

on the same modifications as that of the bladder under similar circumstances.

The uterus after it has emerged from the pelvic cavity, and the bladder when it is fully distended with urine, both give a dull sound to percussion, and may possibly therefore, though this is highly improbable, be mistaken for each other; but the diagnosis presents no real difficulty as the vesical swelling rapidly disappears on passing a catheter and drawing off the retained urine, while the enlarged uterus gives to palpation a feeling of increased resistance which is quite distinctive.

## AUSCULTATION OF THE ABDOMINAL ORGANS.

THE phenomena observed on auscultating the abdominal organs pertain, with the exception of the sound heard over the uterus in the later stages of pregnancy, almost exclusively to the digestive apparatus; they are constant in only a few isolated pathological conditions, and are as a rule merely accidental and irregular in occurrence, though at times they may also be produced at will. A *methodical* application of auscultation in the examination of the abdominal organs is thus scarcely practicable; it is employed as a means of diagnosis only occasionally, therefore, when dealing with affections which are known to present signs appreciable by auscultation. It is of importance, however, to be acquainted with the various sounds which originate in the gastro-intestinal canal, as certain of them reach the ear when auscultating the lower part of the thorax and the cardiac region, where they sometimes accompany and modify the respiratory murmur and the heart-sounds and murmurs in such a way as to prove perplexing to the inexperienced examiner, who is apt to consider them as sounds actually developed within the chest.

### AUSCULTATION OF THE ŒSOPHAGUS.

This method of examination, recommended strongly by Hamburger as an aid to diagnosis in diseases of the œsophagus, is based on the circumstance that the act of deglutition, whether the substances swallowed be fluid or solid, is attended by the production of certain characteristic sounds in the upper part of the alimentary tract.

The cervical part of the œsophagus is best auscultated by placing the stethoscope on the left side of the neck, close to and behind the trachea, at any point between the hyoid bone and the supraclavicular fossa; murmurs arising in the thoracic portion are most readily recognised close to the left side of the spine, from the level of the last cervical to the eighth dorsal vertebra.

In normal conditions there is heard in the cervical portion of



the œsophagus a ringing gurgling sound when fluid is swallowed; a similar sound, but weaker, is audible over the thoracic part. In *stenosis* of the œsophagus, when the constriction is so great that even fluid passes slowly and with difficulty, it is sometimes noticed that below the stricture the sound follows deglutition at an abnormally long interval and is also to some extent enfeebled, but these signs never occur with such regularity or constancy as to enable one to determine the precise point at which the canal is narrowed. The fact that in such cases fluid takes a longer time to reach the stomach and enters it more slowly is also much more clearly appreciable on auscultating in the epigastrium than over the thoracic part of the œsophagus. In a case of inversion of the viscera which I examined the situation of the œsophagus to the right was indicated by the presence of deglutition-murmurs on that side of the neck and their absence on the left. A much more marked murmur, and one therefore much better adapted for auscultation, is generated by drinking fluids than by swallowing solids.

#### AUSCULTATION OF THE GASTRO-INTESTINAL CANAL.

The phenomena revealed by auscultation of the gastro-intestinal canal consist of murmurs, of which some are spontaneous while others (and the greater number) are produced voluntarily. The presence of fluid in the stomach or bowel is necessary to the existence of these murmurs; they are in a few rare cases due to other causes, which will be mentioned further on. On agitating the fluid contained in the stomach or intestine by pressing repeatedly and quickly on the abdomen, a loud ringing metallic splashing or gurgling sound is heard, which may be detected without bringing the ear close to the abdominal wall, or even at some distance from the patient. It is identical with the Hippocratic succussion-sound observed in pneumothorax, or the sound caused by shaking up fluid in a jug, and is ascribable to the same physical conditions,—the agitation of fluid and air in a closed cavity presenting the conformation, &c., necessary to the development of *consonance*.

These murmurs, particularly those arising in the stomach, are very frequently noticed, in perfectly healthy persons shortly after food or a large volume of fluid has been taken, when the

contents of the stomach are thrown into commotion by making sudden pressure on the upper part of the abdomen. They also sometimes originate spontaneously, independently of any mechanical disturbance of the parts adjoining the stomach, but are then scanty and feeble and audible only through the stethoscope or with the ear applied directly to the surface. They not unfrequently seem to depend on the upward and downward movement communicated to the stomach during respiration. Even the simple movement of the parts concerned in the act of deglutition may be accompanied by a scanty murmur, appreciable on auscultating the stomach, and closely resembling the ringing metallic râles; on actually swallowing a little fluid, moreover, these sounds increase greatly in intensity.

