SOME CONDITIONS WITH WHICH HYPERTENSION IS ASSOCIATED.

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High Blood Pressure is a condition frequently met with in all classes of people over middle age. It may also be found, though less commonly, in much younger people, notably those with constitutional hypertension.

The lay public is well aware of the dangers of high blood pressure. Indeed one might say it has been carefully educated in its appreciation of this condition, not only by innumerable articles in the lay press but also, I am sorry to say, by members of our own profession who have stressed its dangers and the need for almost every kind of treatment.

How frequently do we find a patient coming to us with no symptoms other than those caused by a blood pressure phobia. These patients have even got into the habit of regulating their well-being or otherwise on the latest blood-pressure reading, and lose no opportunity of getting their blood pressure taken by various medical men and comparing the results. Blood pressure, therefore, assumes a most important rôle in the health and happiness of those who are victims, or supposed victims, to it.

As an example. I well remember a middle-aged man who attended as an out-patient at the National Heart Hospital for several years, who had this phobia to a marked degree. His blood pressure, due to arteriosclerosis, was in the region of 200, and nothing would satisfy him but that the pressure should be taken at each fortnightly visit. I early found out that if he discovered on his out-patient card that the pressure was higher than on the previous visit he would spend a most unhappy fortnight. Likewise, if the pressure was lower, he went away happy and contributed half-a-crown to the charity box. I therefore devised a scheme of falsifying the blood pressure so that there would be a continuous drop over several months, and only when the pressure reading became absurdly low did I put it up with a jump. Thus he got only one bad fortnight in every nine months, and I feel I was abundantly justified.

Normal pressure. What is the normal blood pressure? We know that the blood pressure varies in the same individual—often several millimetres—even during the course of a few hours. Excitement, food, constipation, worry, exercise, etc., all affect it. Again, there are quite marked variations in blood pressure between various healthy individuals. Thus it is a mistake to consider a certain reading to be the correct one for a person of a known age.

Life assurance companies of this country and of the U.S.A. have drawn up statistics of normal blood pressure readings which should be considered only as a general guide and not as exact figures. In this country it is the custom to take 110 plus half the age as a guide to the correct systolic pressure. Thus a person aged 30 should have a systolic pressure of 125 mm.Hg., and one of 80 a pressure of 150. The American offices have obtained a slightly lower figure. They take the systolic

pressure as 112 plus one-third of the age, and the diastolic as 75 plus one-fifth of the age. Thus a person aged 30 should have a systolic of 122 mm.Hg., and a diastolic of 81 mm.Hg., and a person of 80 a systolic pressure of 139 and a diastolic pressure of 91. These figures are certainly a help in dealing with Life Assurance proposals but obviously every case should be considered on its individual merits.

I do not propose to discuss the various methods of obtaining blood pressure readings beyond stating that a mercurial instrument such as the Baumanometer is to be preferred to the various spring instruments, which are liable to become inaccurate. The only point to be stressed is that by the auscultatory method the true diastolic pressure is the point where the loud sound suddenly becomes toneless or disappears. It is not the point where all sounds cease.

A raised blood pressure may be due to many various conditions, and when found it is essential to find out the exact cause. Thus only can correct treatment, should any be required, be given and progress be made. The two commonest causes are arteriosclerosis and chronic interstitial nephritis.

Arteriosclerosis.

Arteriosclerosis is usually found in late middle life as the result of general wear and tear. There seems little doubt that there is a definite constitutional factor present in many cases, and it is not unusual to find a family history of cardiovascular disease. Other factors are over-work, worry, and a nervous disposition. Over-eating and to a less extent alcoholic excess are common factors. Tobacco is suspect in many quarters of causing arterial changes.

The condition is considerably commoner in males, though there is a group of hyperpietic women found at the menopause. It has also been my experience that some of the highest systolic pressures have been found in women. The condition occurs in all classes of the community, though it is commoner amongst sedentary than amongst manual workers. In my experience it is especially prone to occur amongst Jewish tailors. It is also for the same reason more common in towns and cities than in country districts.

Symptoms. Symptoms of arteriosclerosis tend to occur only when the condition is advanced and signs of failing circulation have made their appearance. High blood pressure is frequently discovered during the routine examination for some other condition, or during medical examination for life assurance.

Apart from symptoms engendered by phobia, an extremely high blood pressure may be present entirely without symptoms. When symptoms make their appearance they are indicative of commencing circulatory failure, either brought about by a failing left ventricle or by arterial changes causing ischæmia.

Left ventricular failure is shown by attacks of nocturnal dyspnoea, by bouts of Cheyne Stokes' respiration and by the occurrence of acute pulmonary oedema.

