

or passing through a crevice, and in these latter cases is generally appreciable by the patient herself; occasionally it undergoes a peculiar musical modulation, conveying the impression of a singing murmur.* The resemblance which this murmur often bears to the sound of the well-known toy the humming-top, has led to its being designated the *humming-top murmur*, the *bruit de diable* of French authors.

Venous are distinguished from arterial murmurs by not being specially connected either with the systole or the diastole of the heart; they are *continuous* murmurs. Intermittent venous murmurs very seldom come under observation, and even then they are, as will be shown, very easily differentiated from arterial murmurs.

That the humming-top murmur really arises in the cervical veins, and not, as was formerly believed, in the arteries of the neck, is proved by a number of facts which will be found set forth in detail below. Its venous origin can also be made plainly obvious by pressing firmly on the dilated lower end of the jugular vein (so as to close it) above the clavicle, when the murmur instantaneously disappears; compression of the carotid at a higher point, where venous murmurs are not heard, does not modify either its character or intensity.

The *bruit de diable* is produced by the *whirling, vortiginous movement of the blood in the jugular veins*. The blood flows from the relatively *narrow* jugular vein into the relatively *wide* bulb (the part at which the vessel debouches into the innominate vein) and is thus caused to sweep in a somewhat spiral course round the walls of the chamber, so that the mode of origination of the venous hum may be regarded as strictly analogous to that of murmurs in the arteries (see p. 305). This dilatation at the lower end of the vessel remains permanently wider than the upper part of the vein, as its sides are held apart by the tense cervical fascia.

The venous hum, though continuous, is not always of quite the same intensity; its variation depends chiefly on the presence or absence of such conditions as accelerate or retard the current of blood through the veins. The quicker the venous circulation the

* By reason of this singing character it was named by Lænnec, who fell into the error of considering it an arterial murmur, the *chant des artères*. It was first traced to its true source in the veins of the neck by Dr. Ogier Ward, in 1837.

louder the murmur, the slower the current the feebler the murmur. Venous murmurs are *intensified* in the following conditions.

1. *By turning the head towards the opposite side.* If the murmur be audible even while the patient holds the head erect and looks straight forward, the augmentation on turning is very striking; the examiner, accordingly, frequently avails himself of this device to render louder such murmurs as are feeble and doubtful in character. The intensification of the *bruit*, so brought about, is due to the circumstance that on rotating the head the cervical fascia and muscles, especially the omohyoid, on the side under examination, are put on the stretch and the jugular vein is compressed and narrowed. The normal, physiological difference in the calibre of the upper part of the vein and its bulb (the latter being, as already indicated, attached on all sides, and so made incapable of undergoing any diminution in capacity) is thus rendered still greater, and the most favourable conditions are established for giving to the blood-stream that spiral direction which is requisite to the production of the venous murmur.—In the great majority of individuals this proceeding usually develops a faint murmur, sometimes even one of a considerable degree of intensity, which is quite inaudible while the head is kept erect and not turned to one or other side. Such artificial murmurs must be carefully distinguished from those which are heard when the muscles and other structures on both sides are in an equal state of tension, and which are very seldom observed in the healthy subject.

2. *By acceleration of the outflow of blood from the jugulars.*

The influence of this acceleration of the blood-current is seen in the facts that the venous murmur is louder while the patient sits or stands, than when the recumbent posture is adopted, and that augmentation of the murmur is noticed also in deep inspiration, and enfeeblement of the murmur in forced expiration; inspiration favours the efflux of the venous blood, expiration retards it. When respiration is suspended for a few seconds the pressure on the intrathoracic venous trunks is increased, and the escape of the blood from the jugular veins rendered slower and more difficult, the current through the vessels is almost arrested, the condition on which the whirling movement of the blood depends is thus practically removed, and the murmur consequently becomes feebler, and under certain circumstances is nearly abolished.

The effect produced by placing the patient on his back, by

forced expiration or by suspension of the breathing, is obtained more rapidly and perhaps in a more striking form by exercising pressure on the dilated lower end of the jugular vein, as above the point of compression the vessel becomes engorged with blood, and distended to such a degree that circulation through it ceases. In the same way, by pressing on the vein with the stethoscope, alternately firmly and gently, the hum may be augmented or diminished in intensity at pleasure; it is therefore above all necessary to the detection of the less marked venous murmurs to bear as lightly as possible on the vessel.

