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THE ANNUAL ORATION—THE RAPID HEART: A  
CLINICAL STUDY.

By ARTHUR ERNEST SANSOM, M.D., F.R.C.P.

MR. PRESIDENT AND GENTLEMEN,—When contemplating the question of what should be the subject of the address which, by your favour, I am chosen to deliver this evening, I was guided by the desire to find one concerning which I had some personal experience, one that should possess the greatest interest for the greatest number, and one the consideration of which should be of some practical usefulness. We are apt, I am aware, to set up, each one for himself, a standard both for the interesting and the practical; but I think I am right in the belief that there are very few members of our profession, whatever their line of practice, who have not been occasionally perplexed concerning

cases manifesting disturbances of the normal action of the heart. Such perplexities have probably occurred in regard to diagnosis, prognosis, and treatment. There have been difficulties in determining whether the perturbations witnessed were due to, or were the disposing causes of, organic heart disease. There have been dangers of over-estimating and of unduly depreciating the signs of disturbance; so in the one case the anxieties of the patients and their friends may have been rendered needlessly acute, and in the other a delusive optimism may have been rudely checked by the fatal logic of events. And, certainly, with reference to questions of the therapeutics of such disorders, it cannot be said that science is yet satisfied. If such thoughts have not occurred to many of my brethren, certainly all these phases of doubt and difficulty have been passed through by myself. It seemed to me, therefore, that it would be worth while to ask you to consider with me this evening some forms of disturbance of the action of the heart. I do not pretend that I shall be able to do much to solve the perplexities that I have assumed to exist, but I know by former experience that, even though no discussion immediately follows this address, my views will be tested in many mental crucibles, and that I shall learn more than I can teach.

Now to define the limits of my subject. I shall treat only of that form of disturbance in which the heart's action is morbidly accelerated. It was my first intention to include some forms of irregularity of the rhythm of the heart, and it will be necessary to mention a few instances of these, because the conditions of irregularity and morbid rapidity sometimes overlap. I found, however, that the time at my disposal could only suffice for a brief review of the cases in which abnormal acceleration of the heart was the chief feature. I do not propose to consider any cases in which valvular or other organic heart disease was found to precede the signs of morbid acceleration, although I am well aware that the symptom is sometimes an important and dangerous complication of such organic disease, and in itself demands careful study. Nor do I mean to treat of any cases in which the condition of rapidity was in association with states of disease accepted by general experience as disposing causes of such acceleration. Such conditions, therefore, as fever, the direct influence of certain germs of disease, pronounced anæmia, hæmorrhage, and the operation of certain poisons, are excluded. So also are conditions of

peripheral irritation, as the presence of undigested food in the alimentary tract and the sometimes pronounced effects of intestinal worms. Furthermore, I exclude cases in which the acceleration is solely paroxysmal. So I do not deal with all those interesting cases which have been described as instances of "paroxysmal hurry of the heart," though some of these, as I shall presently show, will be legitimately grouped with my own. Lastly, I exclude cases of palpitation when such symptom occurs in the case of a heart manifesting, at the times when such palpitation is absent, a normal rate of action. *Palpitation* is defined in 'Quain's Dictionary' as "abnormal movement of the heart, whereby the force of the systolic contractions is increased to such a degree as to give rise to a sensation of discomfort or distress on the part of the patient." This definition I entirely accept. In the cases which I shall ask you to consider there is of necessity no sense of distress or discomfort on the part of the patients when the heart is beating at a rate far above the normal, but these may be, and often are, the subjects of palpitation with its painful concomitants. I take, therefore, only those cases in which there is good reason to believe that the rate of the heart's cycles is unduly quickened for considerable, and in some instances for very protracted, periods. The cardiac action is, as it were, set for an abnormally rapid rate. For brevity, I have denoted these as cases of "rapid heart."

It is obvious that we have to think of a disturbance which has been termed "functional." I share with our excellent librarian, Dr. Allchin, his objection to this term, and adopt his reasoning.\* You will no doubt remember that a German professor long ago defined amaurosis as a disease in which the patient saw nothing, nor yet the physician. Perhaps I may be permitted to paraphrase in some sort this definition, and say that a functional disorder of the chief organ of the circulation is a disturbance which involves the heart of the patient and the mind of the doctor. The vision of the ophthalmic surgeon has been, in the case of amaurosis, greatly aided by instruments for precise observation. The disturbed mind of the physician can only be calmed by the appreciation of truth and this through the enlightenment which comes from the convergence of many facts. I shall here attempt no peering into the mysteries of intimate pathology, nor invoke the use of the imagina-

\* "Functional Disease," by Dr. Allchin, 'Westminster Hosp. Rep.,' vol. ii.

tion, however scientific. I mean to group certain clinical observations, to formulate perhaps some penultimate propositions, and ask you to take therefrom your own inferences.

It is first necessary to pass in brief review the facts in relation to the form of heart acceleration that we are about to consider which have been already established by observers. We should at the threshold agree upon a rate of the heart cycles, which in the adult we may fairly take for the limits of health. We may consider the average rate of the cardiac cycles in the healthy male as 72, and in the healthy female as 80 per minute in the recumbent posture in each case. In the erect position these rates may be raised to 80 and 90 respectively. Seeing that very slight causes may tend to some acceleration, it can scarcely be affirmed that a heart-rate of 90 in the adult is of necessity abnormal. We may, however, I think, justly consider that a rate of cardiac pulsations observed under varying conditions to be over 90 errs on the morbid side, and requires some explanation of its morbid frequency.

