developed in June, when the patient had to be confined to bed. Although the pain in the arm and chest was persistent, her general condition improved with rest, and she was eventually able to carry out her household duties to a limited extent. In August, however, while stepping on to a vehicle, she experienced a sudden severe pain in the left upper arm with a sense of "something having snapped." Examination immediately after this incident revealed subcutaneous haemorrhage along the inner aspect of the left upper arm and immobility of the affected part. A fortnight later the patient was admitted to a nursing home. A hard, fusiform swelling about the size of a tangerine orange was present over the lower third of the left humerus. Crepitus and undue mobility were absent. Tenderness was slight, but movements around the left elbow-joint were painful and limited. Sensations were unimpaired.

Radiograms showed a complete oblique fracture at the lower end of the left humerus, with the fragments in fairly good position and callus formation. The hard bone in the region of the fracture was greatly rarefied. The appearances were definitely indicative of pathological fracture (see Fig. 1). This finding was supported by the history of the case, in which there had been no question of external violence. Other areas of rarefaction were present in both epicondyles, in the head of the radius, and in the olecranon on the left side, while the right humerus, radius, and ulna (see Figs. 1 and 2), and the ribs on both sides, were also involved. Although the evidence pointed to the fracture having been pathological rather than traumatic in origin, healing had not been delayed, since bony union was firm. The differential diagnosis between secondary carcinoma of bone and some form of rarefying osteitis then fell to be considered.

A small nodule, about the size of a haricot bean, was palpable in the left mamma. The patient was examined by Mr. G. T. Mowat of the Glasgow Royal Cancer Hospital, who expressed the opinion that the nodule was more likely to be associated with chronic mastitis than with carcinoma. It was subsequently removed by Mr. Mowat. Histological examination revealed dense

patches of fibrous tissue with very scanty adenomatous elements, indicative of chronic mastitis. It was pronounced non-malignant.

Examination of the pelvis, the chest, and the abdomen gave no evidence of neoplasm. Gastric analysis, after an Ewald's test breakfast, showed a normal acidity. The blood picture was that of a secondary anaemia. The urine contained a trace of albumin. Mitral stenosis was the only other point of note in the general survey.

The above findings, taken in conjunction with the fact that the fracture was well healed, were considered sufficient to exclude the presence of a primary carcinoma in any of the regions from which metastases to bone usually originate, and to confirm the non-malignant nature of the disease in the bones. Furthermore, the patient's nutrition was improving on ordinary diet.

The weight of evidence, then, turned in favour of some form of rarefying osteitis. A metabolic experiment, in which the calcium intake and output were measured over a period of four days, showed, however, that there was no excessive decalcification. The retention of calcium was slightly positive (0.3 gram CaO per day), and the calcium content of the blood was normal (0.014 per cent. CaO).

After returning home, on October 22nd, pain became more generalized, and the patient was completely confined to bed. Mild pyrexia, dyspnoea, and cough with blood-stained sputum commenced in December, following upon a chill. Anorexia and vomiting, not preceded by nausea and unassociated with food, supervened; oedema of the legs developed, and the patient died in January, 1930, with all the signs of cardiac failure.

Although the features of the case at one stage suggested that the pathological fracture might be associated with tumour of bone, the subsequent history as well as the clinical findings indicated that it was due to a localized or arrested osteitis fibrosa.

REFERENCES.

- ¹ Wilder, R. M.: *Endocrinology*, 1929, xiii, 321.
² Hunter, D.: *Proc. Roy. Soc. Med.*, 1929, xxiii, 2, 227.

ARTERIAL PRESSURE IN ITS CLINICAL ASPECTS.*

BY

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IN 1628, close upon 302 years ago, William Harvey published his observations on the circulation of the blood. The fundamental characters of his immortal discovery are still acknowledged to be in the main identical with those that he portrayed, without which no study of blood pressure would have been possible.