Ischæmia of the vital centres of the medulla and brain causes headaches, vertigo, impaired memory and later perhaps mental impairment or attacks of syncope, which may prove fatal.

Dyspnoea on slight exertion is a common symptom of advanced arteriosclerosis due to impaired blood supply of the respiratory centre in the medulla. Insomnia also is a frequent symptom.

The chief dangers are cerebral hæmorrhage, coronary occlusion, left ventricular failure, impaired vision from albuminuric retinitis, retinal hæmorrhage, hæmorrhage into the vitreous, or retinal detachment. Any of these dire conditions may be the first sign of arteriosclerosis, the patient being entirely without symptoms prior to their occurrence.

Treatment. In the early stages little treatment is required. The patient is advised to avoid excesses of all kinds, especially violent exercise, too long working hours and over-smoking. If over-weight this should be reduced by dieting. The amount of food should be cut down, and meat, salt and alcohol should be curtailed. The patient should take more time off his work and have more holidays. Regular mild exercise within his limits is, however, beneficial. If there are obvious septic foci present their removal should be considered. Indeed treatment of these early cases can be summed up in the words of St. Paul: "Be moderate in all things."

In more advanced cases curtailment of activities has to be more drastic. It may be necessary to order three to six months off work, or even advise several weeks confinement to bed. The diet will have to be still further restricted—namely, small, dry meals with avoidance of meat, meat extracts and salt, curtailment of all food stuffs which are liable to cause flatulence, which is usually a common feature in these cases.

Drug treatment consists of sedatives, bromides and the milder barbiturates, diuretics and vaso-dilators, and adequate purgatives.

Other treatments in common use are hydro-therapy—preferably at a Spa—colonic irrigation and physio-therapy.

In cases with very high pressures who complain of vertigo or "bursting headaches," it is my practice to advise venesection of 20 ozs., and this may be repeated at two or three-monthly periods. I am quite sure that by this means I have not infrequently prevented a cerebral hæmorrhage.

The question as to future activities depends on the result of treatment. It may be necessary to advise retirement from business, or at any rate marked curtailment of business hours in some patients, whereas others are allowed to resume their former mode of living so long as they observe certain rules as regards diet, exercise, etc.

Prognosis. The prognosis varies enormously. Some patients go down hill steadily, whereas in others the condition seems to remain stationary for years. One can, however, state in general terms that those patients who are able and willing to plan their lives within the necessary limits have a much more favourable chance of surviving. It is surprising how frequently a healthy heart muscle is found in cases with even advanced arteriosclerosis, and in these the outlook is especially favourable.

The prognosis is adversely affected by impaired kidney function, and the presence of eye changes, notably albuminuric retinitis, usually means death within a few months. Occasionally cases with albuminuric retinitis survive considerably longer than anticipated.

I saw a patient aged 59 early in 1938 who was sent to me with failing vision associated with arteriosclerosis. He was an extremely busy and successful business man and had over-worked for many years. I found a large hypertrophied heart with reduplicated first sound at the mitral area and a loud ringing aortic second sound. The orthodiagram confirmed the clinical findings and in addition showed

a dense wide aorta with large aortic knob in the antero-posterior position, and marked unfolding in the second oblique position. The blood pressure was 240/150, the rate was 72, regular with occasional premature contractions, and the radial and brachial vessels showed marked hardening and tortuosity. The tongue was dry and furred. The urine was pale with a low specific gravity and albumen. His sight was very bad and he was unable to read. He was complaining of severe headaches and exhaustion. The report of the oculist was advanced albuminuric retinitis. The electrocardiogram showed sclerosing changes affecting the heart base.

The prognosis was as bad as could be imagined and it appeared as if he would live a few weeks at the most. I took him into hospital and had his kidney function estimated. I was surprised to find that his blood urea was only 40 mgm. per cent. and his urea concentration over 2.7 per cent. This made it appear that the eye condition was due entirely to his arteriosclerosis and not the result of chronic renal disease. The other point noted during my examination was the questionable condition of his teeth. These were X-rayed and the majority were found to show severe apical sepsis.

Treatment consisted of repeated venesection of one pint every two weeks, and gradual extraction of the affected teeth under gas. He did extremely well. His headaches entirely disappeared and his sight improved enormously so that he was able to read the newspaper without difficulty. He went home and took matters easily and went to Royat for four weeks in June and later spent a fortnight in Switzerland.

