On the anterior aspect of the scrotum there was an irregularly oval area about 2 in. by 1 in., raised above the level of the healthy skin. The surface of this area was red, smooth, and devoid of skin; the edges were rounded and thickened, and in some places actually overhanging, so as to cause a definite sulcus round the mass. Towards the centre of the area there was a smooth, round, whitish nodule about $\frac{1}{2}$ in. round. The whole mass was very hard and quite painless. There was no glandular enlargement to be made out on palpation.

On the legs were two or three small warts; only the dorsum of the foot showed very thin, rough, scaly skin.

Operation.

Operation was performed on October 21st by Mr. Perrin. The growth was removed with a wide margin; the inguinal glands were not touched. The patient made a good recovery.

Histology.

A portion of the growth was sent to the Clinical Research Association; the report on it is as follows: "This growth is a rather atypical squamous epithelioma. It is composed of ingrowing masses of epithelial cells, which infiltrate the tissues and cause a marked round cell tissue reaction. There are no cell nests nor keratinoid changes."

The interesting features of the case are the family history, the condition of the skin, and the previous tumour. With regard to the previous tumour, the patient must have had two primary cancerous growths at the same time, as he says he was aware of the nodule under the skin of the scrotum whilst at Guy's Hospital, but considering it of no importance did not mention the fact.

The literature on the subject conveys the impression that sweeps are not unusually liable to develop cancer on parts of the body other than the scrotum; but it is interesting to notice that of the five growths which occurred in these four sweeps three were not on the scrotum. The patient said that a neighbour of his, who was a sweep, had his ear removed on account of cancer.

Amongst the theories which have been put forward to account for the phenomena of cancer growth as a result of soot irritation, there is one which attributes the new growth to the presence in the soot of a powerful deoxidizing chemical, such as sulphurous acid. If this be the true explanation it brings sweep's cancer into line with cancer in other situations, for it is fairly obvious that cancer tends to arise in those tissues which from any cause lack a good supply of oxygen. To take examples: Cancer arising in scar tissue is by no means uncommon; cases are met with in the scars left by burns or disease, such as lupus; scar tissue in the cervix uteri is very frequently the seat of carcinoma; scars of gastric ulcers are liable to the disease. Again, cancer of the lip and tongue is always preceded by an overgrowth of fibrous tissue from chronic irritation, and this results in a deficient oxygen supply; in the same way cancer will occur in a gall bladder which has been subjected to chronic irritation from gall stones. Cancer develops in the sigmoid flexure of the colon after prolonged irritation of hard faecal matter, which must induce a fibrous overgrowth. In the breast fibrous tissue replaces secreting tissue, and the resulting tissues are but poorly supplied with oxygen.

Primary growth in the lung, where oxygen abounds, is extremely rare; growth in the liver, which receives a large proportion of venous blood, is usually extremely rapid. Fatty tissue, which at no time of life is richly supplied with blood, is liable to give rise to fatty tumours at any age; whereas it is only when the nutrition of the skin and mucous membrane is becoming impoverished as regards oxygen supply, on account of changes due to degeneration of the vessel walls, that tumour growth in the epithelium is met.

If the organism of cancer were demonstrated, and if it were shown to have anaërobic tendencies, the explanation of the predisposition of fibrotic tissues to new growth

would become somewhat more easy to understand. The researches of Smith and Townsend, of Washington,¹ have clearly demonstrated a bacterial origin for the crown-gall of plants, and this is a pathological condition which has the very closest similarity to animal tumour growth, even as regards the occurrence of metastatic growths. The organism was successfully cultivated only after repeated failures. It was found that the organism is scarce in the tissues, that it takes a very long time to appear on a culture plate, but that, when isolated, it very easily gives rise to new growths on inoculating the tissues of the plant. This suggests that the reason why the cancer organism has not been demonstrated in the tissues is because of the small number present; it also suggests that the causes which hitherto prevented the cultivation of the crown-gall organism may be the same causes which prevent the isolation of the cancer organism.

Might it not be that the inoculation experiments with crushed cancer tissue fail because they are not carried out in tissues predisposed to cancer infection?