We have considered the influence of *sex*; that of *age* must be duly weighed. According to the observations of Drs. Keating and Edwards of Philadelphia,\* the mean pulse rate of the healthy infant until the close of the twelfth month varies between 112 and 130 per minute. During sleep this rate is usually reduced about 14 beats per minute. These observations presuppose the infant to be in a state of quietude. During active muscular movement or mental excitement the mean rate is increased to 150 or 163 per minute. The child of six years has an average pulse rate of 100, which at the age of 13 has become reduced to 88, approximating, therefore, to the rate observed in the adult. The cardiac pulsations of the child are readily excited to a high degree of frequency by causes both intrinsic and extrinsic. Rapid action may occur from such causes of peripheral irritation as worms (oxyurides or ascarides), as well as from the multifarious conditions of indigestion, accompanied by pain. Sudden terror may induce violently perturbed and rapid action of the heart of the child. According to some observers, myself included, such terror may be the initiating cause of chorea, a disease in which the cardiac pulsations, sometimes irregular, are generally morbidly over-rapid, though such rapidity is not extreme. Dr. Bristowe has narrated

\* "Clinical Studies of the Pulse in Childhood." 'Archives of Pediatrics,' December, 1888.

a case in which paroxysms of extreme rapidity of the heart were probably initiated in a boy of 8 from physical overstrain in a paper chase. This ultimately became a case of protracted "rapid heart," and ended in sudden death at the age of 19. In boys, especially those nearing puberty, there is considerable evidence to show that masturbation may not only provoke paroxysms of palpitation, but may lead to conditions of irritable heart resembling those in the adult, which we shall now discuss. The classes of cases in which in adult life a long-persistent abnormal rapidity of the heart's action has been observed are for the most part the following:—

1. *Graves' Disease (Exophthalmic Goitre)*.—I cannot help expressing the regret that we must for the present use these terms to denote the affection. The first title suggests a controversy with our continental brethren, who employ the term "Basedow's disease" as its designation; and perhaps the complex title "Parry-Graves-Basedow-Stokes' disease" would be more just. As for the second designation, apart from the peculiar functioning of the adjective, it completely ignores the most important sign and symptom. I do not expect many to acquiesce, but I suggest the term "cardio-vaso-motor disease" for the present as a designation *faute de mieux*. In this affection the rate of cardiac pulsations may be normal with paroxysmal increases, or the morbidly rapid action may be persistent. In the words of Dr. Gowers, "the increased rate of action is sometimes trifling, and the pulse does not exceed 90—100 per minute. More often the rate is higher, 120 or 140 even when tranquil, sometimes 150 or 160, and under excitement it may rise to 180 or 200."\* This acceleration of the heart's action is often the first sign, and it may be for long periods the only manifest sign, of the affection. This point was first noted by Graves.† Dr. Begbie said: "The cardiac and general vascular disturbances precede the thyroid and ophthalmic symptoms . . . . The palpitation of the heart is, for the most part, the symptom which chiefly attracts the attention of the patient, and leads her to seek professional advice."‡ Trousseau recognised as a *forme*

\* 'Manual of Diseases of the Nervous System,' vol. ii, p. 808. London, J. and A. Churchill, 1888.

† 'Clinical Medicine,' vol. ii, pp. 220 *et seq.* New Sydenham Society, 1885.

‡ 'Selection from the works of Dr. Warburton Begbie.' Edited by Sir D. Duckworth for the New Sydenham Society, p. 181.

*fruste* of the disease one in which violent palpitations constituted the chief sign, the thyroid enlargement and the exophthalmos being completely wanting. There can be no doubt that the disease is serious and often fatal, and that the chief cause of danger is in the cardiac involvement. Taking the figures of Charcot, Bellingham, Jaccoud, Hammond, and Hale White, I find eighty-nine cases, with a mortality of 23—25·7 per cent. Gowers says: "In most fatal cases death seems to be the result of the cardiac affection or of increasing general weakness." There may be the ordinary signs of cardiac failure, as in organic disease of the heart; or sudden death, with signs of syncope; or pulmonary or cerebral complications may supervene; or dyspepsia, with gradual asthenia; or, exceptionally, gangrene of the limbs from peripheral thromboses. In fatal cases the heart is commonly found dilated and hypertrophied, but in no considerable degree. The myocardium has been found in strictly normal condition. The one observation by Hale White, where there were hæmorrhages in the brain under the floor of the fourth ventricle, is very important and suggestive.\*

2. *The Irritable Heart of Soldiers.*—The term "irritable heart" was applied by Dr. J. M. Da Costa, of Philadelphia, to designate an affection which he had observed amongst the men engaged in the great American civil war. He found from observation of more than 300 cases, that though these might manifest no obvious departure from health, a persistently quick action of the heart was observable, and the affection was chronic. He noticed that the respiration rate was not quickened *pari passu* with the pulse; though the cardiac pulsations were very frequent, the breathing might be normal. Dyspnœa with dyspepsia and præcordial pain were occasionally concurring signs, and the affection might result in cardiac hypertrophy.† It is shown with great probability that not only changes in the myocardium—hypertrophy or dilation, or both combined—but also valvular imperfections, can result from the condition of irritable heart. As Hirsch has recorded, there has been a notable increase in the proportion of cases of heart disease in a community at times of great political and social excitement. This was noticed in France during the Great Revolution, and after the political agitation of 1830, in

\* 'British Medical Journal,' March 30th, 1889, p. 699.