The bruit de diable in the *right* jugular is very much *louder* than that in the left, and from two causes: in the first place, the dilatation at the central end of the vessel is greater on the right than on the left side, and is accordingly more favourable to the production of the eddy-like commotion of the blood-stream; secondly, the blood flows out of the right jugular vein faster than out of the left, as the former opens into the right innominate vein in almost a direct line, while the latter, in joining the left innominate vein, forms with it an appreciable angle; and further, the somewhat wider right innominate vein also passes in a direct line into the vena cava superior, while the left innominate crosses from the left to the right side to debouch into the same venous trunk. The venous murmur is therefore often heard on the right side as far down as the level of the first rib, in the region corresponding to the innominate vein; at the symmetrical spot on the opposite side, however, it is no longer audible.—Occasionally, nevertheless, the murmur on the left side is as loud as, or even louder than, that on the right, though why it should in these cases be of such unusual intensity is not generally very obvious.

3. *The movements of the heart* affect the intensity of the venous hum to a much less marked degree than the conditions already mentioned. In accordance with the laws of physiology it is to be expected that the murmur should be weaker during the systole of the heart, as the outflow of blood from the jugulars into the intrathoracic veins is then to some extent impeded, and louder during its diastole, as the current of blood is favoured at this period of the cardiac cycle. This diastolic intensification of the murmur is in fact generally observed when the diastole does not happen to coincide with an expiration, which would tend to neutra-

lise its influence; the systolic decrease in the loudness of the murmur, on the other hand, is not so often demonstrable. There is, nevertheless, generally noticed during the systole an *apparent augmentation* of the murmur, the latter being reinforced by the sound of the carotid pulse. On eliminating and leaving out of consideration the sensory impression raised by the arterial pulse, and concentrating the attention solely on the venous hum, it will be found that the bruit is not really intensified during the cardiac systole.

It follows from the description just given of the continuous venous murmurs that they show a constant variation in intensity, a variation, however, which is characterised by no definite rhythm, as the factors which exercise most influence on the circulation through the jugular veins (the respiratory and cardiac movements) do not always work together, but, being only occasionally coincident, are at one time favourable, at another antagonistic to each other in their operation.

Continuous venous murmurs of a certain degree of intensity are also almost always perceptible to the finger placed on the skin above the clavicle, as a distinct *thrill* (*fremissement* of the jugular veins). This vibration is not constant as regards intensity, but is often interrupted by numerous short pauses, only the more energetic of the movements of the blood-stream in the veins being then felt.

Intermittent venous murmur is of rarer occurrence than the continuous murmurs which have been described. It has the same blowing character, but is very much feebler. It appears when the velocity of the current through the jugular veins is increased, (when, therefore, one of the conditions favourable to the generation of a murmur is present), that is, during *inspiration* or during the cardiac *diastole*. When inspiration and diastole occur together the murmur becomes still louder, but when the diastole coincides with expiration the accelerating influence of the former on the venous circulation is counteracted by the retarding influence of the latter, and consequently no murmur may be heard. A diastolic venous murmur, therefore, often disappears on suspending respiration. This serves to distinguish it from a cardiac-diastolic carotid murmur, as the latter continues unabated in intensity even when the patient holds his breath; the venous murmur, moreover, has not the well-defined

rhythm of the carotid murmur,—it does not keep time solely and invariably with the cardiac diastole, its appearance being also in a large measure determined by inspiration; and finally, it is audible only over the veins and not over the heart, while the carotid murmur, synchronous with the cardiac diastole, is never simply of local arterial origin, but arises at the aortic orifice and is propagated peripherally from that point. Diastolic venous murmurs are further frequently accompanied by cardiac murmurs, but the latter are without exception systolic.

Murmurs in the jugular vein have a *pathological* significance only when they are loud and continuous, the stethoscope being placed lightly on the vessel, and the patient's head held erect and turned neither to the one side nor the other. Such murmurs may indeed sometimes be detected in persons in perfect health, but (so far as I have been able to observe) only in a very small number of instances as compared with the frequency with which they are noticed in those suffering from chlorosis and other anæmic affections. Murmurs of the highest degree of intensity, associated with marked fremitus of the jugular veins, occur only in anæmia, never in health. It is therefore plain that in anæmic conditions some other element is added the effect of which is to increase the intensity of the murmur, and the conclusion is almost unavoidable that this is to be sought chiefly in the diminution of the quantity of blood in circulation, the stream through the jugulars being thus reduced in volume and so caused to sweep more forcibly round the walls of the vessel.

Weil holds that the venous murmur is not to be interpreted as a pathological sign, as he has been unable to discover it more frequently in anæmic subjects than in healthy persons of the same age. This is certainly not in harmony with my experience. I have examined many hundreds of individuals for venous murmurs and have found that, as stated above, they are much more common, and of vastly greater intensity, in the anæmic than in those who are strong and well-nourished.