This view that cancer always arises in tissues deprived of a full share of oxygen and is probably due to an organism, is very easy to criticize. Nevertheless, it attempts to explain the relation of age and chronic irritation to new growth, and in this respect very many cancer theories are found wanting.

REFERENCE.

¹ *Crown-gall of Plants: Its Cause and Remedy.* By E. F. Smith, N. E. Brown, and C. O. Townsend, United States Department of Agriculture, Washington, February, 1911.

THE TUNING-FORK AND STETHOSCOPE IN THE ESTIMATION OF ABDOMINAL AND THORACIC VISCERA.*

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For some years I have used the tuning-fork-stethoscope method in preference to, or along with, palpation and percussion when attempting to outline with precision such organs as the liver, spleen, stomach, caecum, heart, etc. My desire, in the first instance, was to ascertain more accurately than is possible by percussion and palpation the area occupied by the liver and spleen, as these are the chief solid organs affected by tropical diseases; but I found that the hollow viscera also—the stomach, the caecum, etc.—lent themselves to the tuning-fork-stethoscope method of ascertaining their dimensions.

I extended the use of the method to the organs of the chest, and found that several conditions were more precisely ascertainable by this than by the methods of diagnosis in use heretofore. To gauge the exact area occupied by the liver, for instance, by percussion alone can never give results more than approximately accurate, whilst at times it is difficult, and occasionally impossible, owing to pain, distension, etc., to define its outline with any degree of precision. Palpation is applicable to the lowest strip and border of the liver only, and even in the healthy state it is often a matter of opinion rather than an actual clinical fact where its lower border really ends. When, on the other hand, the liver is widely adherent or tender; when the abdomen is tense from distension, or ascitic fluid is present, the lower limit of the liver is still more obscure.

* Being an account of a demonstration at the London School of Tropical Medicine to members of the International Medical Congress, August, 1913.

The principle involved in the use of the tuning-fork-stethoscope method is that when the stethoscope is placed over an organ, be it a solid organ such as the liver, spleen, heart, etc., or a hollow organ such as the stomach or caecum, and the vibrating tuning-fork is applied on the surface of the body over one or other of these organs, the note of the tuning-fork manifests by its loudness the limit of the organ under examination, and the moment the

chest wall, just above the lower right true rib cartilages, and about 1 in. behind a line drawn downwards from the right nipple (see Figs. 4, 5, etc.). The tuning-fork is now made to travel from the region of the chest midway between the sternum and the nipple line (Fig. 4) downwards over the liver. The note heard when the tuning-fork is over the lung is faint and distant, but the moment it reaches the area of the liver the note is loudly heard, and in turn when

Fig. 1.—Examining liver in front of axillary line, standing on right side of patient.

limits are passed the note becomes faint, distant, or inaudible.

The Tuning-fork.

I have tried many forms and kinds of tuning-forks, some high pitched, some low pitched, some forks with flattened or button-shaped ends, and some with narrow ends. The best results are obtained by a fork made for me by Messrs. Mayer and Meltzer. Its note is G sharp, and the end of the stem of the fork is not flattened, but has a rather narrow, blunt end. The fork may be set vibrating by striking it against anything hard—the heel of the boot if nothing else is available—and whilst loudly vibrating the end or stem is pressed lightly but firmly on the skin. A tuning-fork with an arrangement attached whereby a hammer is made to strike the end of one of the prongs is convenient, but not at all a necessary arrangement.

The note heard when the stethoscope is placed on the skin over any one of the organs mentioned and the tuning-fork is applied seems to proceed from the point

Fig. 2.—Examining liver in axillary line, standing on left side of patient.

where the fork impinges on the skin; but when the fork passes from off the organ over which the stethoscope is placed, the sound not only becomes fainter, but it seems to proceed from the free or distal end of the fork and *not* from the point where it touches the skin. By a little practice this peculiarity becomes a useful adjunct to the mere loudness or faintness of the sound in the matter of diagnosis.