† 'American Journal of Medical Sciences,' January, 1871.

Rome after 1848, in Sicily in 1860, and in the Argentine States as a result of the political confusion and civil war.\*

3. *Rapid Heart in Osteo-arthritis*.—Such association has been especially noticed by Dr. J. Kent Spender, of Bath, in a communication to this Society. Dr. Spender says: "The pulse quickens with the earliest objective signs of osteo-arthritis: there is a gradual rise until the numerical frequency of 110, 115, or 120 is reached, and there is scarcely any physiological variation during day or night. And the cardiac tumult does not always subside even when the osteo-arthritic phenomena tame down; a quickness and an irritability continue which no medicine effectively controls."† It will be seen that my own observations tend to confirm these views. Dr. Spender has done important service in contributing to the elucidation of the etiology and clinical history of a disease concerning which much has yet to be learnt.

4. *Rapid Heart without notable Morbid Association*.—Cases of extreme rapidity of the heart, attended with little or no subjective sign of distress, have been recorded by Bristowe, Broadbent, Samuel West, and others. In such an extraordinary acceleration of the heart's action has been described as lasting for days, or weeks, or months. Premising that my criticism is of nomenclature only, I must lodge an objection to the title of the valuable paper in which Dr. Bristowe brought such cases before the notice of the profession in 'Brain' of 1888.‡ The communication was entitled "On Recurrent Palpitation of Extreme Rapidity in Persons otherwise apparently Healthy." It is true that attacks of palpitation occurred in many of the cases, but the, to my mind, most important feature was that frequently the condition of undue rapidity persisted for long periods without palpitation (as we have just now defined it) being manifested at all. I must urge a like objection to the term "paroxysmal hurry," which was applied to these cases. The word *paroxysmal* seems to imply acute exacerbations; but these may or may not occur. Whatever objections there may be to the terms, there can be none to the

\* Cf. Hirsch, 'Handbook of Geographical and Historical Pathology,' vol. iii, p. 44. New Sydenham Society, 1886.

† 'The Early Symptoms and the Early Treatment of Osteo-arthritis (commonly called Rheumatoid Arthritis),' by John Kent Spender, M.D. Lond. H. K. Lewis, 1889.

‡ Vol. x, p. 164.



value of the observations. In a married woman, aged 30, the signs occurred suddenly, and left after a week; the pulse rate observed was 180 to 192; on recurrence, it attained 246. Dr. Bristowe says: "What seemed to me at the time the most remarkable feature of her case was the apparent absence of distress. Had I not known that the patient's heart was beating with extraordinary rapidity, it would never have struck me from watching her and conversing with her that there was anything the matter with her."\* In another case, that of a female, aged 49, the pulse-rate was counted on many occasions, and found to vary in rate between 180 and 240 per minute. Yet it is said that there had never been, so far as was known, attacks of palpitation. The condition lasted about three weeks, and ended in albuminuria and death. In a third case, a lady of 40, rapidity of heart continued probably night and day for six weeks, the rate observed being 200 to 260; yet the patient suffered little in spite of such extraordinary cardiac acceleration, and was able to take long walks and perform systematic and laborious mental and bodily work. Agonising pain at the præcordium, however, supervened, and the patient died with symptoms of pulmonary obstruction and failing heart. Again, in a man, aged 65, Dr. Bristowe found the pulse to be not only rapid (144 and 148), but irregular, yet the patient was unconscious that there was anything unusual about his heart. He experienced no uneasy sensation about the præcordium, and manifested no shortness of breath. In a case recorded by Dr. Broadbent, which was observed for three weeks, the pulse was never under 200, and was usually 240; there was every reason to believe that the heart was beating at the same rate during the whole of the time.† It is obvious, therefore, that extreme rapidity of the heart's action, tachycardia, can be manifested for protracted periods without the usual symptoms of palpitation. In most of the cases recorded, no definite cause for the commencement of the affection could be assigned; but in some over-exertion, in others mental overstrain, were very probably in causal relation. An attack which was supposed to be a sunstroke ushered in one of Dr. Bristowe's cases. There was a definite history of syphilis in a case recorded by Dr. Bristowe, and

\* *Loc. cit.*, p. 165.

