PRACTICE OF MEDICINE AND PATHOLOGY.

CASE OF ANEURISM OF THE ASCENDING AORTA OPENING INTO THE VENA CAVA SUPERIOR. By J. Gossy.

When we consider the intimate and extensive relations existing between the arch of the aorta, the vena cava superior, and the innominate of the left side, as well as the frequency of aneurism in that portion of the aorta, we should be led to believe that the occurrence of varicose aneurism at that spot would not be unfrequent. This, however, is not the case; many examples of aneurism of the aorta bursting into the pulmonary artery, trachea, pericardium, &c., are recorded, but cases of perforation of the vena cava superior are so rare, that we had almost believed the case, the particulars of which we are about to relate, was unique. On examining further, however, we found a very similar case detailed by Mr Thurnam, in the Med. Chir. Trans. of London. Mr T. has collected and analysed nearly all the known cases of varicose aneurism of the aorta.

From the extreme rarity of such cases, we shall give the details of the following at some length.

M., a woman aged 45, admitted into hospital on 27th January 1845. Has never had children, and up to the age of 30 enjoyed robust health. Declares that she never suffered from articular pains during any period of her life.

For the last fourteen years she has suffered from palpitation of the heart, and a slight degree of oppression. These symptoms appeared suddenly, and at first caused little uneasiness, but by degrees they assumed a more severe character; and at a later period, which cannot be accurately determined, the palpitation was at times painful, and had its seat towards the upper part of the sternum. From that period these various symptoms continued, but the patient was able to work, and never suffered from edema either of the arms, feet, or face. Her appetite continued good, and she rather gained flesh than lost it. On the 18th January, after working as usual, and taking her supper with appetite, she retired to bed at her usual hour. On waking in the morning, she felt giddy, and her face was somewhat swollen, and of a violet colour, as also the right arm. She immediately went to a neighbour, alone and on foot, and whilst there, two hours after waking, became so giddy as to fall to the ground, where she lay for some minutes insensible. A few hours afterwards she was bled from the arm, but it afforded no relief. In the evening her face was enormously swollen; as were also the upper extremities, but the right more than the left; a disagreeable rushing noise was likewise experienced through the whole head, more especially in the region of the right temple. The tumefaction still continuing to increase, she was brought to the hospital on the 27th, nine days after the appearance of the latter symptoms. On the evening of her admission she was bled from the arm, but with no greater relief than on the former occasion. Shortly after her admission she was seized with epistaxis, which ceased spontaneously, and never returned.

On the morning of the 28th, the horizontal posture could not be maintained, her intelligence was entire, memory good, but easily fatigued, strength little affected. The great tumefaction of the face, neck, and superior extremities, contrasted strongly with the condition of the inferior parts of the body, which was perfectly natural; the face was enormously swollen and tense, of a deep violet colour; pressure with the finger scarcely left a mark. The lips and ears were blue and thickened; eyelids slightly swollen; and numerous veins were visible on the forehead. Frequent attacks of giddiness occurred, especially on a change of posture; there was besides a painful feeling of tension through the whole head, accompanied with a continual and disagreeable rushing noise, more especially in the right temple and ear, but no deafness. The neck was also of a deep vio-

1 Vol. xxiii. 1840.
let colour, and much swelled. The swelling extended over the superior part of the chest, so as completely to efface the clavicles, and fill up the hollows below and behind them. The external jugular veins were the only ones perceptible in the neck, they were by no means prominent, and no reflux was apparent in them. Lastly, the superior extremities, through their whole extent, were oedematous, and more marked in the right than in the left. They were also of a violet colour, benumbed, heavy, and cold; no veins were perceptible on their surface; a disagreeable feeling of tingling was experienced in the hands. The chest, large, and well formed anteriorly, exhibited neither tumour nor appreciable projection. At each contraction of the heart there was a manifest shock over its surface, without any marked elevation, or vibratory thrill in any point. There was a dull sound over the precordial region to a considerable extent, but its limits were not accurately ascertained; the apex of the heart was felt beating on a level with the seventh rib, its rhythm was perfectly regular, and its impulse moderate. The first sound was replaced, or rather marked, by a strong blowing rasping sound, of such length as nearly to occupy the whole of the short pause; the second sound was natural, but only heard clearly at the base of the heart, near the third rib; ten lines lower down it was obscured by the rasping sound, and only heard with difficulty. External to the apex of the heart, and near a line drawn vertically from the axilla, not only could the second sound be heard, but also the first; it was easily distinguished from the rasping sound, which was distant, and only appeared to coincide with it, without replacing it.