The practical application of the tuning-fork-stethoscope method as applied, say, to the liver is as follows: Place the stethoscope (binaural) on the lower part of the right

Fig. 3.—A tuning-fork with hammer attached.

the lower limit of the liver is reached, and the tuning-fork has other abdominal organs beneath it, the sound suddenly fades away to a faintly distant hum. The degree of pressure necessary varies. Over the chest the end of the fork has only to be gently held against the skin, but when a careful examination has to be made to gauge the limit of the lower edge of the liver, as in stout people or in cases of distension from gas in the intestine or fluid in the peritoneal cavity, the fork has to be pressed fairly deeply at times, so that the piece of intestine may be pushed aside or the fluid between the abdominal wall and the liver displaced.

Fig. 5 shows the application of the tuning-fork over the heart, liver, and stomach, and it is at once evident from the diagram that along the middle line of the body the loud sounds are over the liver, and the faint sounds are over the heart above and the stomach below.

The upper and lower limits of the liver may be quickly and accurately ascertained by rapidly passing the tuning-fork all round its presumed border, when any divergence from the regular outline is at once perceptible, and discrepancy between the relative sizes of the two sides of the liver at once brought to light.

Fig. 4.—Liver, vertical dimensions: s, stethoscope; •, tuning-fork loudly heard; o, tuning-fork over lung and gastro-intestinal tract faintly heard.

Fig. 5.—s, Stethoscope applied; •, loud notes over liver; o, faint sound over heart and stomach.

Liver and Splenic Enlargements.—At times it is well-nigh impossible by palpation or by percussion to know where the enlarged liver ends on the left if the spleen happens to be enlarged as well, and vice versa, for the two organs may be actually in contact. The tuning-fork-stethoscope method at once settles the point; for if the stethoscope is placed over the liver the sounds will be practically inaudible when the spleen is beneath the tuning-fork; similarly, when the stethoscope is placed over the enlarged spleen, the tuning-fork, when super-

imposed over the liver, is inaudible or but faintly heard (Fig. 6).

An effusion into the pleura is at once detected by the tuning-fork. As the diagram explains, the tuning-fork is heard only over the liver when the stethoscope is superimposed over that organ, and but faintly heard, or is wholly inaudible, when it is applied over the lung, over the seat of the effusion into the pleura, and over the abdominal contents below the liver. This is a fact of great clinical assistance, for neither by percussion, palpation, nor by auscultation can it be positively diagnosed whether the dullness and absence of breath sounds is due to effusion into the pleura or is due to the liver being pushed upwards towards the lung by abdominal distension, etc. In the same way a congestion of the base of the

Fig. 6.—When liver and spleen touch. s, Stethoscope over liver distinguishes—• loud sounds over liver; and, o, no sounds heard over spleen.

right lung—a not uncommon feature in the tropics—is readily distinguishable from congestion or inflammation of the liver (Fig. 7).

Passing from the solid viscera to a hollow viscus—the stomach—it will be found that the tuning-fork answers true, for by this method the dimensions of the stomach

Fig. 7.—Effusion into pleura. s, Stethoscope; Tract of tuning fork from lung to abdomen; • loud sounds; o, faint sounds.

Fig. 8.—With stethoscope placed anywhere over stomach. • Loud sounds heard; o, faint sounds heard.

are definable with precision; the writer has tested the accuracy of the method in question with that of x-ray examinations, whether by screen or photographs, and finds the tuning-fork is as accurate as the x-ray findings (Fig. 8).

The dimensions of the caecum can also be accurately told, and the difficulty at times to be certain whether an apparently movable caecum is not really a movable right kidney is at once settled. The track of the large bowel can also be followed for some distance, for when the stethoscope is placed upon the caecum the vibrating tuning-fork can be heard as it is carried along the ascending colon and across the body along the transverse colon as far at least as the middle line. In various abdominal, pathological, and other conditions, the tuning-fork method of diagnosis may be of service, and has proved so in the writer's hands. The dimensions of a pregnant uterus, of an ovarian cyst, of a large uterine fibroid, etc., can be readily gauged by the tuning-fork-stethoscope method.