† 'The Pulse,' by W. H. Broadbent, M.D. (Cassell and Co., 1890), p. 101.

in another by Drs. Dreschfeld and Maguire.\* Although in many cases manifesting very few signs of suffering or distress, the condition of protractedly rapid heart is no doubt serious and dangerous. Excluding two cases of Dr. Bristowe's series, one on account of the coexistence of organic (valvular) heart disease, and another because the symptoms were more strictly paroxysmal, there remain seven cases, and of these five died with signs which seem to show that the affection was in causal relation with the deaths. Of the six cases mentioned by Dr. Broadbent, one became hemiplegic and another died in convulsions. In one fatal case recorded by Dr. Bristowe the post-mortem examination showed the heart to be somewhat dilated and hypertrophied, but the valves were absolutely healthy, and so was the muscular tissue. In the case noted by Drs. Dreschfeld and Maguire, in which there was a history both of syphilis and alcoholic excess, the heart was large, and its structure presented degenerative changes. It is clearly proved that the condition of "rapid heart" may be manifested in the subjects of organic cardiac disease, but that it may also arise and progress, or continue for considerable periods, in those in whom no form of organic cardiac disease is known to exist. The question occurs, Is the affection one of the myocardium or of some portion or portions of the nervous system? Dr. Bristowe is of opinion that it has no special connection with cardiac disease, and that dilatation and hypertrophy of the heart, when occurring independently of valvular mischief, are the slowly developed consequences, and not the causes, of the disturbance. Dr. Samuel West, on the other hand, thinks that cases of (paroxysmal) hurry of the heart are due to an organic lesion of the muscular substance, which may be, in some cases, a form of chronic interstitial myocarditis, consequent, perhaps, on rheumatic pericarditis or on syphilis, and thus related to fibroid disease of the myocardium.†

I now proceed to a review of the cases of rapid heart which have been under my own immediate observation. I have taken from my note-books seventy-five cases. You will understand that I do not include in this series any in which, anteriorly to the signs observed, there was evidence of organic disease of the heart, or any with which other structural disease was cognately in association, or any manifesting a palpitation which was only paroxysmal,

\* Broadbent. 'The Pulse,' *loc. cit.*, p. 103.

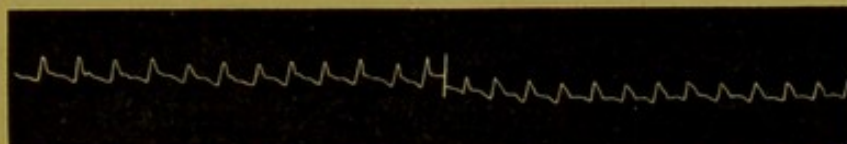
† 'The Lancet,' March 29th, 1890, p. 695.

the heart's action subsiding to a normal frequency with the disappearance of the symptoms of distress. I include only those cases in which there was observed an abnormally rapid action of the heart for comparatively protracted periods. These may be conveniently divided into two categories. First, those in which there was no association whatever with the recognised cardinal signs of the affection I have termed "cardio-vaso-motor disease" (Graves' disease, Basedow's disease, exophthalmic goitre). In this division are forty-six cases—thirty females and sixteen males. Second, those in which there was an association, more or less marked, with the affection mentioned. This division included twenty-nine cases—twenty-four females and five males.

CASE 1.—Perhaps the most interesting case which I have observed in the first category was that of a lady, aged 52, whom I saw in consultation with Dr. Baines. At the time of our interview a complete examination was rendered impossible by the emotional and mental perturbation of the patient. The lady, lying in bed, manifested little or no dyspnoea; there was pallor, but no cyanosis; no objective signs of cardiac or respiratory trouble. The pulse was uncountable, but by auscultation I found the heart beats to be 260 per minute. There were no murmurs nor any signs of abnormality in the size and position of the heart. The condition of "rapid heart" had continued probably for six weeks, and it was considered that the rate of action varied only within slight limits. In early life there had been attacks of "paroxysmal hurry of the heart," which had begun and ended suddenly. There had also been attacks, observed by Dr. Baines, of paroxysmal pain referred to the epigastrium, sudden in onset and abrupt in departure; these were unattended by any quickening of the heart-rate. This pain was only relieved by hypodermic injections of morphia in rather large doses. The lady was of considerable intellectual attainments, not hysteric in the ordinary sense. There was not the slightest evidence of organic heart disease. About three months previously to our visit a condition similar to that at the present had been manifested, and had lasted four weeks, ceasing suddenly. The imminent danger of the condition was apparent. By the advice of a mutual friend massage was attempted, in the course of which a floating kidney on the right side was detected. In the faint hope that this might be a reflex cause of the cardiac irritability, it was attempted to fix the kidney by a bandage; but this measure had no favourable influence upon the condition. (I may parenthetically observe that, though I have seen several cases of movable kidney, I have never known one in which there has been any obvious disturbance of the heart's action, nor have I found such recorded by Landau or other observers. Furthermore, I have never been able to trace cases of protracted acceleration of the heart to any form of peripheral irritation.) The day after my visit the patient fell into a state of trance, lasting half an hour; during this stage the pulse was quite imperceptible, and there was no apparent breathing. Consciousness, however, returned, but there was evident mental perturbation. Death occurred two days subsequently, the rapid action of the heart continuing till the end.

CASE 2.—The next case which I shall quote is interesting, as affording a history of probable origin from physical effort. A clergyman, aged 61, was brought to me in 1884 by Dr. Dugald Stark, now of Oxford. He complained of shortness of breath on exertion, and occasional pain referred to the knees. There had been no antecedent rheumatism. He attributed the onset to overstrain from running two years previously; at this time there was some hæmoptysis. There were no physical signs of cardiac disease; the respiration during rest was normal; the pulse rate was observed to be 192. (Fig. 1.) I have no precise data as to the length of

FIG. 1.