Under the left clavicle the abnormal sound was feeble and distant; but over the whole superior part of the sternum, it was intense, gradually increasing as the stethoscope was moved upwards, till it attained its maximum at the internal extremity of the right clavicle. At this point, the seat of the troublesome pulsations, there was dullness on percussion to the extent of 15 lines square; but no projection or vibratory tremor could be perceived; the normal sound was there of a superficial character, not continuous, somewhat rough, and more intense and prolonged than anywhere else; as at other parts it coincided with the systole of the ventricle. The rasping sound was distinctly heard over the whole superior part of the chest, posteriorly and at the sides; its maximum of intensity was in the right infra-spinal fossa, close to the vertebrae; lastly, there was a well marked thrill behind the right clavicle at its middle, and along the course of the vessels of the neck of the same side, as far as the angle of the jaw. Below that point it completely ceased, and was not perceptible in the external jugular vein. This thrill was of a prolonged character, but not continuous; it was propagated from below upwards, and coincided with the arterial diastole: at the time of its occurrence, a vessel was distinctly felt behind the clavicle enlarging, and though considerably distended, still preserving a remarkable degree of pliancy. On a level with the tremor, and during its continuance, a blowing sound without the rasping character was heard; it was loud, very much prolonged, but not continuous, and had no musical character. There was no trace of tremor on the left side of the neck; all that could be heard was a blowing sound very distant and feeble.

The pulse was regular, 96, small and feeble at the wrists, but beating harmoniously and with equal strength on both sides; the same was the case with the femoral arteries. Voice natural, cough dry, and not frequent, respiration slightly accelerated; dyspnea, but not severe, and not occurring in paroxysms, only increased after speaking, or change of posture. Under the clavicles the respiration was fine and vesicular, but without rale; on the right side, posteriorly and inferiorly, there was a dull sound, to the extent of four or five fingers' breadth; over that portion the respiration was feeble or altogether wanting, and there was evident æphophony. Percussion yielded a clear sound over the rest of the back and sides, respiration was vesicular and somewhat feeble everywhere, but no râle or bronchophony could be heard. The respiratory murmur was almost completely obscured, at the infra-spinal fossa, by the rasping sound, which was heard more distinctly there than at any other part of the back.
The tongue was clean and moist, but of a slightly violet colour; deglutition easy; bowels slow.

The patient was regularly examined twice every day, from the date of her admission till death, but not the slightest variation in the signs furnished by auscultation could ever be detected.

On the evening of the 23th there was great uneasiness and anxiety; the face and neck were much in the same condition as in the morning; but the extremities were somewhat larger. Pulse small, regular, 104, to 112.

29th. Had some broken sleep; less uneasiness; suffers greatly from distention and rushing noise through the head. Was bled from the right arm; the blood flowed in a very small stream, and was of a dark colour. It afforded no relief,—not even momentary.

At the morning visit on the 30th, she was found to have been in a comatose state for some hours, but with no tracheal râle; the superior extremities were still large, cold, and violet coloured, as well as the face and neck; the veins of the forehead and temples were more apparent than on the previous evening; urine and stools were passed involuntarily; the pulse was imperceptible at the wrist. A bleeding was ordered immediately, and as the blood only flowed in drops from the arm, one of the frontal veins was opened, from which the blood flowed abundantly in an incomplete jet, but with well marked jerks, synchronous with the pulse; from the very first the blood was of a clear red colour, and exhibited a strong contrast to the dark colour of that which oozed from the opening in the arm. Immediately afterwards the face became less tense, and diminished in size, and a rosy tint replaced the violet colour of the cheeks; the coma was also less profound; the patient, however, never recovered her consciousness, and died at two o'clock.

Dissection Forty-three Hours after Death.