In fractured bones the method under discussion is also applicable. When a thigh bone or any of the large bones of the limbs are fractured anywhere along the shaft, the stethoscope placed over one end, say over the great trochanter of a fractured femur, the vibrating tuning-fork placed on the lower end of the bone, just above the knee, cannot be heard so well as on the femur of the sound side. A fractured rib can also be recognized from its intact neighbours, and when the stethoscope is placed far back on the shaft and the tuning-fork far forward, it is easy to detect the difference between the note in the fractured rib or ribs and the sound given out by the ribs above and below. A doubtful fracture of the sternum or of the collar bone can be detected in a similar manner.

The dimensions of the heart, and its relation to the lungs, can be readily gauged when the stethoscope is placed on the chest over the cardiac area and the tuning-fork is made to pass in various directions over the area occupied by the lungs around the heart.

I have been making observations on the different tones which seem specific to different affections of the liver; that a fatty liver conducts sound less loudly than a cirrhotic liver is certain, and so with other ailments, but the evidence is not sufficiently advanced to tabulate the sounds peculiar to each condition.

When applying the tuning-fork it is better not to drag it along the skin, but to raise it and "dab" it on the skin at short intervals. As the limits are made out they may be marked by a pencil in the usual way.

EPIDEMIC CERVICAL ADENITIS WITH CARDIAC COMPLICATIONS.

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DURING the autumn and early winter of 1912 I saw several cases of tonsillitis, accompanied by unusually tender cervical glands, but not by any other complications so far as I remember. Convalescence was very slow, and I accounted for their unusual severity by calling them influenzal.

In the middle of January, 1913, a young lady came from Hastings to stay at my house, and almost at once developed tonsillitis, with swollen and tender cervical glands. My daughter was attacked a day or two later; a few days after I developed the same condition, with, in addition, very troublesome subacute laryngitis, and it was some weeks before I felt quite well. Later in January I saw two more cases, similar in all respects, and equally tedious. In February I was called to see a man, aged 40, who had just come down from Sheffield.

CASE I.

This patient had a temperature of 102° F. and a sore throat, accompanied by swollen and very tender cervical glands, and was feeling very ill. A few days later a diphtheria-like growth appeared in both tonsils, and spread to the pillars of the fauces and the soft palate. I felt sure the case was not one of diphtheria, and sent a swab from the growth to Dr. Collins, who reported: "Streptococcus; no Klebs-Loeffler bacillus." Two days later Dr. Collins saw the case with me, and took a specimen, the examination of which confirmed the result of the first. Dr. Collins prepared a vaccine, and I inoculated the patient several times, but the entire diphtheria-like growths came away just before I injected the first dose. The patient was three weeks before he could leave his bed, and several more before he recovered his strength. The heart sounds were feeble, and occasionally intermittent, but there was no dilatation and no bruit. The urine was normal throughout.

CASE II.

My next case was a lady, aged 40, who had slight tonsillitis and a few rather enlarged, very tender glands. In a week or two a mitral murmur had developed. After many weeks she quite regained her strength, but did not quite lose the murmur. She was much weaker than could apparently be accounted for by the disease; and I tried to satisfy myself by saying that she had had an influenzal throat.

By this time I had heard that Dr. Kirkland considered these cases, of which he had seen several, to be instances of a new disease. Cases began to multiply, and I had six in one house. I realized that they were astonishingly like one another, but not quite like anything else I knew, and that they were infectious and bred true.

CASE III.

A boy, aged 9, at school, had an attack early in May. The right tonsil was swollen and congested, the inflammation spread over the anterior and posterior pillars of the fauces, and the cervical lymphatic glands on the same side became so enlarged that the case looked like a severe attack of mumps. The glands enlarged were the parotid and submaxillary lymphatic glands, and a gland which I shortly began to observe was almost unvaryingly enlarged in these cases, as it also is occasionally in other tonsillar troubles. It lies in the angle where the facial vein opens into the internal jugular, and when enlarged is easily felt a fingerbreadth below the angle of the jaw. I will speak of this as the jugulo-facial gland; Kuttner calls it the *Haupt-ganglion*. The boy had a temperature varying