Radial pulse tracing. Male, aged 61. Pulse 192. Origin ascribed to "overstrain from running" two years previously.

time during which this rapidity persisted, but Dr. Stark generally observed the heart rate to be very rapid, and the pulse sometimes irregular. He thinks that the condition of rapidity continued the whole time that the patient was under observation. The outline of the heart appeared to be normal, the apex being just within a vertical line from the nipple, and five centimetres below. The absolute width of the heart dulness at the fourth interspace was ten centimetres. The patient took no sort of care of himself; he went for hours without food, was at everybody's beck and call, and allowed himself no cessation of work from week to week. I saw him again about four months after his first visit, when the signs were much as before. He again came to me after another interval of three months. Then the breadth of the heart-dulness had increased to eleven centimetres, and the apex was seven centimetres below the nipple; the heart had obviously dilated. I learned from Dr. Stark that one year and seven months after I first saw him the patient came to London for four days, and then returned to his home. Thirteen days afterwards, as he was hastening to catch an early train, he fell dead in the road about 200 yards from his house.

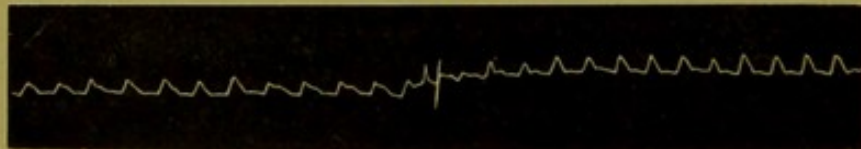
CASE 3.—My third case appears to indicate nervous shock as a disposing cause, though there was a predisposing cause in osteo-arthritis. A lady, aged 65, consulted me in April, 1888, for fearful, agonising pain referred to the sternal region with radiations to the throat and tongue, and sometimes to the axillæ, the shoulders, and the arms. This pain occurred every day, its maximum duration being an hour and a half, and its minimum five to ten minutes. The outline and the sounds of the heart were normal. The pulse was 136. The patient complained of a feeling of intense weakness with tremors. These were mostly general, but sometimes local on the right arm; they were felt as a fine and rapid vibration. Breathing was slightly quickened, and there was marked dyspnœa on very slight exertion. There was no history of rheumatism. Sixteen years previously there had been a slight attack of right hemiplegia with aphasia, which had resulted in recovery of all movement. All the existing series of symptoms dated from the Riviera earthquake, the patient being in the midst of the terrors. The pain was much reduced after a course of digitalis and iron, but the rapidity of heart continued,

and in May I advised a course of weak galvanic currents from the cervical spine to the region of the great nerves of the neck. Ten days afterwards there had been no attack of pain, and the pulse rate was reduced to 96. Variations were observed between this rate and 116, but the recovery was progressive and exceedingly satisfactory. There was no return of pain during the treatment.

I propose to present the chief points in relation to this section of my cases in a summary.

1. *Circulatory Phenomena.*—The maximum pulse-rate observed was from 90—110 in seven cases, 110—130 in twelve cases, 130—160 in thirteen cases, 160—260 in six cases. In the great majority the outline of the heart was normal; in some it seemed to be even smaller than the normal. In three cases only were there signs of dilatation, and the probabilities seemed strong that such dilatation was the consequence of the perturbation, and due to no other causes. Usually the heart sounds were quite normal in pronunciation, though often the sounds and pauses seemed to be of equal duration, so there was a close resemblance to the rhythm of the foetal heart. Murmurs were heard only exceptionally. In one case, after a time, a systolic murmur became audible for occasional periods in the axilla; in another a systolic murmur became manifest at the apex; whilst another was heard at the base; in a third a systolic murmur was localised over the fourth left interspace, close to the sternum; in two cases a systolic murmur became audible over the site of the pulmonary artery. An examination of the radial pulse-tracings shows, for the most part, an absence of those signs of low tension which obtain in the case of the rapid heart of febrile disorders. Marked dirotism is quite exceptional. In the very rapid pulses the line of ascent is short, and not vertical, but sloping. (Fig. 2.) The fall is not sudden, and there

FIG. 2.

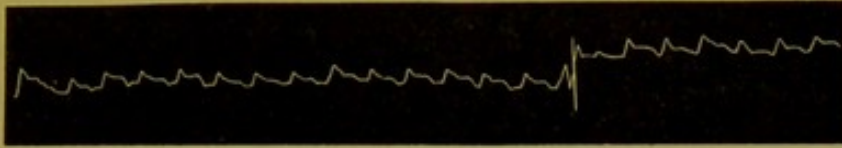


Female, aged 27. Pulse 210. Recovered.

are generally some indications of the tidal or predicrotic wave; in many instances the summit is formed by a broad plateau. (Figs. 3 and 4.) The dicrotic wave is, in some cases, scarcely marked at all; in others it comes as a rounded bulging from about the level

of the middle of the upstroke. In some of the cases in which there is less extreme rapidity the elevation may be considerable,

FIG. 3.



Female, aged 54. Pulse 161. Severe hysteria, epistaxis, headache, insomnia. Died.

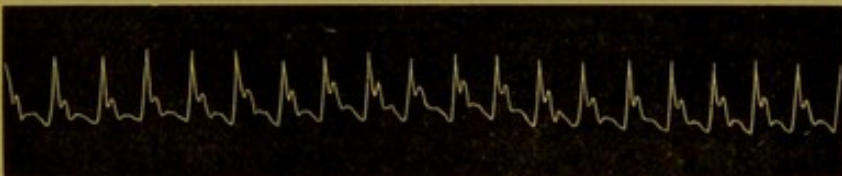
FIG. 4.