External appearance. General but slight stiffening; no traces of decomposition; superior extremities as during life; face considerably less swollen; the cheeks still retained the rosy tint they had acquired a short time before death; veins of forehead sunk; no traces of infiltration in the lower extremities.

Head.—Scalp of natural thickness, contained little blood; a small quantity of dark fluid blood was found in the sinus of the dura mater, which, as well as the arachnoid and pia mater, were healthy. The latter was thin and pale, its vessels slightly injected. The convolutions of the brain were firm, rather small, and of a pale grey colour; internally the two substances of the brain were every where healthy, very pale in colour, and without red points; there was a slight but uniform yellow tint, over the whole white substance. About a table-spoonful of clear colourless serum was found in each of the lateral ventricles; the septum was entire, and the tela and plexus choroides of a pale colour. The cerebellum and medulla oblongata were healthy and free from sanguineous congestion. A small portion in the centre of one of the branches of the arbor vitae, of the right side was found softened, and of a deep yellow colour.

Spine not opened.

Chest.—In the pericardium there was found about an ounce of limpid citrine-coloured serum. The heart was large, but the increase in volume being equal throughout its various parts, it retained its natural form; its tissue was red and firm, and the only part of its surface covered with a thin layer of fat was the right ventricle. On measuring it, it was discovered that there was not only considerable increase in the size of its four cavities, but that the latter were also hypertrophied.1 The hypertrophy was more marked in the ventricles than au-

1 Ventricles: Height anteriorly, from the origin of the aorta to the apex, 0.115; height posteriorly, from the transverse sulcus to the apex, 0.095; circumference of the ventricles at their base, 0.325; maximum thickness of the parietes at 3 cent. from the base, 0.019; left ventricle: internal circumference at the base, 0.185; height of the cavity from the free edge of the aortic valves to the apex, 0.085.

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The result of either passed the num, and the cava hering ly of the natural shape some two likewise this observed cial of examining its was where the right bronchus, aspect superficial depressions internal portion was considerably dilated, yellow colour, was completely empty. The coronary arteries and veins were healthy, and nearly of the natural size. A thin black clot was found in the pulmonary artery, which was very slightly enlarged, its circumference being 0m. 072.

The arch of the aorta, from its origin to the giving off of the left subclavian, was considerably dilated, it had a shrunken uneven appearance on its convex edge, where an aneurism was discovered, which we shall immediately describe. On examining it interiorly it was found to be nearly empty, and of a yellow colour; its aspect was remarkable for its inequality, owing to the existence of numerous superficial depressions which were separated from each other by small crusts of a yellow colour, and by no means prominent; five or six large, but superficial depressions were also discovered, which corresponded to the inequalities observed externally, the parietes of the artery in the centre of these were thin, nearly transparent, and only of the thickness of two-thirds of a millimetre. At this portion the middle coat was also thin; in the other parts of the arch it was likewise thin, the external coats alone remaining, but the thickness of the parietes was variable, from the deposition of a yellow friable matter between the two internal coats. Two osseous plates were also discovered. Its interior below the left subclavian presented nothing remarkable, with the exception of some spots and slightly projecting yellow plates, they decreased in number towards the bifurcation.

The innominate, subclavian, and common carotid arteries of both sides were of the natural size, and the parietes healthy. The aneurismal tumour, of the shape and size of a hen's egg, was situate on the convex edge of the ascending portion of the arch of the aorta, below the arteria innominata, and consequently anterior to its origin. It was attached to the aorta by a species of neck very slightly contracted, and having its seat at one side of the tumour; it measured 55 millim. in its largest diameter, the vertical, and 40 millim. only in all other directions. Covered in part by a fold of the right mediastinum, it projected into the right pleura, and depressed the superior lobe of the lung without adhering to it. It was separated anteriorly from the superior edge of the sternum, and the cartilages of the second and third ribs on the right side, and by a thin layer of yellowish adipose tissue. Posteriorly it adhered closely to the vena cava descendens. Lastly, the trunk of the left subclavian vein passed over its superior extremity, and separated it from the arteria innominata. The trachea, the right bronchus, and the pneumogastric nerve, were at some distance from the tumour; the right phrenic nerve adhered closely to its external surface, and passed over it, but was in no way altered. The internal surface of the sac was smooth, of a rose colour superiorly, and of a deep red inferiorly, apparently by the result of imbibition. There was found in it but a small quantity of blood, either fluid, or in the shape of inconsistent non-fibrinous clots. The sac had

