THE FUNCTION OF THE AURICULAR APPENDIX.*

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It has always seemed to me that a particular mechanical difficulty connected with the working of the heart has not attracted attention, and that the mechanism by which the difficulty has been overcome has consequently not been adverted to.

The question is as follows. How is it possible for a chamber like the auricle, thin in its walls, yet acting only by the muscular force of those walls, to distend, even to tension, a thick-walled chamber like the ventricle, powerful in contraction, and therefore equally powerful in resisting distension? It is evident that the mere relaxation of the fibres of the ventricle, which occurs on the termination of the systole, will not account for the subsequent full tension produced by the action of the auricle. There must exist within the auricle itself some mechanism, hitherto not specified, by which its power is so much augmented, as to enable it to exert a force sufficient to overcome the resistance of the much thicker walls of the ventricle. On the other hand, a very well marked mechanism, with strong evidence of purpose in its construction, but to which no function of any importance has as yet been assigned, exists in the auricular appendix with its *musculi pectinati*. To mix up the blood in the auricle, is the only function which physiologists have been able to invent for it. But the appendix is known to contract after the sinus, and when the greater portion of the blood has consequently been expelled. To mix up this blood cannot, therefore, be its true function.

But this fact, that it is the last portion of the chamber to contract, taken in connection with another known fact, namely, that the auricle does not completely empty itself of blood, seems to me to point very strongly to a different function discharged by the appendix, and to which I wish to call attention. Since the auricle does not completely empty itself of blood, it follows that there exists a communication between the fluid in the appendix and that in the ventricle, up to the instant at which the auriculo-ventricular orifice is closed by the shutting of its valve. Now, we are all well acquainted with the fundamental property of fluids, namely, that pressure applied to any part of the fluid is transmitted equally in all directions throughout its entire volume, and we are familiar with the practical application of this principle in the Bramah press. It is clear that the pressure exerted by the appendix, as it contracts subsequently to the contraction of the sinus, must be transmitted without diminution by means of the small column of fluid still remaining within the auricle, through the auriculo-ventricular orifice and into the chamber of the ventricle; and if the force exerted by the appendix on this small column of fluid be represented by x , the force exerted on the internal surface of the ventricle will be ax , if this surface be a times as large as the transverse section of the column; if the expansive force within the ventricle thus increasing *pari passu* with the increasing tension to which its fibres are subjected, and continuing until the instant at which the communication between the two chambers is cut off by the closure of the auriculo-ventricular valve.

The auricular sinus acts upon the ventricle when the walls of the latter are in a relaxed condition, and therefore comparatively easy to distend; and, up to a certain point, the action of the sinus fills the ventricle with blood, and increases the extent of the fluid surface within it; but, just as the fibres of the ventricle become tense, and require the exertion of more force on the part of the auricle to complete their distension, the fibres of the sinus are becoming incapable of further contraction, and consequently of further exertion. Had the sinus now completely emptied itself of blood, there would be no means of completing the distension of the ventricle; but the force of the appendix comes into play just as that of the sinus is nearly exhausted, and is brought to bear on the ventricle by means of the small column of blood still remaining in the auricle, and this, just at the moment when the most force is required to overpower the increasing resistance of the ventricular fibres, and just under the circumstances when the most force can be exerted by it, owing to the increasing extent of the fluid surface within the ventricle.

Further, in consequence of the small superficial extent of this column of blood, the force of the appendix acts to a minimum degree against the walls of the auricular sinus, at the very same time that it is acting to a maximum degree against the walls of the ventricle.

What are we to regard as being the function of the *musculi pectinati* of the appendices? Not, as seems to me, the strengthening of the action of the appendices, the function assigned by some; for this could

be easily accomplished, if necessary, by a slight addition of strength to a smooth wall, such as is found in the sinus; and we never find nature waste ingenuity on an elaborate arrangement for accomplishing that which might as easily be effected by a more simple one; nor yet can we regard them as indicating that, were the interspaces filled up, the appendix would be too strong; for surely to make a smooth wall thinner would obviate this opposite difficulty. Yet these contradictory views have both been put forward. To my mind, this marked peculiarity of structure indicates some special end to be attained, which could not so well be accomplished by any specified thickness of a smooth wall; and this end I conceive to be the complete emptying of the appendix of its contained fluid, by means of their contraction and mutual interpenetration; and this emptying is, I conceive, necessary, in order to obtain a sufficient amount of fluid for injection into the ventricle; for it is evident that, whatever force might be capable of being brought into play, there would practically be little result if there was not a sufficient quantity of fluid for injection to carry out the effect.

I have only to remark further, that, as muscular fibres surround the great veins for some little distance from the auricles, these chambers must also be submitted to hydraulic pressure previously to their contraction, and for the purpose of accomplishing their complete distension.

OBSTETRIC MEMORANDA.

[It is not often that observations so interesting can be recorded so briefly and clearly. But the subjoined memoranda are in many respects models of the kind of notes which we had in view in founding this department. We shall be glad also to receive short records to be published under the head of THERAPEUTICAL and of CLINICAL MEMORANDA, including very short notes of cases and hints as to remedies and formulae; such, for instance, as will be found in connected form in the valuable records of a ripe and cultivated observation by Dr. Symonds, which we commend this week.]

TWINS: KNOT OF ONE CORD ENCIRCLING CORD OF THE SECOND CHILD.

By J. M. HEWARD, Esq., and W. NEWMAN, M.D.Lond., Stamford.

I.—MR. HEWARD'S CASE.

On February 16th, I delivered H. B. of female twins, at the full period of gestation. Both infants were well grown. The first, a head-presentation, was still-born; the epidermis peeling off, the integuments swollen and discoloured. The second, a breech-presentation, was alive and vigorous. Looking for the cause of death in the first-born, I found a most complex knot in the middle of the two cords. These were about two feet long, and sprang from one placenta. It was difficult to undo the knot, in which the funis leading to the still-born infant was compressed and shrivelled. The children had apparently indulged in gymnastic exercises whilst *in utero*, the one unconsciously causing the death of the other.

II.—DR. NEWMAN'S CASE.

As a fitting pendant to the above case, I wish to add the following. On May 12th, 1858, a multipara was attended by me in a twin-labour. One child, a male, was born before I arrived; it was alive and healthy. The second child, also a male, was born soon afterwards; it was livid and dead. Midway in its length the first child's cord had a single simple knot. Through this the cord of the second child passed, and the nurse had by traction drawn the knot tight in her anxiety to prevent the cord from going up again. A full report, with sketch and note, was given by Dr. Chas. West, in the *Edinburgh Medical Journal*, July 1858.

CASE OF SPONTANEOUS EXPULSION OF THE FÆTUS.

By D. DYCE BROWN, M.A., M.D.,

One of the Medical Officers of the Aberdeen General Dispensary, Fellow of the Obstetrical Society of London.

J. C., aged about 28, unmarried, had had three children before. For two months previously to her present confinement, she had bronchitis, at first acute. After the acute stage had subsided, it remained chronic, improvement being but slight till after delivery. For some time before delivery, she had not felt the foetal movements. The delivery occurred at or near the full term of gestation. The case was being attended by a student. When I came, I found, on examination, the elbow protruding from the vagina, the right shoulder easily within reach; and the

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