Meaning of Blood Pressure.—A certain level of blood pressure is essential for every individual in order that the circulation may be maintained. It is only when this level is too high or too low that symptoms are apt to arise. In physics blood pressure may be defined as that pressure exerted by the blood at a given instant upon a given point in the circulatory system. In physiology the term includes not only arterial, capillary, and venous pressures, but also the pressure of the blood upon the interior of the heart itself. In everyday language, however, the term is employed solely to designate arterial pressure. In its clinical aspects arterial pressure represents "a force originated by the contractions of the heart, maintained by the reaction to distension of the arterial walls, and regulated by the degree of resistance in the terminal portion of the arterial system." (Gallavardin.)

Types of Sphygmomanometer.—Modern instruments used in the clinical estimation of arterial pressure are of two main types—mercurial and aneroid. The mercurial sphygmomanometer registers the height in millimetres of a column of mercury equivalent to the arterial pressure at the moment of investigation. The aneroid instrument possesses an expansile chamber, distension of which by increase of internal pressure is magnified, and in turn transmitted to a fine needle travelling round a dial. Personally I find no instrument so generally satisfactory as an accurately constructed mercurial manometer of modern type, such as the baumanometer. Many practitioners prefer instruments of aneroid type owing to their smaller compass and greater

portability. All aneroids, however, should be calibrated annually against a standard mercurial manometer, since after frequent use the aneroid chamber is liable to undergo over-distension, and thus to give readings which are too low in high pressure cases.

CLINICAL ESTIMATION OF ARTERIAL PRESSURE.

For the majority of cases the auditory method of estimation is the simplest, quickest, and most generally applicable. It is performed as follows: The patient, seated in a comfortable position, allows the bared arm to lie with the muscles relaxed upon a convenient support of such height that the armlet is approximately at the level of the heart. For patients confined to bed the instrument may be placed on a small adjoining table. The armlet should be evenly wrapped round the arm from within outward like a bandage, the tail being tucked in beneath the last fold. It should be applied as high as possible, so that the lower margin is well above the bend of the elbow, the middle of the pressure bag lying over the inner side of the arm, thus ensuring effective compression of the brachial artery. The patient's attention should be distracted by noting the rate and characters of the radial pulse. Apprehensiveness on the part of a sensitive patient should be allayed by explaining that the band round the arm will tighten for a minute or so, but that this temporary pressure is quite harmless. The pressure bag should be rapidly inflated until the pressure within it is above that in the brachial artery, over which the bell of a stethoscope has been lightly placed just above the bend of the elbow, to the inner side of the biceps tendon.

On decompression following pulse obliteration the first audible click denotes the level of the systolic pressure. As the external pressure in the bag is permitted gently and evenly to fall a variable murmur phase becomes audible, passing into a longer sequence of sonorous thuds, which gradually reach a climax of intensity before being succeeded by a series of dull and muffled sounds, the fourth auditory phase, preceding silence. The first dull sound following the last loud thud denotes the level of the diastolic pressure. By subtracting the diastolic pressure from the systolic one obtains the differential (so-called pulse) pressure. These figures, along with the pulse rate and characters, can readily be entered in the case notes, and constitute "the complete arterial pressure picture."

* An address given to the Kensington Division of the British Medical Association on March 19th, 1930.

Importance of the Diastolic Pressure.—Of the two ends of the pressure scale the diastolic¹ is by far the more important, in that it is a measure of the burden which the arterial walls and aortic valves must continually bear, while the systolic represents only an intermittent and superadded load. Further, the diastolic pressure constitutes a valuable measure both of peripheral resistance and of eliminatory capacity. The differential (pulse) pressure, obtained by subtracting the diastolic from the systolic, represents the cardiac load, and is almost a constant in health between the ages of 20 and 50.

PHYSIOLOGICAL FACTORS IN ARTERIAL PRESSURE.

Numerous physiological factors cause considerable fluctuations in systolic arterial pressure, the diastolic being much less influenced. The chief factors that bring about increase in pressure are body weight and, to a less extent, height; psychical stimuli; restless sleep and nightmares; food and alcohol, the rise being soon succeeded by a fall; tobacco in those unaccustomed to its use; muscular work; mental exertion; puberty; and the menopause. The factors which cause a fall are rest and quiet sleep; fatigue and fasting; menstruation and pregnancy cause variable effects.