The spontaneous gastric murmurs above mentioned are sometimes so distinctly audible over the posterior lower part of the thorax and in the cardiac region that one unskilled in auscultation, when examining these parts, might very readily fall into the error of regarding them as true pulmonary metallic râles; their generally rapid disappearance, however, their irregularity with respect to the period of respiration at which they occur, and the fact that they are heard even when respiration is suspended, are all points which suffice to stamp them as murmurs arising in the stomach or in the adjacent portion of the colon.

When the *stomach*, dilated from pathological causes, contains a large quantity of fluid as well as gas, and when in addition to this its walls are soft and flaccid (as they generally are), sudden pressure in the upper abdominal region gives rise to numerous ringing splashing or gurgling sounds, frequently audible even at a distance,—sounds which, in proportion to the violence of the disturbance of the stomach, are distributed over a large part of the abdominal surface superiorly or even, as I observed in one case, over nearly the whole of the abdomen. This physical sign, together with others already mentioned, is diagnostic of dilatation of the stomach or of that condition of the organ in which food and fluid are detained in it for an unusually long period. In such cases also a number of fine râles may be detected on auscultating, without making any pressure with the hand on or near the epigastrium; these spontaneous râles are doubtless due to fermentation of the contents of the stomach and the consequent formation and bursting of bubbles of gas.



Gurgling or splashing sounds similar to those arising within the stomach may be produced also in the *intestine*, when its contents are thin and watery, by shaking and pressing upon the abdomen. This is observed in *all* cases of *diarrhoea*; it is the louder the greater the quantity of fluid, and is therefore exceedingly well marked in cholera, in which the paralysed intestine is often found enormously distended with watery discharge. This gurgling may be audible over the whole abdomen—though not usually in equal intensity at all points—or only at certain parts. Of those coming under the latter category, the circumscribed intestinal sounds, the most note-worthy from the diagnostic point of view is that elicited by pressure and limited to the *ileo-cæcal* region, occurring especially in typhoid fever, but met with also in simple catarrh of the ileum and cæcum.—Gurgling may also be developed spontaneously within the bowel in cases of *diarrhoea*, when the fluids are urged quickly onward from one part of the intestinal tube to another by powerful peristaltic action or when the bowel is compressed by the contraction of the abdominal muscles; in these circumstances the action of the muscles of the abdomen and intestine gives rise to the same phenomena which in the cases mentioned above are mechanically excited by the force of the hand of the examiner.

Such sounds, however, do not depend solely on the presence of fluid in the intestinal canal; they may be caused by the rapid passage of *gas* through the bowel, as the result of increased peristaltic action.

With these rumbling noises (*borborygmi*), in Germany described onomatopoeitically by the terms “kollern, poltern, gurren,” every one is sufficiently familiar; they are often heard when the stomach and bowel are empty, as after a prolonged fast, very frequently in diarrhoeal conditions they are the immediate precursors of an evacuation of the bowels, while in many who are subject to flatulence their continual occurrence becomes a troublesome and annoying habit. In diarrhoea they are sometimes accompanied by colicky pains passing rapidly over the abdomen in the direction of the colon. Not unfrequently they cease spontaneously, but relief is complete and lasting only when the wind escapes by the anus.

In cases of *perforation of the bowel*, *murmurs* of a blowing *amphoric* character may be developed, when the opening is suffi-