| Right ventricle, | Circumference of the Orifices, |
|-----------------|--------------------------------|
| Maximum thickness at 3 cent. from the base, | Arterial. |
| Internal circumference at the base, | aorta on a level with the free edge of the valves, |
| Maximum thickness of the middle portion, | pulmonic, ditto |
| Arterial. | 0.004 |
| Arterial. | 0.182 |
| Arterial. | 0.020 |
| Arterial. | 0.085 |
| Arterial. | 0.072 |
| Arterial. | 0.100 |
| Arterial. | 0.131 |

1 Exclusive of the columnae carneae.
two openings,—the one very large, scarcely less than the largest circumference of the sac itself, communicated with the aorta near the origin of the innominate; it was of an irregular oval shape, and round its edge there was a smooth pliable fold, very much resembling the cutaneous fold of the helix. The second opening was situate towards the upper part of the posterior portion of the sac, and perforated the thin pliable septum formed by the adhesion of the walls of the sac with those of the vena cava superior. The perforation opened into the vein, a little below the junction of the vena innominata; it was gaping, and of an irregular lozenge shape; its edge was surrounded with a very fine lace-work of small rose-coloured projections; its axis lay from above downwards. No erosion or change of colour could be discovered, either in the vein or in the sac, in the neighbourhood of the perforation. The parietes of the sac were composed of the internal membrane, which adhered closely to a thin pliable layer of condensed cellular tissue; more anteriorly and outwardly they were strengthened by a prolongation from the fibrous portion of the pericardium and the mediastinal pleura, which were separated by a thin layer of fat. The middle coat of the aorta terminated abruptly at the neck of the sac; but it was only after minute dissection that it was ascertained that the internal membrane of the sac was not actually, but apparently, a continuation of that of the aorta.

The vena cava superior contained merely a black clot of little consistence, and not adhering. At the origin of the vena azygos its diameter was 55 millim. whereas in the neighbourhood of the perforation, it was only 26 millim.; its internal surface was every where smooth and pale. The trunk of the vena innominata, the subclavian, and internal jugular vein of the right side, were all much dilated, and exhibited a slight degree of thickening, which was rendered more obvious on comparing them with those of the opposite side, which did not deviate from the natural state. The dilated veins, with the exception of the innominata, were smooth and pale internally; the internal surface of the latter appeared as if scattered over with brilliant and transparent grains of fine sand, which adhered to it; its colour was natural.

The deep and superficial veins of the superior extremities were natural. In the vena cava inferior there was found a considerable quantity of black fluid blood. It was otherwise healthy, as well as the veins of the inferior extremities.

Respiratory Organs.—Nearly a pound of limpid citrine-coloured serum was found in the right pleura, and about half as much in the left. The lungs were free from adhesions, anteriorly pliable, and of a greyish colour, posteriorly infiltrated with a limpid serum, scarcely sanguinolent, and which flowed freely when the substance was cut into. There was neither sanguineous effusion, tubercles, nor pneumonia.

Abdomen.—Some clear serum was found in the cavity of the peritoneum. The stomach was large; its mucous membrane was smooth, thin, and reddish; it was somewhat soft near the pylorus, more so at the middle portions, and towards the great cul de sac it had degenerated into a kind of pulp. The liver was large, and its tissue soft and congested. Gall-bladder filled with brown thick bile.

In conclusion, from what was observed in his own case, as well as in those of Mr. Thurman, the author conceives that the principal circumstances denoting a varicose communication between the aorta and vena cava superior, are the following:

1st. Considerable oedema, exclusively confined to the superior extremities, neck, and face, occurring suddenly, and accompanied with an intense violet colour of the integuments, numbness and decrease of temperature. These latter symptoms are not dependent on the mixture of the two kinds of blood, but are to be regarded as the result of venous stagnation, and one of them, the violet colour, is not without some degree of value in a diagnostic point of view.