Menstruation.—During the week preceding menstruation both pressures rise. With the onset of flow they fall rapidly, to reach their lowest levels at the end of the period, during the next fortnight of the intermenstrual cycle arterial pressures gradually return to the previous standard levels.

Pregnancy.—As yet there is no absolute agreement as to the levels of arterial pressure in pregnancy. Most of the figures given in the literature are too high. In primiparae below 30 years of age one does not, as a rule, expect to find a systolic pressure greater than 95 to 115 mm. of mercury, nor a diastolic respectively greater than 50 to 75. In multiparae the pressure tends to range slightly higher, being probably influenced by age. During the latter end of pregnancy there may be a gradual and slight rise. Nevertheless 60 per cent. of all cases are below a maximum of 125 mm. Another 25 per cent. with systolic pressures varying between 125 and 140 may be regarded as potentially toxic, and require more careful watching than is usually given. The remaining 15 per cent. with systolic pressure above 140 and diastolic correspondingly elevated may be regarded for the most part as definitely toxic. In such cases albuminuria and occasional casts are frequently met with. If the pressure still goes on rising the patient's life becomes endangered and premature termination of pregnancy may be necessitated.

Climacteric.—About the climacteric epoch a benign form of hyperpiesia may occur, most frequently in multiparae inclined to obesity and constipation, the condition being aggravated by worry and anxiety. Faulty endocrine balance in the directions of ovarian insufficiency and adrenal hyperactivity almost certainly plays a large part in causation.

CLINICAL INVESTIGATION.

Supposing one has in the consulting room a patient in whom some abnormality of arterial pressure is suspected, what is the best procedure to adopt? On accurate diagnosis correct prognosis and control alike depend. Hence it is well to begin with a detailed inquiry into the personal and family history. Systematic investigation of the cardio-vascular system follows, first estimating arterial pressure and pulse rate, and then noting the condition of the superficial arteries, the position and character of the apex beat, the size of the heart and of the great vessels at its base by careful percussion, together with the quality of the cardiac sounds. Inspection for the possible presence of oedema, examination of the fundi with the ophthalmoscope, and urinary and blood tests complete the special investigation.

SYMPTOMS OF HIGH AND LOW ARTERIAL PRESSURE.

Uncomplicated high arterial pressure is usually unaccompanied by symptoms. Only in later stages in the presence of associated conditions does the patient begin to complain. Even arterio-sclerosis is not a necessary con-

comitant of high pressure, for about half the total number of cases exhibit standard or even low pressures. In the absence of conditions of association the subject even of a high grade of pressure may feel quite well. Indeed, a dramatic feature of hyperpiesis, to which I have drawn attention, is the feeling of comfort and well-being on the part of those about to succumb to cerebral haemorrhage. If a patient with a perilously high pressure expresses himself as feeling particularly fit, then is the time to beware of sudden and desperate events. Subjective sensations may be met with in the course of high pressure in the following order of frequency: fullness, heaviness, pressure feelings or throbbing in the head, often aggravated by mental effort; dizziness on exertion; palpitation or precordial pain amounting at times to angina; dyspnoea on exertion; drowsiness and disinclination for effort; impaired memory and concentration; irritability; insomnia; anxiety states; gradual failure of vision or sudden one-sided blindness; neuralgia; migraine; epistaxis; uraemic symptoms.

One striking fact, which I emphasized last year, is that the majority of these symptoms are identical with those found in cases of low arterial pressure, but arise from opposite circulatory causes of excess on the one hand and defect on the other.² Dizziness in hyperpiesis results from cerebral congestion; in the low pressure case it is postural and readily induced by sudden change from recumbency to the vertical position. Again the feeling of well-being may precede cardiac failure. A notable example is afforded in the death, on March 16th, of General Primo de Rivera, the ex-Dictator of Spain. As reported in the daily press, at 9 a.m. his two daughters and his son saw him sitting up in bed dealing with his correspondence. He told them that he had had a good night's rest and had never felt so well. One hour later he died of cardiac failure consequent upon influenza.

