the diagnosis of Graves' disease or of adénie; and the presence of tubercular disease of the lungs may simplify the diagnosis of a strumous testicle. In other cases, the tumours are secondary to the local affections; this association is still more common, and still more useful for purposes of diagnosis. As examples of this may be mentioned particularly glandular swellings, such as those in the groin from an abrasion on the foot, soft chancre, urethritis, soot-wart, epithelioma of penis; those in the axilla from inflammation or carcinoma of the mamma; those in the neck from pediculi capitis, otorrhœa, tonsillitis, facial chancre, epithelioma of lip, tongue, or larynx. Another example is furnished by the association of chronic epididymitis, or of perineal abscess with stricture of the urethra.

XIV. Puncture of the tumour, with a view of removing some of the contents for examination, often determines its nature in cases which otherwise would be obscure. Where the tumour is supposed to be fluid, it may be tapped with a grooved needle, or a fine trocar and canula, and a syringe or aspirator may be attached to this with advantage. A grooved needle often suffices, but in deep collections of fluid, the solid tissues through which it passes may press into and block up the groove, and for this reason an exhausting syringe is much to be preferred. In the case of ulcers or ulcerated tumours, the surface should be cleaned and gently scraped with a clean knife, and the scraping so obtained may then be examined microscopically in a drop of glycerine or saline solution. Where the tumour is solid and not ulcerated,

a harpoon may be introduced, by means of which a small fragment of the tissue can be removed, and examined microscopically.*

The fluid removed should be tested microscopically and chemically. In withdrawing fluid from any swelling, not only is the nature of the fluid to be investigated, but also its mode of escape, and the effect of its withdrawal upon the tumour.

Pus will be recognised by its colour and opacity, and by the presence of very numerous globular nucleated granular cells. It may be of the nature of thick pus, curdy pus, sero pus, etc. A peculiar penetrating and very offensive odour, quite *sui generis*, indicates that the pus is connected with *necrosed bone*. This odour is especially observed in connection with necrosis of the lower jaw and of the teeth. A *fecal odour* indicates that the abscess has formed close to the alimentary canal, as around the cæcum or rectum. Where the abscess communicates with the bowel, the pus not only smells fæculent, but contains fæcal matter mixed with the pus. The pus from an *urinary abscess*, whether renal or urethral, may smell urinous, and show the characteristic test of urea. (See page 161.) A brown colour, when not attended with a fæcal odour, indicates an admixture of broken-down blood with the pus, as in a *suppurating hæmatoma*. The pus formed in connection with caries or necrosis of bone, when chemically examined, shows the presence of bone salts, even to the extent of 2 per cent.

Milk, when concentrated, may closely resemble pus. When allowed to stand a layer of cream rises to the top; under the microscope, the characteristic molecular basis, fat particles and globules, and large cells full of fat in fine division, are characteristic.

* For the microscopical characters of the various tumours, the reader is referred to Pepper's "Manual of Surgical Pathology."

When mixed with pus, the smaller pus-cells are also present.

Blood is recognised by its colour, by the well-known red corpuscles it contains, by its spontaneous coagulability, and by its characteristic spectrum. By the rapidity with which it flows some estimate may be formed of the vascularity of the tissues pierced, and if it flow out forcibly and in a jetting stream, it is evident that an artery or an aneurism has been perforated; the colour of the blood may indicate whether the vessels opened are arterial or venous; the blood in the capillaries is bright in colour like that in the arteries. The escape of blood in any quantity indicates either that very vascular tissues, such as tissues acutely inflamed, soft sarcomata, carcinomata or nævi, or some larger blood-vessel has been punctured. If the tissues be acutely inflamed a drop of pus may be detected in the blood; if the needle or trocar have pierced a soft neoplasm some of its cells or distinct shreds of the growth may be recognised among the blood corpuscles.

Altered blood is recognised by its darker colour, sometimes brown, at others black; by its non-coagulability; by the corpuscles being converted into shrunken granuled *débris* (perhaps unrecognisable); and by the spectrum being that of methæmoglobin.* Such blood is obtained from old hæmatomata, hæmatocèles, and blood extravasations into tumours.

Where the *blood is withdrawn from the circulation* no alteration in the bulk of the tumour is produced, but when a *circumscribed collection of blood* is tapped some lessening of its bulk or tension may be noticed.

Cystic fluid varies greatly in its characters. It should be examined microscopically for any formed elements, such as cells, hooklets, hairs, spermatozoa, or

See Ralfe's "Clinical Chemistry," page 77.

crystals of cholesterine and fatty granules; and chemically for albumen, mucin, urea, chloride of sodium.*

If the fluid be clear, free from formed elements, and the addition of silver nitrate to it show the presence of traces of chloride of sodium, while on boiling it gives but a slight precipitate of albumen, it is what is known as *serous fluid*; or the fluid from a *serous cyst*.

If the fluid be quite clear and watery, but become opalescent on standing, is alkaline in reaction, give no precipitate of albumen on acidulation and boiling, but a dense precipitate with nitrate of silver, it is probably *hydatid fluid*, and if the microscope reveal the presence of echinococcus hooklets in it, the diagnosis is certain.