2dly, A well-marked blowing sound, having its maximum of intensity at the superior part of the right side of the sternum; in one of the cases, instead of this, there was a noisy murmur, with vibrating thrill; in another, the thrill was wanting, and the abnormal sound was very much prolonged, but not continuous; the latter characteristic appeared owing to loss of elasticity in the parietes of the aorta.
3dly. In one of the patients, there was considerable reflux, synchronous with the pulse into the large veins of the neck, accompanied with an intense blowing sound and marked thrill. It was only observed on the right side, and this was afterwards explained by a peculiar disposition of the varicose opening, which could not have been foreseen; the hypertrophy of the large veins in which it was manifest, appeared to be the result of the distention they had undergone.

4thly. In the head, a continued and painful noise, vertigo, feeling of confusion, slight delirium, and coma in the last stage. The head was examined in one of the patients only, and contrary to all expectation, no appreciable trace of sanguineous congestion was found.

5thly. In two of the patients, notwithstanding there was in one of them effusion into both pleurae, the dyspnoea was always moderate; there was also slight hemorrhage from various passages.

6thly. Sudden and simultaneous appearance of nearly all the symptoms, which rapidly acquire their maximum of intensity. No relief from bleeding in one case,—death ensuing in from eleven days to two months after the occurrence of the perforation.

—Archives Générales, Sept. 1845.

FUNCTION OF THE PAPILLARY MUSCLES OF THE HEART. BY DR SKODA.

Dr Skoda, in a note to his original and excellent work on auscultation and percussion, (Vienna, 1839,) whence the following paper is drawn, remarks—"A view similar to mine, respecting the function of the papillary muscles, has been already published by Professor Weber, (Hildebrand's Anatomy, vol. iii. p. 137. Brunswick, 1831.) Of this, however, I became only lately aware; and as I had met with no attempt to explain their use in any physiological work, I published my view in the Austrian Medical Journal, vol. xiii. art. 2, supposing that to have been its first appearance in print."

"Laennec," says Skoda, "conceived the connection between the papillary muscles and the valves to be of such a nature, that the contraction of the former must open the latter. This mistaken opinion, consequently, led to the erroneous conclusion, that the papillary fibres did not contract simultaneously with the other fibres of the ventricles, but during the ventricular diastole, in order by opening the valves to furnish a passage for the blood in the ventricles. Bouillaud, on the other hand, thinks it quite evident that the valves are closed by these muscles.

No degree of strength, by which the papillary muscles, and, consequently, the tendinous cords arising from them, can be drawn in the direction in which they lie in the heart, will either close the valves or diminish the size of their openings. Hence their contraction cannot close the valves. It has also not been observed that the blood passes with increased difficulty from the auricles into the ventricles, in cases where these muscles are found to be flaccid. The opinions of Laennec and Bouillaud respecting their functions are both erroneous; and as the valves cannot be closed by the contraction of the papillary muscles, there remains only one way in which they can, viz. by the pressure of the blood against them. The cords passing from the muscles to the valves are evidently for the purpose of steadying, and preventing the passage of the latter backwards; for were the free edges of the mitral and tricuspid valves not held by the tendinous cord, the valves must necessarily be driven, during the systole of the ventricles, by the stream of blood, partly into the auricles, and partly against the mouths of the arteries, so as completely to prevent their closing.

Of such importance to the functions of the valves is the peculiar disposition of the cords upon them, that were this otherwise, the regurgitation of the blood into the auricles, during the systole of the ventricles, could not be prevented. Notwithstanding this, an exact description of this distribution of the cords in the mitral and tricuspid valves is nowhere to be found; and even Bouillaud, who has made the heart so much his study, does not seem to have appreciated this distribution, or known its object.

Several strong cords run from each papillary muscle, to be inserted into the ventricular surface of the valve, from its centre to the angle which it forms with
the side of the ventricle. From about the middle of these cords, and from the papillary muscles, there arises a set of weaker ones, which are inserted nearer the free edge of the valve. These again furnish a fixed point for others still more slender, which are inserted nearer to, or into the free edge of the valve. To the auricular surface of the valve there are no cords attached.