The high pressure individual is often the subject of excess metabolism and labours under the strain of acid retention with inability adequately to eliminate waste products; the low pressure individual usually suffers from faulty assimilation, the acid-base balance of the tissues being deviated to the alkaline side, and tissue destruction preponderating over repair. Now that by biochemical methods we are enabled to gain a much closer approximation to exact ideas as to how errors of metabolism may be corrected and faulty balance redressed, we can formulate measures of control with far greater certainty. It is only from a broad biological standpoint which takes cognizance of early departures from that delicate adjustment of vital functions that we term "health" that the difficult problems of both high and low pressures can be rationalized and brought under one comprehensive law, to which I have referred both of these states as opposite expressions of failure to environment in its widest application.³

DIAGNOSIS.

Differentiation of Types of High Arterial Pressure.

The most direct way of attacking the problem is to regard hyperpiesis as including all types of raised arterial pressure, whether physiological or pathological, temporary or permanent, renal or non-renal. For the sake of simplicity one now takes out of the general group the syndrome to which the late Sir Clifford Allbutt gave the name of hyperpiesia. This malady is of considerable interest and importance in that it possesses individual features. Becoming manifest between the ages of 40 and 60, heightened arterial pressures of 160 mm. or more systolic and 100 mm. or more diastolic appear as constant phenomena in conjunction with left ventricular hypertrophy and changes in the walls of the arteries recognizable at necropsy as a diffuse hyperplastic sclerosis (G. Evans), but distinguishable on the one hand from renal sclerosis and on the other hand from senile atheroma. From renal sclerosis hyperpiesia is differentiated by its occurrence in robust and often plethoric subjects, who for years may experience no disability; from senile atheroma, by the existence of the high pressure. Blood urea is generally within normal limits, and the urine shows at most only traces of albumin. A heart weight of 15 oz. or so is

a common post-mortem finding. Cerebral haemorrhage or cardiac defeat are the most frequent terminal events; uraemia is uncommon.

Conditions of Association.

The only effective way of studying pure hyperpiesis is to watch its manifestations in early life before degenerative processes have set in. In children and adolescents, as well as in later life, there is one association that is not degenerative. This is arterial hypertonia, which is capable of inducing either a temporary angiospasm or, when true hypertrophy of arterial muscle has developed, a permanent hyperpiesis. The real degenerative changes of association are cardio-arterio-sclerosis and nephro-sclerosis.

Tests of Renal Efficiency.

In hyperpiesis the situation is controlled by the state of functional efficiency of the kidneys. For those patients whose kidney function is unimpaired one can do much; for those in whom the renal secreting substance is already gravely damaged one can do little.

Blood Tests.—The term "nephritis" in connexion with raised arterial pressure is universally taken to mean interstitial or azotaemic nephritis (chronic Bright's disease), and the order in which the non-protein constituents of the blood are affected is as follows. In the earliest stages there may be a rise of the blood uric acid above the normal 4 mg. per cent. without the other fractions being affected. The blood urea nitrogen, which in private patients does not exceed 15 mg., and in hospital patients 20 mg. per cent., is next acted upon and may rise well above 100 mg. per cent. It is, however, accepted that a figure for blood urea nitrogen of above 100 mg. per cent. persisting over a lengthy period of time denotes a prognosis of almost certain fatality within twelve months. Creatinine nitrogen is the last to be affected, as it is so easily eliminated; its normal figure is 1 to 2 mg. per cent., and a rise of over 3.5 mg. per cent. almost invariably indicates a hopeless prognosis. With regard to the alkaline reserve, this as a rule is only affected during late stages. The most common cause for a notable diminution of the CO₂ combining power of plasma (normally not below 55 c.cm. per cent.) in nephritis is an inability on the part of the kidney to excrete acid phosphates, with a consequent rise in the blood phosphorus figure (the normal inorganic phosphorus in the plasma is 4 mg. per cent.). This interferes with the buffering power of the blood, and the alkaline reserve may fall to 30 c.cm. per cent., or even lower.