In some rare cases of chlorosis and anæmia the *femoral veins* become the seat of a venous murmur, which is markedly augmented on elevating the limb and so increasing the velocity of the venous current.—Coughing, also, or the contraction of the abdominal muscles, may give rise to a short, sharp, whizzing murmur, perceptible to the finger, in the femoral vein below Poupart's ligament. This murmur is caused either by insufficiency of the valves of the femoral vein, or, when these structures are wanting, by the backward rushing of a centrifugal wave of blood through the vessel. I have on several occasions observed a well-

marked murmur, determined by violent coughing, in large varicose dilatations of the femoral vein at a point lower than Poupart's ligament.

Over other superficial venous plexuses very loud murmurs are sometimes heard,—as over the enlarged thyroid gland in exophthalmic goitre. Here they originate partly in the dilated arteries, partly in the veins, their continuous character being derived from the latter source; they depend on the formation of large and irregular dilatations in the course of the veins, whereby the eddying movement previously described is given to the sanguineous current. My experience leads me to support strongly the opinion that in the ordinary form of endemic goitre, no matter how large the tumour, murmurs of this kind *do not occur*, as in this affection the enlargement of the gland is due simply to hyperplastic development of the normal glandular substance and not to widening of the vessels. I consider the presence of such a murmur in the goitrous swelling a most important diagnostic symptom in doubtful cases of Graves' (Basedow's) disease, that is, in those in which there is only the tumour of the thyroid and palpitation of the heart, but no exophthalmos, to act as guides to their true nature.

Systolic murmurs in the jugular veins, produced by the movements of the heart, are occasionally, though seldom, met with; they come into existence only when there is at the same time a distinct venous pulse from insufficiency of the tricuspid valves. This murmur is developed partly at the insufficient jugular valves, but in part also consists of the transmitted murmur due to the tricuspid insufficiency.

CARDIO-PULMONARY MURMURS.

There is a group of murmurs of considerable rarity, which are *dependent, not on cardiac disease of any kind, but on structural changes in the substance of the lung*, and which are excited by the ordinary movements of the heart. These are known as cardio-pulmonary murmurs. They are most commonly systolic, but may also be diastolic as well as systolic, that is to say, they may encroach a little on the diastole; they are, nevertheless, always louder in the systole.

In this category are included the following murmurs:

1. The blowing or sipping (*schlürpfenden*) murmur heard, simultaneously with the cardiac systole, in *large thin-walled pulmonary excavations* situated in those parts of the lung adjoining the heart. The manner in which this murmur originates is obvious: the shock caused by the movements of the heart is propagated through the walls of the adjacent cavity to the column of air it contains, and a certain quantity of the air

thus thrown into commotion is driven out through the bronchus with which the cavity communicates. Such a murmur therefore arises from substantially the same physical causes as the bruit de pot fêlé.—During the cardiac diastole the air is readmitted into the cavity, its return, however, being attended by a murmur of but very feeble intensity. The effect of suspension of the respiration on pneumo-cardiac murmurs is very variable; they are sometimes decidedly weakened, occasionally almost abolished, and at other times in no way perceptibly affected.

2. Certain *systolic murmurs* which are sometimes heard in the *pulmonary artery* when the upper part of the left lung is to some degree *contracted* and consolidated as the result of chronic pneumonic infiltration. The shrunken tissue in such cases grasps and compresses the main trunk or one of the larger branches of the pulmonary artery, so that the passage of the blood through the constricted part of the vessel gives rise to a systolic murmur. In certain circumstances also a diastolic murmur may be produced in connection with regurgitation of blood taking place in the period of contraction of the same artery.—These pulmonary murmurs are occasionally limited in distribution to a small area in the second left intercostal space, when they may also be associated with an appreciable thrill, or they may be audible over a considerable portion of the upper segment of the thorax.

Immermann has put on record a case of this kind, in which both principal divisions of the pulmonary artery and their primary subdivisions were constricted by cicatricial contraction of the lung-tissue; during life a systolic pulmonary murmur was heard over the whole upper part of the lung, both in front and behind. Similar cases have been described by Bettelheim, Heller, Aufrecht, and others.