If the papillary muscles be drawn upon in the direction in which they lie in the heart, the stronger cords which arise directly from them will alone be made tense; the weaker ones, which arise from the stronger, and are inserted nearer to, or into the free edge of the valve, remain flaccid, even when the greatest force is used, consequently the free edge of the valve can never be rendered tense by drawing on the papillary muscles; that portion which lies between their junction with the ventricular wall, and the point into which the cords arising from the papillary muscles are inserted, will alone be expanded. The rest of the valve, viz. the portion between the free edge and the centre, will remain flaccid.

If pressure in the direction of the auricle be made on any point in this flaccid part of one of the mitral or tricuspid valves, so that the cords inserted into it shall be rendered tense, a number of pouches will be observed in the part; and if the pressure be applied to the whole of the valves, the surface facing the auricle will not be found even, but composed of pouches, which begin at the free edge of the valve, and extend to its centre, or even beyond; this peculiarity of the surface evidently depends on the manner in which the tendinous cords are distributed.

These pouches represent small crescentic valves, a large number of which form the mitral and tricuspid valves, which are held in the proper direction by the tendinous cords. If the flaccid part of one of the valves be blown in the direction of the auricle, it becomes expanded like a sail, and the pouches over the whole circumference of the free edges are seen at once. The same may be observed by pouring water against the surface of the valve.

When the blood is pressed backwards towards the auricles during the systole of the ventricles, it is necessarily caught in the small semilunar pouches of the mitral and tricuspid valves, and forces the flaccid portions of these valves as far in the direction of the auricles as the length of the tendinous cords will allow. The blood, by thus expanding the valves, shuts the way into the auricles against itself, that is, as long as the valves are held by the tendinous cords in such a direction, as when expanded, to completely close the passage. Hence, the tendinous cords of the valves would not answer their end, were they attached differently to any part of the ventricular walls, or were they not of a particular length.

The width of the ventricles is greater at the commencement of their systole than at its termination, and the points of attachment of the papillary muscles in the walls of the heart approach in proportion as the ventricles contract nearer to the fixed points of the mitral and tricuspid valves. If the tendinous cords to effect the closing of the valves require to be of a certain length, the object of the papillary muscles is very evident.

Supposing them to arise immediately from the walls of the heart, and to be of exactly the proper length at the commencement of the ventricular systole, they must become too long during its progress. If, on the other hand, they were only long enough to hold the valves in a proper direction at the end of the systole, they must prevent the diastole of the ventricles. As a change in the length of the tendinous cord is impossible, the object of their connection with muscles, viz. by their shortening and lengthening, to keep the valves constantly in the proper position, is obvious. In proportion as the origins of the papillary muscles approach the fixed points during the ventricular systole, these muscles become shortened, and the tendinous cords arising from them would, provided the blood did not press against them, remain in the same state of tenseness in which they were at the beginning of the ventricular systole, and would also retain the same degree during the diastole, because the papillary muscles lengthen as the walls of the heart recede from each other.

The correctness of the above view is further confirmed by the circumstance of that portion of the tricuspid valve, which is attached to the septum, not re-
ceiving its cords from papillary muscles, but directly from the wall of the cavity. The points of attachment of those cords on the septum, approach the fixed point very little, if at all, during the systole of the ventricles, and recede as little during the diastole, a tendinous cord is consequently here quite sufficient to fix the valve, no change in its length being required.

According to all that has been said, the action of the mitral and tricuspid valves may be described as follows:—During the contraction of the ventricle, the passage of the valves into the auricles, and against the mouths of the arteries, is prevented by the shortening of the papillary muscles. The papillary muscles, and the cords arising from them, at the same time approach each other, the surface of the valves where the cords are inserted becomes wrinkled, and the auriculo-ventricular passages are made narrower.

The remaining portion of the passages is closed by that portion of the valve which is not drawn upon by the papillary muscles. This portion of the valve is blown up like a sail by the pressure of the blood, the single points in the free edges of the valves come alternately in contact with those of the opposite valves, and partly from the support which they yield each other, but principally from that derived from the cords, their free edges are prevented from being turned back. As the delicate cords which go to the free edges of the valves, arise from the stronger ones, which have their origin in the papillary muscles, the larger cords are drawn closer together, and in a curved direction, by the smaller ones, when the latter become tightened by the pressure of the blood on the free edges of the valves.