Urine Tests.—Where blood examination is difficult or impracticable, MacLean's urea concentration test can be performed. It involves the taking of 15 grams of urea in 100 c.cm. of water, and the analysis of specimens passed at half-hourly intervals for urea, the concentration of which should be well above 2 grams per cent., which indicates that the kidney efficiency is uninjured.

ETIOLOGY.

Hyperpiesis is probably due to a variety of causes. Hereditary and familial influences undoubtedly play a part, as also do protective and mechanical factors. Many cases arise as the result of long-continued anxiety states, or of emotional shocks, which through endocrine-sympathetic influences send up arterial pressure and induce angiospasm. This hypertonia of the vessel walls, at first transitory, may pass into a state of permanent contraction, and finally end in true thickening of the muscular coats. In many cases a still further explanation is required, which in my judgement is often afforded by toxæmia, either induced by bacterial toxins or by intoxications of endogenous or exogenous nature. It is probable that such toxæmias do not become operative in raising arterial pressure unless some basic disturbance of metabolism is present.

PROGNOSIS.

Uncomplicated hyperpiesis is much more amenable to control than when associated conditions of degeneration, especially of the kidney, have supervened. Endocrine-

sympathetic cases, inducing angiospasm in high pressure states and hypotonia in low pressure states, can often be favourably influenced. In pressures of moderate grade a fair prognosis may be given, as at the menopause, especially in patients with endogenous obesity. Cardio-vascular defects demand a more guarded opinion. In cases of permanently raised pressure the onset of commencing heart failure is of the gravest import. The signs of this are a drop in pressure with dyspnoea, cyanosis, premature contractions either single or grouped, gallop rhythm, total arrhythmia, and continuous acceleration of the pulse rate. Any combination of these signs points to cardiac defeat. A diastolic pressure continuously of 120 mm. or more frequently indicates renal involvement, and if maintained at 135 mm. or higher implies a grave outlook.

CONTROL.

I prefer to speak of control rather than of treatment, since it is not in every case that treatment is required. To attempt by indiscriminate use of vaso-dilator drugs, such as the nitrites, immediately to lower a heightened pressure in the absence of indications of the cause is likely to be productive of considerable harm to the patient. Such harm may, indeed, be irreparable, so that it is wise to keep these powerful drugs only for emergencies. High arterial pressure resembles fever in that both are symptomatic of processes of reaction and defence against underlying disorder or disease. Unless either of these symptoms becomes so high as to threaten life, irrespective of the cause, it is illogical and futile to anticipate more than temporary reduction by a direct attack. A warning should also be given against too vigorous treatment by fasting or purgation. Each individual has an optimum pressure at which he or she feels most comfortable, often below standard levels in low pressure states, and above these levels in high pressure states, more especially when a fairly high head of pressure has to be maintained in order that the kidney may continue to secrete and excrete.

Although drastic attempts at reduction are to be deprecated, the opposite view that nothing can be done to relieve high pressures is equally erroneous. Having realized that the most potent causes of this condition are toxæmia, worry, and excess, first proceed to eliminate any that are obvious by a careful search for diseased tonsils, septic gums and teeth, infections of the gall-bladder, appendix, and prostate, and appropriate treatment directed to these and other like causes of focal sepsis. Intestinal stasis, with absorption into the circulation of toxins from this source, is a potent cause of both high and low pressures; hence directions should be given as to regular daily evacuation of the bowels to avoid straining.

Anxiety states should be dealt with by inculcating principles of self-control. For certain cases rest in bed at the outset may be necessary; for others it is inadvisable. Efforts should be directed to making environment less irksome and more harmonious. An occupation of steady routine is beneficial, and should be preferred to one of constant anxieties and sudden hazards. A sufficiency of rest should be enjoined. In general a minimum of eight hours should be spent in bed, and this time should be devoted as far as possible to quiet sleep. Enough relaxation and holidays should be taken in quiet, sunny, and congenial surroundings. Excesses and over-indulgence of all kinds should be checked.