When I saw him last at the end of October I found his improvement had been maintained. His sight was still satisfactory, he was free from headaches and was sleeping and eating well. His blood pressure still remained high, 230/150. At this time he had been on a strict diet with no meat or salt and restricted fats. The only drug he was then taking was Diuretin, 1 tablet t.d.s. for the first ten days in each month. He was also having one rest and starvation day a week and a venesection every two months. He resumed work at the beginning of September. He recently died in Paris from heart failure. Unfortunately his temperament prevented him from taking life as quietly as the condition demanded.

I have given this case in full as an example of what can be done, even when the result of the original examination makes the future appear hopeless.

Malignant Hypertension.

There are a few cases with hypertension in whom there is a rapid deterioration with severe involvement of the kidneys and a very high blood urea. Previously there was no evidence of kidney damage. These cases go down hill quickly and usually die in the course of a few weeks. Venesection is of value for a time, but a progressive anæmia contra-indicates its employment in the later stages. The condition is known as malignant hypertension and can be differentiated from chronic Bright's disease by the short history of kidney involvement.

The following is a typical case. On October 22nd, 1938, I was called in to see a man of 55—a university professor of chemistry. He was complaining of severe headaches, nocturnal dyspnoea and frequent vomiting. He gave a history of having inhaled a strong dose of sulphur dioxide gas inadvertently on October 10th, and that his first attack of dyspnoea occurred that evening.

On examination he had a large hypertrophied heart, a blood pressure of 250/140, pulse 100 with numerous extra-systoles, a furred tongue, and pale urine

with specific gravity of 1.010 and a trace of albumen. The lower lids were puffy. The condition suggested chronic Bright's disease, but the sudden onset and history of previous good health was against this diagnosis. The electrocardiogram showed inverted Ti and Tiv and numerous auricular extra-systoles, and was strongly suggestive of his having had an anterior cardiac infarct some time previously. On further enquiry he stated that he had had small conjunctival hæmorrhages during the previous eighteen months and had noticed shortness of breath on hills for the previous nine months. The blood urea was 180. In spite of various measures he quickly deteriorated and died of uræmia with cardiac failure on November 6th.

Chronic Interstitial Nephritis.

Chronic interstitial nephritis is almost invariably accompanied by raised blood pressure and hardened arteries. Indeed the more one sees of arteriosclerosis and of chronic Bright's disease the more one realises how many features of similarity there are between them. At times it almost seems that they are variations of the same disease—in the former the pathological changes primarily affect the systemic vessels and in the latter the renal. The end result—namely hyperpiesia associated with cardiac and renal failure—is approximately the same.

As the subject is too large a one I do not propose to discuss it further.

Chronic Valvular Disease.

High blood pressure is commonly found in many patients with chronic valvular disease—notably aortic regurgitation. It is easy to realise on mechanical grounds that this must be so. Owing to regurgitation through the aortic valve the heart has perforce to drive more blood than normal into the aorta in order to maintain an adequate circulation. This is brought about by enlargement and hypertrophy of the left ventricle. For the same reason the systolic pressure is raised.

In cases of aortic regurgitation resulting from acute rheumatism one can surmise that the height of the systolic pressure depends on the degree of the reflux and the integrity of the heart muscle. The diastolic pressure naturally in these cases tends to remain low, and in marked cases may even drop to zero.

In syphilitic aortitis the blood pressure is usually raised, though to a less extent than in cases of arteriosclerosis and chronic interstitial nephritis. In some cases it may be subnormal. Where there is aortic reflux the systolic pressure is raised but not markedly so. Indeed one of the diagnostic differences between aortic reflux of rheumatic and of syphilitic origin is the not infrequent failure of left ventricular hypertrophy and hyperpiesis in the latter. This will be understood when one realises that in syphilitic aortitis the myocardium itself is affected through narrowing of the coronary orifices, whereas in rheumatic aortic reflux the myocardium is usually healthy. This is especially the case in young people who often have a surprisingly good heart function.

It is easy to understand why there should be a raised blood pressure in aortic regurgitation, but its occurrence is more difficult to explain in certain cases of mitral stenosis. These cases are usually middle-aged or elderly women in whom is found a definite mitral presystolic murmur without cardiac enlargement. The blood pressure is frequently found in the region of 180. I label them sclerosing mitral stenosis. The prognosis is good—the rhythm remains regular for a considerable time and the condition seems to remain stationary for years. They rarely die from heart failure. No treatment is necessary other than their being put on a definite regimen.

The prognosis of rheumatic aortic reflux cases is extremely good during the first half of life, but in later years with increasing arterio-sclerotic change the coronary vessels have become involved and death may ensue from fatal syncope or from coronary occlusion.

No treatment is needed in younger people with satisfactory heart function. In older cases the various measures already stated in the treatment of arteriosclerosis are used.