Female, aged 56. Pulse 150. Origin ascribed to grief at death of husband and protracted nursing.

and the dicrotic wave more pronounced. (Fig. 5.) Even in these, however, I have found that such evidences of low tension may be

FIG. 5.



Female, aged 44. Variable dyspnoea and diaphoresis; flatulence; habitual rapidity with paroxysmal increase. Pulse 144.

only occasional, and may be succeeded by a period in which tension is comparatively high. It would seem to me, therefore, that the systoles of the left ventricle are generally not so sudden as they seem; that they are complete and, as it were, normal, but the heart is set to an unusual rate of cyclical activity; that the arteries tend to be somewhat contracted, and the arterio-capillary resistance, if differing at all from the normal, somewhat increased.

2. *Sensory Phenomena.*—Pain about the heart was complained of in fifteen cases; it was localised over the sternum in two cases; it was very severe, having the characters of angina pectoris, in three cases. Difficulties of respiration were noted in six cases. Palpitation in varying degrees of severity were noted in seventeen cases, in some very intense, jarring the patients when recumbent, and preventing sleep. On the other hand, there were no subjec-

tive troubles referred to circulation or respiration in fourteen cases (about one-third of the whole number), including some in which the rapidity of heart was most extreme. These, therefore, afford confirmation of Dr. Bristowe's previous observations.

3. *Probable Disposing Causes.*—In many cases the patients ascribed the onset of their symptoms to a mental or physical overstrain. Among such causes operating on the nervous system were: railway accident, shock from death of a child, shock from death of a relative, mental overstrain (unexplained), operation for strangulated hernia, worry associated with piles and fistulæ, bad confinement, general nervous breakdown, over-nursing, hardship, and anxiety. Among physical causes assigned were: athletic excess (two cases), muscular overstrain, long walk, tricycle racing, overstrain from running, over-exertion, and late hours. In one case self-abuse was acknowledged as a cause, and it seems probable that sexual excesses are understated as factors. In other cases the oncome of symptoms was gradual and associated only with vague dyspepsia.

4. *Associated Symptoms.*—Very generally there was a restlessness difficult to define, and insomnia was manifested in a large majority. Muscular tremors were very marked in eight cases; numbness was noted in one case in variable situations, in another in the left arm, in a third in the right arm; severe perspiration occurred in two cases—in one it was said to be "fearful"; mental troubles and aberrations were distinct in five cases—in one there was a history of hystero-epilepsy, in another of the alcohol or morphia habit (or both); vertigo and tinnitus aurium occurred in five cases, neuralgia and headaches in very many; osteo-arthritis was found in six patients, thus confirming Dr. J. K. Spender's observations; spasmodic asthma occurred in two cases; in one case there seemed a probable association with syphilis.

I turn now to the second division of my cases of rapid heart—those in which there was an association with some of the phenomena of Graves' or cardio-vaso-motor disease. Of these (twenty-nine in number) the three cardinal signs of the affection—exophthalmos, thyroid enlargement, and rapid heart—were manifested in twelve cases; in nine the cardiac rapidity coexisted with thyroid enlargement only, and in six with exophthalmos only. In two cases the only vaso-motor disturbance associated

with the rapid heart was a throbbing in the great arteries of the neck. I thought I might be justified in regarding these as intermediate cases—on the borderland of the more developed disorder.

I will first take two cases which I consider particularly interesting as types:—

CASE 1.—The first seems specially instructive, as showing an acute determining cause of the grave symptoms in a shock to the nervous system, as indicating that such may lead up to organic disease of the heart with its commonly associated symptoms, and as pointing to the conclusion that protracted treatment may result in very satisfactory, if not complete, recovery. In September, 1882, I saw in consultation with Mr. Blackstone, of Regent's-park, a lady, aged 44, the subject of rapid heart. A week previously she had been in the country with her husband, and walked with him to the railway station to take the train for their return to London. Just before reaching the station they observed that the train was already waiting at the platform; they hurried on, and the husband entered a carriage intending to assist his wife to step in. Unfortunately the train started, leaving the lady on the platform. She immediately experienced a violent attack of palpitation of the heart, and was assisted to the waiting-room. The husband returned by a subsequent down train, but found her too ill to undertake any journey. She remained a week in the country town where the shock occurred, and then came to London, Mr. Blackstone and myself seeing her shortly after her return. Her pulse was about 160; there was little or no dyspnoea, but extreme feebleness. There was no exophthalmos, but distinct enlargement of the thyroid. It was probable that this existed in some degree previously, but increased after the attack. We kept the patient as quiet as possible, advised a course of digitalis in small doses, and the application of the continuous galvanic current to the situation of the great nerves of the neck and the præcordium twice a day. Three months afterwards, general anasarca supervened, for which the usual remedies, with free puncturing the skin of the legs, were resorted to. A systolic murmur had become developed at the apex. The treatment by the continuous galvanic current was patiently persisted in for fifteen months. The signs of dropsy entirely passed away, the systolic murmur was no longer audible, and a very fair recovery ensued. The lady is now—nearly eight years after the onset—able to fulfil all ordinary social duties, though incapable of much exertion. The pulse is still rapid (100 to 125), and there have been occasional bronchial attacks, but no serious symptoms have been complained of.

