THE RELATION OF THE LEFT AURICLE TO THE CHEST-WALL, AND TO THE MURMURS AUDIBLE IN THE CARDIAC AREA.

By GEORGE W. BALFOUR, M.D., LL.D. (Edin. and St. And.)

PLATE VIII.

AT various times and in sundry places I have made known my faith in Naunyn's view, that a systolic murmur, audible between the second and third ribs, to the left of the pulmonary area, is an early sign of mitral regurgitation, and that any pulsation perceptible there is, in the greater number of cases, of auricular origin. This opinion is now pretty generally received as correct, especially on the Continent; it was therefore with some amazement that I read in the third volume of this *Journal*: "He"—Russell, to wit—"has demonstrated *beyond all possibility of doubt* that the left auricle *never* reaches the anterior wall of the thorax."¹ The italics are mine. This startling announcement sent me at once to the original authority, which I now quote: "The assertion made by Dr. Balfour that the auricular appendix is enlarged to any considerable degree has yet to be proved; for there are no recorded observations either on this or on the other interesting point as to which diameter is most increased. For the acceptance of the doctrine of auricular appendix pulsation it would be necessary to prove that the appendix is elongated, as the most earnest believer in the theory can scarcely claim that more than the tip of the structure reaches the chest. I have made no precise measurements; but, after examining a large number of hearts in all morbid conditions, I am satisfied that when the appendix is enlarged, it is, as a rule, more so in its transverse than in its longitudinal diameter; in fact, it has often seemed to me that the enlargement of the auricle was in part effected by drawing upon the appendix, and that the tendency was more towards obliteration of the normal diverticulum than towards enlargement of it."²

The statement just quoted, though not put in so dogmatic a form as Gibson has represented it, amounts to much the same thing, and

¹ "Remarks on the Heart in Debility," by G. A. Gibson, M.D., *Journ. of Path. and Bacteriol.*, Edin. and London, 1894, vol. iii. p. 34.

² "Investigations into some Morbid Cardiac Conditions," by William Russell, M.D., Edinburgh, 1886, p. 41.

throws the *onus probandi* upon me. Not having the same opportunity nowadays of obtaining material of this character I at once applied to two friends for assistance, and in a few days I got a photograph of a large auricle from Glasgow, and also a heart from Dublin. The photograph is that of a large auricle, but partly filled with a thrombus, cut open, and not available for the purpose I had in view. The heart is that of a woman, æt. 35, who died of catarrhal pneumonia, engrafted on chronic heart disease of rheumatic origin, in the City of Dublin Hospital, under the care of my friend Dr. Duffey. An illustration (Plate VIII.) of this heart is given here, and needs no description; it speaks for itself, and shows *beyond all possibility of doubt* that in this case not only the apex of the appendix auriculi, but a considerable portion of the appendix itself, must have been in the closest juxtaposition with the anterior chest-wall. I have placed this heart in the museum of the Royal College of Surgeons, Edinburgh, where it can be seen and examined at any time. Such auricles are not uncommon; I have seen scores of them myself, both during life and after death.

It is chiefly in connection with mitral stenosis that the left auricle attains so large a size, but it is in connection with dilatation of the heart that the auricle plays its most important rôle.

We learn from Walshe¹ that experience gained from observations carried on during many years on the bodies of male subjects cut off by various diseases had convinced him that the appendix of the left auricle is, in almost every instance, visible anteriorly, as the organs lie *in situ*. The middle point of the auricle in this position from above downwards corresponds, he says, to the cartilage of the third rib. This is the position in which a systolic murmur is often to be heard, and a systolic pulsation occasionally to be felt, as an early and infallible sign of mitral regurgitation due to dilatation of the ventricle. These signs are naturally absent in those comparatively few cases in which the appendix of the left auricle is too short to reach the chest-wall, even when slightly dilated.

The auricular murmur is a murmur of everyday occurrence; as an early indication of mitral regurgitation it is found at a time when there is practically no change in the configuration of the heart, and no reason for assuming any other source of origin for the murmur than the auriculo-ventricular opening connected with that auricle, the apex of which lies directly beneath that point on the surface of the chest where it presents its maximum intensity.

The conditions presented by such a heart are a feeble impulse; an apex beat that no longer represents the distinct thrust of the left ventricle, but is a mere extension from the strongest point of pulsation lying beneath the lower part of the sternum; a matter that the stethoscope can detect long before it is sufficiently well-marked to be

¹ "Diseases of the Heart and Great Vessels," by W. H. Walshe, M.D., 3rd edition, London, 1862, p. 2.

otherwise appreciated. Over the apex the first sound is prolonged, blunt, faint, or impure; over the lower end of the sternum the first sound is louder and more distinct. The second sound varies; sometimes the aortic second is markedly accentuated, at others this is feeble and the pulmonary second is slightly accentuated. But at this stage the pulmonary congestion is not sufficient to produce either marked accentuation or reduplication of this sound.¹

The natural progress of the auricular murmur is a gradual extension of it into all the cardiac areas, till a systolic murmur becomes audible in every one of them. The dilatation of the heart itself slowly increases, combined with more or less hypertrophy, till in certain circumstances it may become a veritable *cor bovinum*.²

At that early period of ventricular dilatation, when the auricular murmur is first detected, there is but little change to be found in the heart itself. The auriculo-ventricular opening is unaltered; any dilatation of this is of much later occurrence; and as we know that one segment of the valve alone is almost sufficient to close the natural opening, there can be no post-mortem evidence of the existence of regurgitation. In its early stage mitral regurgitation is, so to speak, purely a vital phenomenon; so soon as residual accumulation and ventricular failure together are sufficient to keep the insertions of the *chordæ tendineæ* so wide apart that the trifling pressure of the blood flowing from the auricle is unable to bring the valve segments into apposition, then the moment the ventricular systole commences we have regurgitation between these segments into the auricle.³ This regurgitation may only occupy the first portion of the systole, or it may occupy the whole of it, according to the degree of imperfection of the mechanism.

Regurgitation through the mitral opening gives rise to fluid veins which impinge upon the wall of the left auricle, exciting in it sonorous vibrations that give rise to an audible systolic murmur at the only point at which that auricle approximates the anterior chest wall. This systolic murmur does not reach the chest-wall in the usual position, just over the apex beat, apparently because the vibrations of the ventricular wall are too feeble to be sonorous, or are not sufficiently so to be communicated to the chest-wall in this position otherwise than as a mere impurity of the first sound; a state of matters no doubt greatly favoured by the separation of the left apex from the chest-wall by the dilated right ventricle. How trifling a dilatation is required for this is readily discovered by the simple experiment of putting a finger on the apex beat and holding the breath for a few seconds, when the apex beat is found gradually to recede till it becomes almost imperceptible.

¹ Balfour, "The Senile Heart," London, 1895, pp. 36, 52, etc.

² Balfour, *op. cit.* p. 59.

³ Balfour, *op. cit.*, p. 61. And Ludolph Krehl, *Arch. f. Anat. u. Physiol.*, Leipzig, 1889, s. 291.