Diet.—More people are killed by overeating than by over-drinking. Hence the pleasures of the table should be enjoyed in strict moderation. Meals should be varied in kind and balanced, with the inclusion of a sufficiency of vitamins in the form of fresh fruit, vegetables, milk, cream, and butter. Excess of fat is inadvisable, though olive oil may be taken well mixed with fresh salads. Similarly with carbohydrates, excess producing flatulence and digestive upsets, and tending to augment arterial pressure by causing obesity. Meat, including fish, should be taken only at one meal, and the quantity should be limited to the minimum metabolic needs of the body. When the kidneys are injured, a lacto-vegetarian diet becomes essential, since butcher's meat, spiced and seasoned dishes, and meat soups are harmful where there is difficulty in eliminating waste

nitrogenous products. In general, boiled meats, chicken, and fish are preferable to roast joints. Eggs are usually admissible, but a light breakfast of wholemeal bread and butter, or toast and marmalade, followed by fresh fruit, is better than heavy dishes of fish, or bacon, sausages, and eggs. Table salt should be avoided when renal, cardiac, or cerebral complications are present, a non-pressor table salt being substituted, if craving is felt, consisting of ammonium hippurate 1 part, potassium nitrate 4 parts, potassium chloride 25 parts.

Drinks.—Water is the best, and should be taken on an empty stomach an hour before meals and at bedtime. Where the water is hard, as in London, it may with advantage be softened by a permutit or other water-softening plant. Pure English table waters are Stretton, Malvern, Braceborough, and still salutaris, which latter is distilled water passed over forest burnt wood charcoal to render it palatable. Of the French mineralized waters, Evian, Vittel, and Contrexéville enjoy a deserved reputation in flushing out the kidneys. One pint of water for each five stones of body weight, imbibed during twenty-four hours, is a good working rule. Other drinks should be taken sparingly; China tea or tea freshly made with milk is to be preferred to Indian blends; H.A.G. caffeine-free coffee may replace the ordinary coffee. Alcohol is best not taken at all.

General Habits.—Tobacco is best avoided. Cigar smokers are more prone to arterio-sclerosis than pipe or cigarette smokers. Exercise should be well within the limits of fatigue, and elderly people should not vie with their juniors in tests of endurance. Motoring, but not at great speeds, suits most, but not all. Golf should be preferred to tennis for those in whom age changes have begun to be manifest. Finally, the keynote of avoidance as well as of control of arterial pressure may be summed up in the four words of advice—moderation in all things.

Special Modes of Treatment.

Deep breathing exercises, relaxation, and passive movements, resistance exercises, and massage have their appropriate uses. General massage combined with Swedish movements is a most useful therapeutic adjunct in lowering raised arterial pressure. X rays, high-frequency, and diathermic currents in experienced hands yield good results. Some subjects benefit from ultra-violet radiation, which balances opposite abnormalities of arterial pressure. In emergencies, such as threatened or actual apoplexy, lumbar puncture is of timely aid, as well as in warding off or relieving uraemic convulsions or severe congestive headache. Venesection up to 500 c.cm., followed by fasting for a couple of days, gives relief to an embarrassed circulation, particularly in the presence of venous stasis.

Drug Therapy.

For the toxæmia resulting from intestinal stasis rectal injections every morning for three weeks of a pint of solution of potassium permanganate, 1 grain in water, after the method advocated by Dr. Nott, is often of great value, any constipation being at the same time corrected by tablets of lactobyl or taxol. Calomel at night, twice weekly, in 2-grain doses, with a teaspoonful of equal parts of sodium and potassium sulphate on the morning following, is useful in thinning the bile, and by inducing a greater flow lessens intestinal putrefaction. Though it is impossible to disinfect the intestinal tract, monsol tablets or T.C.P. emulsion are at times serviceable in lessening toxic products of fermentation and putrefaction.