ciently wide to permit of the free intercommunication of the gases contained in the intestine with those which have already entered the peritoneal sac. These sounds are synchronous with the respiratory movements, and are louder in inspiration than in expiration (Tschudnowsky); it is to the inspiratory descent and the expiratory ascent of the diaphragm that they are to be ascribed, as by the former the intra-abdominal pressure is greatly increased and a quantity of gas driven through the opening into the peritoneal cavity, while by the latter the pressure is relieved and a certain proportion of the gas caused to re-enter the bowel through the perforation. This amphoric sound, on the other hand, when it is not spontaneously audible and does not happen to coincide with the respiratory movements, may be artificially produced by exercising sudden rapid pressure on the abdomen and at the same time listening either with the ear applied directly to the surface or through the stethoscope; the gas is displaced from the parts under the hand, a portion of it passing into the intestine when the perforation is still patent and of sufficient width (Sommerbrodt). If, however, the opening in the bowel be small, as it most commonly is, or closed up by inflammatory products, no trace of these amphoric sounds can be discovered; but as in peritonitis from perforation of the intestine the cavity contains not only air but a variable amount of fluid, a *ringing metallic splashing sound* (abdominal succussion) is heard on pressing firmly and quickly on the abdomen, or on grasping it between the hands and shaking it,—provided such rough handling is bearable, considering the acuteness of the pain by which these cases are usually characterised. The severity of the symptoms which accompany peritonitis from this cause affords a ready means of distinguishing these sounds from the splashing or gurgling developed in the stomach or intestinal canal. The sounds of the abdominal aorta also acquire a metallic quality when the peritoneal sac is filled with gas.—Sometimes, though rarely, the evolution of gas, taking place within closed abdominal cavities containing pus, (encysted exudations, cysts), gives rise to similar splashing sounds (Laboulbène, Gerhardt, &c.).

The *peritoneal friction-murmurs* which are met with in certain cases are palpable as well as audible, and have already been discussed in the chapter on palpation (see p. 336).—It should be mentioned also that



occasionally, on pressing on the gall-bladder when it is occupied by a number of large calculi, the *clinking* of these against each other may be felt and heard.

*Vascular murmurs* are also sometimes observed in cases of abdominal tumour. They are most commonly associated with tumour of the uterus (occurring, according to Spencer Wells and Winckel, in about one-half the cases), more seldom with ovarian tumour; Winckel and Hirschfeld report having detected them in subjects suffering from tumour of the spleen, and Leopold has heard them once in hepatic cancer. Their arterial origin is shown by their being synchronous with the pulse.

#### AUSCULTATION OF THE GRAVID UTERUS.

The aim of auscultation of the gravid uterus is the detection of the sounds of the fetal heart and the placental murmur.

The *sounds of the fetal heart*, discovered by Mayor, of Geneva, in 1818, are first appreciable towards the end of the fourth month of pregnancy. At this period they are feeble, but subsequently they gain considerably in volume; they are most often heard on the left side of the mother, from the great frequency of the first cranial presentation, in which the back of the child is turned forwards and to the left. Their presence proves conclusively that the child is alive, their absence that it is dead, auscultation thus furnishing an important indication for the adoption or the avoidance of operative interference with the process of delivery.

The *placental murmur*, discovered by Lejumeau de Kergaradec, in 1822, is a sound which is synchronous with the arterial pulse, but is frequently of slightly longer duration, particularly when the abdomen is somewhat forcibly pressed upon with the hand. It is not of equal intensity at all points on the surface of the womb, being louder sometimes to the right side, sometimes to the left. It is heard in the second half of pregnancy, being at first very faint, but afterwards of greater intensity. It is developed in the dilated uterine arteries, at the part at which they terminate in the uterine veins.

## EXAMINATION OF THE EXCRETA.

### THE URINE.

THE points to be noted in examining the urine are its quantity, colour, reaction, specific gravity, and the occurrence in it of abnormal constituents.

#### QUANTITY OF THE URINE.

This is very variable even in perfect health, and depends chiefly on the amount of fluid taken by the patient and on the greater or less abundance of the excretion of water by the sudoriparous glands of the skin. If the consumption of fluid be moderate and the cutaneous transpiration slight, as in winter, the quantity of urine passed by an adult in the twenty-four hours amounts on the average to about 1,500 ccm.

The urine is *diminished* in quantity in all febrile affections, in the stage of failure of compensation in diseases of the heart, and frequently in the different forms of *nephritis* (though in the latter class of cases it sometimes remains normal in volume); it is, further, reduced in a number of other disorders, and occasionally even in health, from causes of only temporary duration, to be mentioned in detail further on.—The quantity voided in the twenty-four hours may, in extreme cases, sink to one-fourth that passed normally; at times even, as in the stage of collapse in cholera, and now and then also in scarlatina, almost complete anuria may be observed.—The cause of this diminished excretion is either that the quantity of blood in circulation is unusually small or that the blood itself is deficient in water, the pressure within the renal arteries being in both cases reduced to a minimum. When in the later stages of cardiac disorders the compensatory changes in the heart's structure fail to completely overcome the obstacle to circulation, the venous system becomes overloaded, the arteries, and among them those of the kidneys, contain less blood than normally, and the excretion of urine