In syphilitic aortitis the prognosis is very much worse. The majority die within three to five years of the condition being diagnosed, from angina, congestive heart failure, some complicating affection or cerebral lesion, and (rarely) from ruptured aneurysm.

Treatment consists of anti-syphilitic measures—courses of arsenical or bismuth preparations intravenously or intramuscularly alternating with mercury and potassium iodide by mouth. General measures depend on the severity of the symptoms and on the degree of impairment of the heart's function.

Myocardial Degeneration.

This condition may be subdivided into various types, depending on the cause. It is usually associated with high blood pressure. The types chiefly met with are fibro-fatty heart, alcoholic heart and fibroid heart.

Fibro-fatty heart is found in people past middle age who have been considerably over-weight for years. There is usually a history of excessive intake of rich food together with lack of exercise. These people, however, are often very hard workers and not, as one would suppose, lazy except in the matter of physical exercise. There is often a family trait of obesity. The condition is of slow onset and usually symptomless, except for undue breathlessness on exertion, especially on hills and stairs, for many years.

It is only when interstitial fibrotic changes make their appearance and still further obstruct the blood supply of the heart muscle fibres which have already been impinged on by fat globules, that definite symptoms of circulatory impairment occur. The chief of these are increasing shortness of breath, vertigo, faintness, and insomnia. There may also be pain in the chest, either over the præcordium due to abdominal pressure, or substernal from coronary sclerosis. The blood pressure increases slowly and does not reach such heights as in chronic Bright's disease.

Treatment in the early stages is extremely beneficial. Strict dieting, regular exercise, Turkish Baths, and in certain cases a stay at a Spa, will restore the person to normal health by weight reduction and by improving the muscular tone. In these early cases, provided they carry out the lines of treatment conscientiously, the prognosis is excellent.

In later cases in which fibrotic changes have made their appearance treatment consists in keeping the patient within his heart's limitations, strict diet, rest after meals, and avoidance of physical and mental strain. Symptomatic treatment is given as needed.

Alcoholic heart. This condition is the result of excessive consumption of alcohol over several years. It resembles fibro-fatty heart in many respects. It tends to occur in late middle age and is often associated with over-weight. The patient may have a superficial appearance of health, but on careful examination other

evidence of alcoholic excess will usually be found—namely a large tender liver, a furred tremulous tongue, a poor appetite with constipation, perhaps leg cramps from time to time, and an unstable mentality with alternating periods of euphoria and depression.

Clinically the heart does not differ from a fibro-fatty heart. At the mitral area the first sound is short and lacking in tone, and often reduplicated, and the aortic second sound is accentuated. There is usually some cardiac enlargement. In time fibroid changes make their appearance.

Treatment consists of the gradual elimination of alcohol from the diet and general measures for bolstering up the damaged heart muscle.

The prognosis depends on the age, the state of the myocardium, the condition of the other organs, notably the liver and kidneys, and the conscientiousness with which the patient carries out the treatment.

Fibroid heart. Fibroid heart is caused through under-nourishment of the muscle. The usual cause is coronary sclerosis, but it may be brought about by toxins impairing the ability of the heart to take up nutriment, and by any severe anæmia. Thus, tobacco, vitamin deficiency as in pellagra, and diabetes, are examples of causes other than coronary sclerosis which may bring about this condition.

As already mentioned the usual cause of fibroid heart is coronary sclerosis, and this is brought about by two main disorders, namely arteriosclerosis and syphilis.

Arteriosclerosis is the chief cause of coronary sclerosis. The aorta becomes involved in the generalised arterial change and in due course the coronary arteries become affected with increasing narrowing of their lumen. This results in diminution of the blood supply to the heart muscle, producing a condition of ischæmia.

If the coronary obstruction is gradual there is scattered degeneration of the muscle fibres, which are replaced by connective tissues. There may be, however, when the obstructive process is slow, a certain amount of regeneration of heart muscle due to re-establishment of the blood supply through collateral circulation.

Syphilitic mesaortitis causes myocardial fibrosis by narrowing of the coronary orifices, but the process does not affect the vessels beyond.

Fibroid heart or myocardial fibrosis tends to occur after middle age, and is comparatively rare under forty, though most of us have probably met with cases under this age.

As the condition is largely the result of arteriosclerosis one would expect sedentary workers, especially males, to be the usual victims, and this is found to be the case.

The physical signs are often extremely slight. The blood pressure is usually on the high side but otherwise examination of the cardiovascular system may show no abnormality. Even the electrocardiogram and X-ray findings are frequently normal and the diagnosis has to be made entirely on the history and the typical nature of the symptoms. In other cases, however, there may be found gross evidence of structural disease, i.e., large heart, altered heart sounds, and abnormal X-ray and electrocardiographic findings. It is probable there has been a previous coronary occlusion in most of these.