Quincke has drawn attention to two other special causes of *systolic pulmonary murmur*: 1, an absence of due proportion between the calibre of the pulmonary artery and that of its conus arteriosus; 2, flattening of the pulmonary artery by pressure, when it comes into abnormally close relation to the chest-wall. That the first of these conditions is really an efficient cause of such murmurs has been shown by the result of at least one post mortem examination; the necessary vortiginous movement is communicated to the blood as it passes from the relatively narrow conus arteriosus into the relatively wide artery beyond. In the second class of cases the margin of the left lung is retracted, the base of the heart is no longer covered in by pulmonary tissue, and the pulmonary artery comes forward into direct contact with the front wall of the chest; as the antero-posterior diameter of the heart is increased at each systole the pulmonary artery is at the

same time thrust against the framework of the thorax and flattened, whilst the conus arteriosus suffers no such change in shape when the heart contracts; the spiral direction is thus given to the blood-current, and a murmur is the result.

3. There are other *systolic murmurs* observed at *various parts of the thorax*, which cannot be traced to the main trunk of the pulmonary artery, as in the region of the pulmonary orifice both sounds are clear and pure, but which seem rather to take their rise in the larger subdivisions of the vessel, when these are the seat of a certain amount of dilatation.

Bartels has reported several cases of phthisis in which a murmur of this nature was audible, not on the diseased side of the chest, but over a large portion of the sound lung, while the heart-sounds were at all points absolutely normal. It arose presumably in dilated branches of the pulmonary artery, was intensified by expiration, and possessed generally all the distinctive characters of a genuine arterial murmur. Over pulmonary excavations, also, systolic murmurs have been heard, which proved to be due to the fact that the cavities were traversed by a branch of the pulmonary artery isolated by the breaking down of the lung-tissue (Schrotter, &c.).

In the *subclavian artery*, immediately under the clavicle, short *blowing murmurs* are sometimes observed, synchronous with the *cardiac systole*, and this notwithstanding that the circulatory apparatus may be in all respects intact and that every care is taken to press as lightly as possible with the stethoscope. They are in no way connected with those subclavian murmurs which accompany murmur in the carotid (see p. 304, *et seq.*), but are confined strictly to the parts mentioned; they are further distinguished from the group of murmurs described on the pages just referred to, by being audible in only *one* subclavian artery, not in both. They are by no means common, but occur most frequently in cases of chronic pneumonic induration of the apex of the lung. When inspiration and the systole of the heart coincide with each other these murmurs are usually rendered much louder. Their mode of origination is probably essentially the same as that of the systolic pulmonary murmur, that is, they may be attributable to compression of the subclavian artery by contracting lung-tissue, or perhaps to dragging on the arterial wall, and consequent diminution of the calibre of the vessel, by adhesions which may have been formed either between the costal and visceral layers of

the pleura near the apex of the lung, or between the outer surface of the pleural sac and the artery (Friedreich).

According to many English authors (Fuller, Palmer, Richardson, and others) the subclavian murmur is a phenomenon of not unfrequent occurrence; possibly, however, they have reckoned as belonging to this class some of the above-described murmurs which are not properly speaking to be regarded as subclavian, that is, those which are not limited strictly to the subclavian artery of *one* side. The true subclavian murmur has been found by Weil only six times in 600 cases, and I, though for several years I have watched specially for this sign, have recognised it in only three cases (of phthisis); it was always capable of being greatly intensified by pressure with the stethoscope.—It is now known also not to be invariably connected with disease of the apices of the lungs, being occasionally heard when the whole respiratory apparatus is perfectly sound.

EXAMINATION OF THE ABDOMINAL ORGANS.

INSPECTION OF THE ABDOMEN.

DISEASES of the abdominal organs are generally recognisable by simple inspection only when they occasion some evident change in the volume and shape of the abdominal cavity. As this alteration in size takes place in but a few of the many abdominal diseases, and in these only under special conditions, inspection is divested of much of its importance as a method of investigation when applied to the examination of the parts within the abdomen. To ensure accuracy also the signs which it elicits should, as a rule, be checked by palpation.

The most common change observed in the size of the abdominal cavity is *enlargement*.

When this is slight the determination of its actual existence is not always an easy matter. The normal dimensions of the abdomen vary within very wide limits. In those whose customary diet is more of a vegetable than an animal nature, in those who habitually eat to excess, in drinkers, and sometimes also in individuals who are in all respects strictly temperate, distension of the bowel and undue development of fat may, as our daily experience teaches, combine to produce a degree of prominence such as is seen in other cases only as the result of considerable ascites or decided increase in the bulk of some of the abdominal organs. Nevertheless, the presence of *pathological* increase even of a less marked character is also usually indicated by other easily-appreciated signs. Thus, the morbid processes which give rise to swelling of the abdomen modify also the whole aspect of the patient; they lead to more or less emaciation and to changes in the colour of the skin (often to pallor of the surface, or to a cyanotic or yellow, jaundiced hue, according to the precise nature of the original disorder). In such cases the contrast between the bulky abdomen and the lean chest and body generally, becomes very striking.—