If the fluid be clear or slightly turbid, viscid, and yield an abundant precipitate of mucin on the addition of acetic acid, it shows that it was obtained from a *mucous or synovial cavity*, and the position of the tumour will at once enable the surgeon to distinguish between these two.

Fluid removed from tumours of the head or back should be examined for sugar, by Fehling's, or some similar test, as the detection of sugar in such fluid would show it to be *cerebro-spinal fluid*, provided that the patient were not the subject of diabetes, when any of the fluids of the body may contain sugar. To examine a fluid for *urea*, nitric acid should be added to it, and the mixture evaporated, when crystals of nitrate of urea may be recognised under the microscope in the form of shining colourless rhombic plates.

If the fluid be turbid and contain shrunken epidermic scales, cholesterine crystals and granular fatty matter, it has been removed from a *sebaceous*

* For full details as regards these fluids the reader is referred to Ralfe's "Clinical Chemistry."

cyst. But if such a fluid be found acid in reaction, and hairs be seen in it, it shows the cyst to be a *dermoid cyst*; the contents of such cysts vary much; as a rule they are more fluid than those of sebaceous cysts.

If the fluid removed have the appearance of oil and solidify when cold, and again melt on the application of heat, and be entirely soluble in ether, it has been removed from an *oil cyst*, which is probably a variety of dermoid cyst. (For *Spermatic cysts*, see page 517.)

The withdrawal of a notable quantity of fluid from a tumour may cause its entire disappearance, showing it to be simply a collection of fluid; or it may cause a general and uniform diminution of the tension of the swelling, showing the tumour to consist of a single fluid-containing cavity; but if it lessen the tension or cause the collapse of one part only of the swelling, it shows that the collection of the fluid tapped is but a portion of the entire mass; the remainder may be of similar nature as in compound cystic tumours, or solid. Tapping a swelling may permit the detection and examination of parts of the tumour which were before inaccessible, as *e.g.* in tapping a hydrosarcocele, or when, after tapping an ascitic belly, cancerous masses in the omentum are felt. It is well, therefore, to remember the twofold object of exploratory puncture of tumours from a diagnostic point of view.

XV. **The age of the patient** is of importance in the diagnosis of tumours. In *infancy* we meet with congenital tumours of all kinds, such as *nævi*, dermoid cysts, cystic hygroma, spina bifida, meningocele, and encephalocele; swellings resulting from congenital malformations, such as hernia and hydrocele; swellings due to inherited syphilis or to rickets, and occasionally with fatty tumours and sarcomata. In *childhood and youth*, glandular enlargements, abscesses

acute and chronic, and cartilaginous and bony tumours are most common. In *early adult life*, syphilitic and venereal affections, traumatic and inflammatory swellings, together with fatty, mucous, and fibrous tumours prevail. And *in late adult life*, malignant tumours of all kinds, and other senile swellings, such as those of rheumatoid arthritis and hydrocele become common. Age is of most direct value at the two extremes, in aiding the diagnosis of congenital tumours and of malignant tumours.

XVI. **Sex** seems to have little or nothing to do directly with the etiology, and therefore the diagnosis of tumours, apart from the affections of the organs peculiar to the two sexes. Aneurisms, with the exception of those of the carotid artery, and cancer of the lips and tongue, are much more frequent in men than women, but this is probably not due primarily to sexual difference. A case in point, however, is afforded by the much greater prevalence of femoral hernia in women than in men.

XVII. **The previous history** of the patient may aid in the diagnosis of tumours. In diathetic diseases such as struma and syphilis, evidence may thus be obtained of the existence of those diatheses. In the infective diseases, such as sarcoma and carcinoma, light may be thrown upon the nature of a secondary tumour arising after the removal of the primary focus of disease; thus, where a cancerous tongue has been excised, a progressively enlarging gland in the neck will not be mistaken for a strumous gland or some other simple tumour.

CHAPTER XVI.

DIAGNOSIS OF GENERAL TUMOURS.

HAVING in other chapters treated of the diagnosis of fluctuating and pulsating swellings, of swellings connected with bone, and of swellings of special regions, it remains for us here to speak of those swellings which have not these particular features, and which occur more or less generally over the body. In investigating such tumours, the first point to be determined will be the *history* of the growth, especially whether *congenital* or *acquired*; if the latter, whether *traumatic* or *idiopathic*; and if idiopathic, whether accompanied by signs of *inflammation* or not; in any case, whether it is *stationary*, *continuously progressive*, or *receding*.

Then the surgeon should examine the swelling, and first of all notice *to what structures* it is *adherent* (skin, superficial fascia, muscle, gland) and its degree of adhesion to or mobility in these; whether it have a sharply marked *outline*—and if so, the character of its edge—or gradually fades off into the healthy parts around. Then observe its *consistence*, whether hard, firm, soft, or gelatinous, whether *compressible* or not, and if it fill out and become more tense on strong expiratory efforts, and particularly whether the surface be *smooth* or *lobulated* at any part; in some cases the colour of the swelling is characteristic. If the skin be ulcerated over the tumour, the characters of the ulcer will of course attract attention. Then the surgeon should feel the lymphatic glands connected with the swelled part, and notice whether