With the ventricular diastole the papillary muscles lengthen, and separate from each other. Were the valves not held in a proper direction by the tendinous cords, they would be driven by the blood in its passages out of the auricles against the sides of the ventricles, and partly across the mouths of the arteries. The tendinous cords arising from the papillary muscles do not relax during the diastole, for if they did, the valves could not in the beginning of the systole possess the direction required for their immediate closing, a large quantity of blood would every time regurgitate from the ventricles into the auricles, and the valves would frequently require to be drawn into the proper direction for opposing the regurgitation of the blood, by the contraction of the papillary muscles.

In order that the mitral and tricuspid valves may perfectly perform their function, their free edges must exhibit the above-mentioned pouches, and the tendinous cords and papillary muscles must possess a length in proportion to the capacity of the ventricles. If the structure of the valves be other than normal, they are either not in condition to prevent the return of the blood into the auricles during the ventricular systole, or they are insufficient, or they offer hindrances to the passage of the blood from the auricles into the ventricles during the systole of the latter.

Insufficiency takes place in thickening and shortening of the free edges of the valves, when the free edges grow together with the tendinous cords, which are inserted into the middles of the valves, by which the pouches become obliterated in shortening, lengthening, or tearing of the tendinous cords, in excrescences, deposition of coagulated blood, &c.; at the edges of the valves, and in growing together of the valves with the sides of the ventricles, the blood is hindered in its passage into the ventricles by considerable excrescences, coagula of blood, chalky concretions, &c., on the auricular surfaces of the valves, or by a growing together of the tendinous cords, or of these with the free edges of the valves, which prevents a separation of the valves from each other.

Action of the semilunar valves.—The semilunar valves in the aorta and pulmonary artery, are pressed during the systole of the ventricles, by the blood which is forced into the arteries against the sides of the latter, and during the diastole they are expanded by the return of the blood which is pressed by the elasticity of the arteries as well against the ventricles as in every other direction.

From excrescences, chalky concretions, &c., which develope themselves on the valves of the aorta, or from a growing of those valves together, they sometimes become immoveable, do not admit of being pressed against the sides of the
artery, and prevent the passage of the blood into it. If the free edges of these valves be shortened, turned back, or covered with excrescences, or if the valves be partly separated from their function with the mouth of the artery, or have apertures in them, they are no longer in condition to prevent the regurgitation of the blood, and it returns during the diastole of the ventricles, from the aorta into the left ventricle.

It is very easy to determine in the dead body whether the valves of the aorta had perfectly closed during life or not. If in the normal condition of the valves, water be poured into the aorta, it will not pass into the left ventricle, but will remain in the artery, because the valves close and hinder it, but if the valves be insufficient, it will sink into the ventricle.

This test cannot be applied in the dead body to the mitral and tricuspid valves. If a ventricle be filled with water, the mouths of the arteries closed, and pressure made on the ventricle, the mitral or tricuspid valve will be expanded, but the passage of the water will not be completely hindered, even although the valve be perfectly normal. The reason of this is obviously that the contraction of the ventricles on all sides, cannot be imitated. Thence it can only be determined whether these valves had closed during life or not, by examination of their form, of the tendinous cords, and of the papillary muscles, and by remarking the presence or absence of those changes, which insufficiency of the valves usually produces in the auricles.—British American Journal, No. 3.

Function of the Muscular Pillars of the Auriculo-Ventricular Valves of the Heart. By Dr Spittal, Edinburgh.