CASE 2.—My second case in this category illustrates recovery from a condition of extreme danger. I was called in June, 1888, by Dr. Leeson, of Twickenham, to see a lady, aged 49, in consultation with him. The patient appeared to be *in extremis*. She was lying in bed, unconscious, manifesting short and shallow respirations. The pulse at the wrist was uncountable, but the heart beats by auscultation were estimated as 200 per minute. No murmurs were heard over the præcordium. Five years previously the patient had complained of shortness of breath on exertion as well as of general irritability. At this period she had some muscular tremor and occasionally dropped a tea-cup from her hand. Three years



afterwards some prominence of the eyeballs was noticed, and feelings of discomfort were referred to the throat—probably both signs occurred *pari passu*. The condition of rapid heart developed gradually; palpitation was not noticed. Five months previously to my visit she had an attack characterised by acute pain, chiefly in the muscles of the back and the arms. This was thought to be acute rheumatism. The cardiac excitement was then so excessive that it was considered that an attack of pericarditis was imminent. At the same time very severe diarrhoea occurred. Following this were syncopal attacks, and then the grave condition which I witnessed, when all feared that death was imminent. I considered that the signs indicated a crisis of Graves' disease. We agreed to administer hypodermic injections of ether and several successive 5-grain doses of musk. If the patient should rally from her state of imminent danger, we arranged that treatment by the weak continuous galvanic current to the eyelids, the thyroid swelling, and the heart region, should be begun on the day following and continued daily. Recovery did take place, and Dr. Leeson reported great improvement, eyes retreating, thyroid swelling diminishing. The patient came to my house ten months subsequently to the attack. She was then in very fair health, though evidencing some difficulty of breathing on undue exertion. She could walk about fairly well. The pulse was 100 both in the standing and in the sitting position; it was slightly irregular. Proptosis was not noticeable, and the thyroid swelling very slight. It was obvious that there had been a very satisfactory recovery.

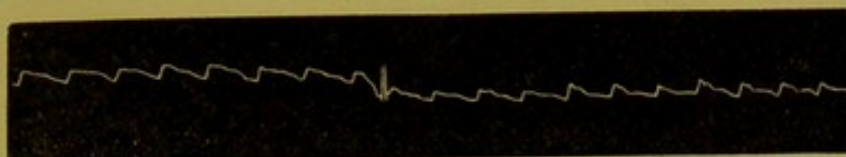
I proceed now to a brief summary of the most important points in relation to my 29 cases of rapid heart occurring with some manifestation of the phenomena of Graves' disease.

In regard to *circulatory phenomena* the maximum rate of pulse observed was 108–120 in 12 cases, 130–160 in nine cases, 180–200 in four cases. Murmurs, systolic in time, were heard over some portion of the præcordium in 16 cases. The most common situation was over the pulmonary artery (11 cases); the area of audibility also included the third left interspace near the sternum in four cases, and the fourth left interspace in two cases. In six cases a systolic murmur was heard at the apex; this was often variable, and in the cases that recovered passed entirely away. There can be little doubt that when it existed it indicated mitral regurgitation. In the case already cited, dropsy and the pronounced signs of organic disease were manifested. In other cases, œdema was noticed about the eyelids and the feet, and in one it was extensive in the legs and thighs.

An analysis of the pulse tracings shows that whilst in some cases the rapid pulse has the same characters as those described in the former section (Fig. 6), in others there is a very extreme irregularity—in some a veritable *folie du cœur*. The irregularity is in time and in volume; a fall may be succeeded by a diminutive

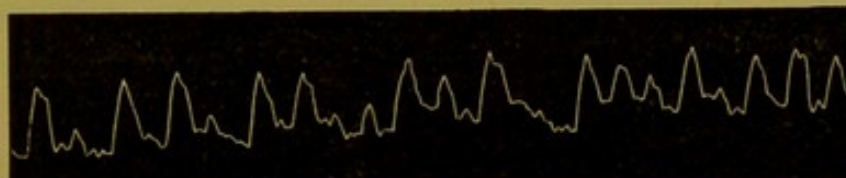
systole; then two well-pronounced cycles may be manifested; then perhaps two diminutive ones; then an intermission (Figs. 7 and 8). In some cases in which this irregularity exists, the indi-

FIG. 6.



Female, aged 41. Pulse 160 to 180. Graves' disease without exophthalmos. Treated by weak continuous galvanic currents for more than seven months. Then great improvement and heart calm.

FIG. 7.



Female, aged 38. Typical Graves' disease. Pulse varying from 108 to 144. Marked irregularity.

FIG. 8.



Male, aged 41. Typical Graves' disease. Pulse 196. Extreme irregularity; sometimes hyperdicrotism.

vidual tracings may present broad summits, and evidence a fairly high tension; in others there may be extremely low tension—hyperdicrotism. And yet the patients whose hearts present the signs of this extraordinary riot may come to us walking about as usual, and manifesting few, if any, signs of distress. I do not know that this extreme irregularity of the heart in some cases of Graves' disease has been sufficiently brought under notice. I have had under my care at the same time two sisters suffering from Graves' disease—the one presenting signs of rapidity only of the heart, whilst the other manifested extreme irregularity.

