

The Heart in Hyperthyroidism

By

A. LANFRANCO M.D., B.Sc.

Demonstrator in Medicine

Clinical Findings.

Cardiac disorders, which, for lack of better designation, are vaguely labelled as "Myocarditis", will very often be found to be nothing else but the main manifestation, sometimes the only manifestation, of a diseased thyroid, if the effect of hypersecretion of this gland on the circulatory system is kept in mind. In the case where the cardiac condition is accompanied by all the classical signs of hyperthyroidism, the real cause of the mischief is, of course, evident, but the difficulty arises where the thyroid enlargement is not at all conspicuous and where the usual signs and symptoms do not accompany the circulatory disturbances. The importance of diagnosing these cases in the early stages before the circulatory system is permanently involved, is too obvious to be stressed further. They are more prevalent in women than in men because of the predilection of Thyrotoxicosis for females, which is to be expected on account of strain imposed on the thyroid gland during the critical periods of a woman's life, i.e. puberty, menstruation, pregnancy, and the menopause.

Although Graves, in 1835, was the first who gave the most detailed description of Hyperthyroidism, and later in 1840, von Basedow discovered that exophthalmos formed part of the whole picture, yet as far back as 1802, Flajani had already associated goitre with tachycardia. The type and severity of the cardiac condition depends on the degree of Hyperthyroidism, but, because at all stages of this disease the sympathetic, and to a less extent, the parasympathetic nervous system are always involved, all cases at all stages present a rapid pulse rate, a high pulse pressure and an increased activity of the heart. The *Pulse* is persistently rapid

even at rest, ranging from 100 to 120 beats per minute; exercise and excitement cause a further acceleration which is more marked and takes a longer time to recuperate than in the normal subject. It is easily compressible and is not sustained, but of the 'collapsing' type — as in aortic regurgitation — with an abrupt full stroke. Its rhythm is generally regular, but irregularity of the pulse-rate, because of either extrasystoles or auricular fibrillation, is by no means a rare occurrence; it is stated that fibrillation of the auricle, either paroxysmal or continuous, is present in about one-fourth to one-third of all cases that come under treatment. Extrasystoles are not of serious consequence; when auricular fibrillation is present, however, its ultimate prognosis depends on whether it is the *only* cardiac disorder, or a consequence of an already damaged heart. When present in the first stages of hyperthyroidism, auricular fibrillation is usually of a temporary nature, and if it does not disappear spontaneously, it is sure to do so with the treatment of the Thyrotoxicosis, and, there is no necessity to treat it specifically i.e. with quinidine. If this cardiac irregularity, however, appears in the later stages, and is the result of damage to the conducting system of the heart, it is permanent, and may respond only to quinidine therapy. In rare instances fibrillation is replaced by flutter or by paroxysmal tachycardia.

The *Pulse-pressure* is always high. At first — in the 'pre-Graves' stage — the systolic pressure is still within normal limits, but the diastolic is low, since the peripheral arteries are poorly filled owing to the flaccidity and lack of tone of these blood-vessels. In the later stages, the systolic pressure rises,

the average rise being about 150mm. of mercury; as with the pulse-rate, it is raised further with excitement, both physical and mental, much more than in the normal subject, and takes a longer time to return to its previous level. Accessory factors, such as the menopause and kidney disease, help to raise the blood-pressure higher still; in the first instance, however, its influence as to prognosis is not to be taken too seriously.

The *Heart* contracts excessively and works with a lively action, consequently the heart sounds are abrupt and accentuated, and the impulse at the apex is diffuse. Systolic murmurs may be heard at any of the cardiac foci and are very often audible over two separate foci at the same time. They are, however, mostly heard over the pulmonary area, propagated along the blood-vessel, and over the second or third left interspace; when the heart is over-acting a cardio-respiratory murmur is usually audible in the left axilla. Sometimes a pre-systolic 'bruit', simulating that of mitral stenosis, is heard over the mitral area, but its inconstancy and the absence of an accentuated second sound in the pulmonary area serve to differentiate it from that of the rheumatic condition. All these murmurs are soft and blowing in character, are not accompanied by a thrill and are inconstant in their appearance. At first they are purely functional and will disappear entirely when the heart and circulation are brought under control as the thyrotoxic state improves with treatment.

In untreated cases of hyperthyroidism, where the tachycardia has persisted for some time, hypertrophy of the cardiac muscle is bound to result; X-rays examination then reveals a spherical or more commonly a triangular enlargement which involves mainly the left ventricle. In more severe cases, the cardiac hypertrophy is followed by dilatation of both ventricles and auricles, which is sometimes of great extent, the condition then resembling, to all intents and purposes, ordinary advanced myocardial de-

generation; if irregularity of the pulse-rate (extrasystoles or auricular fibrillation) supervenes, the picture is one of full-blown 'Thyrotoxic myocarditis' — the heart muscle has probably suffered irreparable damage, and the state of affairs is irreversible and serious indeed. If congestive failure is not already present, it is certain to occur within a very short time, because the high rate of beating of the heart and the increased blood-output against a systemic blood-pressure which is usually much above normal, will drain the energy expenditure of the heart to its limit. It has been pointed out by Lewis that in such cases enlargement of the liver is a much more reliable sign of an over-loaded venous system than engorgement of the cervical veins, for the simple reason that the increased vascularity of the Thyroid gland in Thyrotoxicosis will tend, by itself to overfill these veins as a whole.

Because of the tachycardia, the *Electrocardiographic* tracing shows a shortened P-R interval. Irregularity of the heart rate will show either as extra-systoles or if due to auricular fibrillation the 'f' waves, typical of this condition make their appearance; very rarely the 'flutter' wave replaces that of fibrillation. Whenever the functional efficiency of the heart is impaired, there is, even in mild cases, very high P and T waves and a low R; in more severe cases, the P and T waves are lower than normal, and there is definite evidence of myocardial degeneration, i.e. delayed conduction time or slight displacement of the R-T segment.

Post-mortem findings: In the average case there is moderate hypertrophy of the heart, which is more in evidence in the left ventricle. If auricular fibrillation was present, the auricles are found to be dilated; when the immediate cause of death was congestive failure, dilatation of the whole heart was observed. Brown pigmentation of the heart muscle is usually present, and histological examination reveals areas of degeneration and of lymphocytic infiltration, and diffuse small fibrous scars. Myocardial infarction, due to emboli, is sometimes present.