In the lesser grades of hyperpiesis 2-drachm doses of potassium chloride thrice daily in a tumblerful of water give encouraging results. For the cardiac types, theominal, a combination of luminal with theobromine, promotes diuresis and lowers arterial pressure. Iodides I have found of little use, greater effect being obtained from oral administration of the French tincture of iodine, 5 minims in water or milk after meals, with gradual increase of dosage, or by hypodermic injection of an iodine compound such as tiodine. In all cases of cardiac decompensation there is no drug to compare with the time-honoured digitalis in standardized preparations.

More recent remedies are: (1) liver extract, which often induces considerable lessening in the height of pressure and affords relief of symptoms in the majority of cases, those without arterio-sclerosis offering the best prognosis. Lilly's heparmone contains a histamine-like substance, and is one of the best preparations for intramuscular injection up to 5 c.cm.; (2) sodium sulphocyanate, also where organic changes in the arteries are absent, is useful in 3-grain tablets by the mouth; (3) choline derivatives, such as pacyl, may be given in tablet form, or acecoline (acetylcholine hydrochloride) parenterally; (4) animasa, an extract of the muscular coats of arteries of young animals, has been found of benefit in sclerotic cases when long continued; (5) anabolin has given me no results which are appreciable.

I have left treatment by baths and waters till last, since these demand still further study. Effervescent carbonic acid baths exert on arterial pressure reduction or increase, depending upon the pre-existing state. They can be obtained either naturally aerated or artificially prepared at many spas, notably at Royat, Spa, and Nauheim. Manipulation baths and douches are beneficial in high pressure cases, and in those of low pressure associated with circulatory stasis.

REFERENCES.

- ¹ Halls Daily: *High Blood Pressure*, second edition, '26 (William Heinemann), pp. 50, 55, 103.
- ² Idem: *West London Med. Journ.*, October, 1929, xxxiv, No. 4, p. 185.
- ³ Idem: *Low Blood Pressure*, 1928 (William Heinemann), pp. 39, 68.

CEREBRAL ABSCESS FOLLOWING TONSILLAR INFECTION.

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THE occurrence of cerebral abscess as a direct sequel of tonsillar infection is rare, and deserves record. In the *British Medical Journal* of June 29th, 1929 (p. 1158), Housden describes a case of cerebral abscess following acute tonsillitis, and points out that there is little or no reference to such an association in the literature.

I am indebted to Dr. Francis Roberts and to Dr. T. Pearse for some of the following notes.

A boy, aged 7 years, suddenly became ill one afternoon with a temperature of 101.4°, and was found to be suffering from severe acute tonsillitis. In addition, he had old mitral disease of rheumatic origin. He was kept in bed, and his temperature fell to normal in eight days, but in view of the cardiac condition he remained in bed for a further three weeks.

Five and a half weeks from the onset of his attack of tonsillitis the tonsils and adenoids were removed. Following this his convalescence took a normal course for five days. He then suddenly developed a sharp rise in temperature accompanied by a rigor. His chest was carefully examined at this time, but no trace of broncho-pneumonia was detected. He rapidly became seriously ill; vomiting was not a marked feature. On the day following the rigor weakness was noticed in the lower part of the left side of his face; on the following day some weakness in the left arm appeared, and shortly afterwards slight weakness in the left foot. On the fifth day after the rigor this had developed into a complete left-sided hemiplegia. On the seventh day he was definitely drowsy; his temperature was 101°, and the discs were reddened and congested. On this day he was admitted to hospital.

On admission the boy was in a drowsy, almost stuporous, state. The temperature was 98.2°, the pulse 68, and the respirations 32. He could, however, be roused, and no sensory or motor aphasia was present. There was a left-sided hemiplegia, paralysis of the face and arm being more marked than that of the leg. The tendon reflexes were brisk on the right side and very much subdued on the left. The abdominal reflexes were equal and present; the plantar reflexes were marked extensor on the right and faint on the left. Kernig's sign was not definite, but the neck seemed slightly rigid. There was no vomiting. The pupils reacted to light and to accommodation; there was no nystagmus, and no oculomotor paresis. The other cranial nerves were normal. Mr. Bernard Chavasse reported that both discs were blurred and red, with some swelling in their lower halves. A coarse systolic murmur was heard at the apex of the heart. On examination of