Palpitation was complained of by seventeen of the patients, probably it occurred in a larger proportion; but it is certain that in some it was never complained of as a symptom, though the rapidity of the heart's action was great. It is certain also that in some cases at the time of extreme rapidity and irregularity of action no distress at the heart was experienced.

With regard to *probable disposing causes*, the patients ascribed the commencement of their symptoms to the following:—A carriage accident, sudden mental depression, grief at loss of a son, trouble from death of a sister, extraction of a number of teeth, severe confinements (two cases), much worry, being overtaxed with nursing, hurry to catch a train (in addition to the case already quoted, in which a like cause was alleged). In eight cases the onset was gradual, and no disposing cause could be assigned. The heart signs were the first to be noticed in the majority of cases, but not in all. In two the eye symptoms began. In one the sequence was (1) eyelids swelling, (2) heart symptoms; thyroid was enlarged, but its enlargement had been unnoticed. In another there was first excessive nervousness, then palpitation, then thyroid signs, and, lastly, exophthalmos. In two the thyroid signs commenced.

The following were some of the *associations*; it is unnecessary to consider all, for many were such as are well known and amply described in extant works on Graves' disease:—*Muscular tremors* were very marked in seven cases, present in many more; they were general in four, localised in the arms in one case, in the face in one, and in the eyelids in one. This observation is not in accord with Charcot, who, following the observations of M. P. Marie, says that the fine tremor observed in Basedow's disease is general in all the great muscles of the trunk and limbs, but never in those of the head and extremities.\* *Defects of hearing*, tinnitus, and vertigo were manifest in five cases; it will be remembered that this association was also marked in the former section of cases. *Glycosuria* was present in one case, the urine containing 2·83 per cent. of sugar; it is worthy of note that in two other cases the father died of diabetes. As in the former section, *severe perspirations* were suffered in three cases. Epistaxis, menorrhagia, headaches, faintings, discolorations of the skin, diarrhœa, and dyspepsia were noticed in

\* 'Gazette des Hôpitaux,' Jan. 31st, 1885, p. 98.

both sections of the cases of rapid heart, and in both sections mental disorders have been evidenced.

As I said before, I do not intend, on this occasion, to enter upon the questions of the precise pathology and pathogenesis of the condition of rapid heart, yet I think the evidence adduced is sufficient to justify my placing before you certain propositions. In the first place, it appears to me in the highest degree probable that the conditions in the two sections of cases manifesting abnormal rapidity of the heart's action are closely allied. This seems to be indicated from the points of view of etiology, consequences, and associations. In both divisions there is strong evidence of the initiating influence of psychical or physical overstrain, or of these causes combined; whilst in both, also, the condition may develop without such initiating influence. In the one and in the other organic disease of the heart may be manifested, though exceptionally. There seems to be no good evidence to suggest the probability that such structural disease, whether inflammatory or degenerative, is protopathic, or even initiated at a comparatively early period of the malady. On the other hand, there is much to show that it is secondary to the nervous implication. It is clear that the impairment of the myocardium occasioning dilatation of the cavities may be temporary only in some cases. I do not think that we should look upon the cases of rapid heart as *formes frustes* of Graves' disease; rather cases of the latter may be regarded as *formes étendues* of the former. I should interpret the differences between one and the other as differences of extent as regards nervous implication rather than as differences of intensity. In certain cases where the heart rapidity is the only sign of circulatory disturbance the danger to life is extreme.

The signs of more extensive involvement of the nervous system are (*a*) in disturbance of the vaso-motor conditions of the great arteries of the neck, whereby these manifest obvious, and perhaps painful, throbbings; (*b*) in like disturbance in the thyroid arteries, which may present dilatations and bulgings; (*c*) in similar affection of the post-orbital arteries, with perhaps such alteration in nutrition as to lead to the accumulation of superabundance of fat. It is to be noted that in the first section, in which the cardio-motor conditions were disturbed without local vaso-motor involvements, murmurs heard over the great vessels emerging from the heart were proportionately far less frequent than in the second

section. It seems probable that these murmurs indicated a disturbed correlation between the heart and the arteries. The condition of marked irregularity noticed in some of the cases seems to point to a further nerve involvement. I have evidence to show that an irregularity resembling that present in some cases of Graves' disease may occur without abnormal rapidity, and without any other signs of the cardio-vaso-motor affection. Concurrently with any of the signs mentioned, or with all, there may be an implication of the motor area leading to muscular tremors, and in some cases there may be an impairment of the powers of the mind.

It was my hope to have been able to devote some portion of this address to the subject of treatment. To consider this adequately would require far more time than is possible this evening, but I hope to have an opportunity in the future to offer some evidence on the subject. It must suffice now to say that though in the less severe cases medicinal treatment has proved of great value, it has seemed to me that in the more severe ones, drugs have been almost useless; especially is this the case in regard to digitalis and heart tonics generally. As I have incidentally mentioned in describing some of the cases, the systematic employment of the continuous galvanic current in the region of the great nerves of the neck has appeared to me to be of value. I have to express my thanks to Mr. H. W. D. Cardew, who has not only undertaken the galvanic treatment of some of my cases, but has helped me in the endeavour to procure precise data as to the immediate effect of the current, applied as I have mentioned, upon the vaso-motor conditions. I believe that a *primâ facie* case has been fully made out for such method of treatment of the cases of rapid heart, but many points in regard to it demand, and I think would repay, further investigation.