Views similar to those contained in the above extract have been published by Dr Spittal long ago, in refutation of Dr David Williams' views of the second sound of the heart, which he (Dr W.) attributed chiefly to the flapping of the auriculo-ventricular valves against the walls of the ventricles at the moment of the dilatation of the latter; and at which time Dr W. argued, the papillary muscles, from having been much extended, suddenly contracted, and forcibly opened the valves. (Edinburgh Medical and Surgical Journal, 1829.) "There is no reason to suppose," remarks Dr S. "that the columnae carneæ become lengthened during the contraction of the ventricles, or that they act separately from the other fibres of the heart; on the contrary, from the latest observations of anatomists, these appear to be merely continuations of the external fibres of the heart, which we are sure contract during the systole of the ventricles; consequently there is every reason to suppose, that the columnæ also contract at the same time. The contraction of the muscular pillars of the valves—which are the only parts of the columnæ of importance in this question—in consequence of these being much shorter than the external fibres, will be much less than that of the latter, and probably not sufficient to neutralize the effect produced by them, which is in part that of drawing the heart in a mass towards its base. The pillars of the valves, then, forming a part of the general mass, will, during the contraction of the external and other fibres, be approximated to the base of the organ. By their own contraction, however, they will, at the same time, be drawn in an opposite direction; but as their contraction, compared with that of the more external fibres, will be much less, so, after all, the pillars of the valves may be actually brought nearer to the base of the heart; not lengthened, according to Dr Williams, but really shortened, and in a state of contraction, necessary for preventing the valves from being pushed into the auricles, during the contraction of the ventricles." . . . . "Dr Williams, as already mentioned, is of opinion, that the columnæ carneæ, by their contraction, open the valves. The reverse, and more correct, is the opinion of most physiologists, namely, that they, by their contraction, close the valves. We are not sure, however, that this is quite the correct explanation, when the structure of the pillars of the valves is taken into account. Each pillar is found to divide generally into two diverging papillæ; by the con-
traction of which these will be brought close to each other, being united at the base, and the contraction taking place in a line from the apex to the base of junction; consequently, the valves, through the medium of the cordæ tendineæ, will be approximated; but it does not appear that by this they will be entirely closed, for the columnar extremities of the cordæ tendineæ cannot be brought close to each other, in consequence of the lateral rounded projection of the pillars of the valves themselves, from which it is probable that these valves never can be completely closed by this cause; and we believe that the pressure of the blood, which acts alone upon the sigmoid valves, also performs a similar function to a certain extent, in the closing of the mitral and tricuspid valves; and the comparatively loose and floating edges of these valves, between the attachments of the cordæ, may be the parts principally acted upon.” Pp. 113–116.—Spittal on Auscultation, Edinburgh, 1830.

S U R G E R Y.

POLYPI OF THE FEMALE URETHRA. BY M. H. BAVOUX.

Little attention has been paid to the subject of polypi in the female urethra; many individual cases of this affection are no doubt to be found scattered through the various journals, but nowhere have they been collected together as a whole, so as to present anything like a complete history of the disease. It has been the object of the author to supply this desideratum. His paper was suggested by some cases observed at the venereal hospital of Strasbourg.

The urethra in the female is a canal in which both a mucous and a vascular structure are found, and it is this peculiarity which gives to the polypi occurring in it, an individual character. They possess, at the same time, a mucous and a vascular structure, and these two characteristic elements are never observed increasing independently of each other. On the contrary, these small bodies are constantly seen to originate from hypertrophy of the mucous membrane, into which numerous vessels, from the subjacent erectile tissue are prolonged, so that of all the species of polypi described by authors, those which, in a descriptive point of view, approach nearest to these tumours of the urethra are, without doubt, the fungoid species; with this distinction, however, that these polypi rarely, and as it were exceptionally, degenerate.

Polypi of the urethra very rarely occur before the age of puberty, and appear to have for their cause a too great stimulus of the genital organs. Thus the affection is more frequently met with in prostitutes than in other females. Schutzemberger has seen them occur after blenorragia; but, of course, frequent coitus or masturbation may act in the same manner.

The polypi sometimes project beyond the orifice of the urethra, and lie between the large labia; they are sometimes retained within the interior of the canal; and hence, the division into external and internal polypi.

External Polypi are of much more frequent occurrence than the latter, and generally originate from the posterior wall of the canal, near the meatus urinarinus, a circumstance which did not escape the observation of Boyer. At other times, however, they originate higher up, and thus remain concealed for a longer or shorter period, till by their increase in size, or the elongation of their pedicle, they at length protrude. Their size is seldom considerable; it varies from that of a currant to that of a large cherry, and rarely exceeds that of the latter. The pedicle is in general large as compared with the size of the polypus, and decreases in size as the latter enlarges. Their shape at the commencement is very generally that of a cone; at a later period, from the increase of growth being irregular at various points, they assume a lobulated appearance. Their surface is most generally of a bright red colour; at other times, it is somewhat pale, and at others of a deep red: sometimes they are entirely covered