The typical symptom is effort pain (angina pectoris). This is usually situated behind the middle of the sternum and tends to radiate down the arms, usually the left. The pain may be merely a slight feeling of oppression or may be an agonising gripping pain. Walking up an incline, especially soon after a meal, or going out

into the cold air, is a common history. The pain pulls the patient up and then gradually passes off in a few minutes. It is relieved by sucking nitroglycerine tablets and also belching up wind.

Patients with angina pectoris may live for several years, provided they keep within their limitations, but sooner or later a branch of the narrowed coronary vessels will become occluded, resulting in a cardiac infarct. When this occurs the systolic blood pressure at once tends to fall to a marked degree, but I have met with a few cases in whom the systolic pressure remained at its high level for several days. This possibility must be recognised, as otherwise the condition might be misdiagnosed and vital measures not given.

Auriculo-Ventricular Block.

Auriculo-ventricular block is occasionally met with, and almost invariably the blood pressure reading is markedly raised. Apart from those cases of auriculo-ventricular block resulting from mitral stenosis of rheumatic origin, and the few cases of diphtheritic and congenital origin, it is probable that almost all cases of auriculo-ventricular block are the result of myocardial fibrosis. Whatever the actual cause is, a posterior infarction involving the nodal tissues or an increasing fibrosis without infarct is difficult to determine.

About two years ago I saw a lady of 74 who had had attacks of syncope with a bradycardia of 18, which came on suddenly three weeks previously. When I saw her the syncopal attacks had ceased and the pulse was 76 regular. The electrocardiogram showed a typical record of a posterior infarct, and I have no doubt in my mind that at the onset the infarcted area involved the nodal tissues, but with contraction of the scar conductivity was restored. She made a good recovery.

In my experience elderly patients with complete heart block live longer than one would expect. I remember seeing a patient of 74 six years ago, who was giving himself injections of adrenalin many times a day for Stokes Adams attacks. I thought the prognosis hopeless and was most surprised to be called in to him four years later when his condition was approximately the same.

Coarctation of the Aorta.

This is a rare congenital heart abnormality. Outside medical meetings I have only seen six cases in private and hospital practice. The condition, which consists in narrowing of the aorta just beyond the origin of the left subclavian artery, and in the adult form in obliteration of the ductus arteriosus, gives one of the most interesting clinical pictures to be met with. The condition is easily missed, and one should bear in mind that all young patients with an abnormally high blood pressure may have coarctation. The diagnosis is based on the following points:—

- (1) Raised blood pressure of upper extremities.
- (2) Low blood pressure of lower extremities.
- (3) Pulsation, visible or palpable, of greatly enlarged branches of the subclavian arteries in the back.

On X-ray examination.

- (4) Notching of the under surfaces of the costal cartilages by enlarged intercostal vessels.
- (5) Absence of the aortic knob.

Considering the gross abnormalities of the circulation my experience of the condition has been a fortunate one. One patient has been under my care at

this hospital for some years and only recently had several dental extractions under gas and oxygen with no difficulty or ill-effect. His age is about 56.

Another patient in whom I diagnosed the condition when he was a schoolboy at Stowe afterwards passed through Oxford and for some years has been working as a land agent in Wales. He is able to play golf and mild tennis.

No treatment is necessary where the heart function is satisfactory.

Thyrotoxicosis.

Thyrotoxicosis is commonly associated with a raised systolic pressure and a raised pulse pressure, though it is unusual to find a pressure above 180. The blood pressure is higher in cases of secondary thyrotoxicosis, which occurs at a somewhat later age than does the primary type, and is more often associated with arteriosclerotic changes.

There certainly appears to be a greater frequency for high pressure cases to go into aricular fibrillation. The height of the blood pressure *per se* does not affect the treatment nor the operative risk unless aricular fibrillation is present.

Menopausal hyperpiesia is not infrequently found and tends to disappear, or at any rate fall to some extent, once the menopause is over. It appears to be associated in certain cases with diminished thyroid activity, when thyroid medication will cure the condition.

Some of the highest pressures are met with in cases of supra-renal tumours. The symptoms are often those of hypertension without evidence of kidney disease. The hypertension is often paroxysmal. The chief complication is cerebral hæmorrhage. Cure may follow the removal of the tumour.

In conclusion I should like to reiterate two points, namely:—(1) the necessity of diagnosing the causal conditions, and (2) the importance of not making a blood pressure neuropath of anyone in whom the blood pressure is found moderately raised during a routine examination, where no other abnormality is present.

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