(dilatation) of the right heart (from mitral disease) the aortic diastolic murmur was loudly and plainly conducted down and outside the right edge of the sternum; the conduction might be to the apex as well, but that to the right of the sternum was very marked.

Mention has been made above of the appearance of mitral regurgitant murmurs in the course of heart disease which began as aortic, and in which the mitral affection may fairly be inferred to be secondary to it. No relief appeared to be thereby afforded to the cardiac disorder.

SUMMARY.

	Males.	Females.	Total.
Aortic regurgitation purely	2	4	6
Aortic regurgitation, with aortic systolic murmur	4	5	9
Aortic regurgitation, with mitral regurgitation	5	4	9
Aortic regurgitation, with mitral stenosis only	?1	0	?1
Aortic regurgitation, with aortic systolic murmur, and also mitral disease	5	3	8
Cases.			
Great enlargement of heart present in			21
Dilatation of aorta			12
Flint's murmur			17
Flint's murmur, with thrill at apex			11
A "knock" audible in peripheral arteries			10
A "knock," together with a murmur			5
Albuminuria present in			13
Albuminuria disappearing rapidly			11
History of previous acute rheumatism			21
History of rheumatic pains only			4
History of chorea only			4
History of scarlet fever only			1

A few remarks as to treatment may be added. Of course, in cases severe enough to be admitted to hospital rest often over a long time is necessary. Restriction of the amount of fluid taken, so far as can be done without discomfort to the patient, is valuable, by relieving the work of the heart by after a time diminishing the amount of fluid in circulation. In the absence of rheumatic manifestations or of fever, I have not seen much benefit from the continued use of the salicylate group of drugs; short courses may be useful in relieving precordial pains. The iodides, in combination with salicylates or alone, have not seemed to me to influence the course of the disease, and the iodides given for some time have not prevented the occurrence of attacks of angina or acute dyspnoea in those subject to them. Digitalis was given whenever there was signs of heart failure according to the indications in each individual case as they occurred from time to time; it is more often necessary than in the aortic disease of adults, partly because of the far greater frequency of implication of the mitral valve. As to relief of special symptoms, the most urgent are the very distressing and sometimes alarming attacks of angina pectoris, which are not infrequent. In these young patients amyl nitrite is the most effectual drug. In several cases, nitro-glycerine, and the other nitrites, completely failed both to relieve and prevent the attacks, when amyl nitrite gave prompt relief, but of course did not prevent their recurrence. Possibly it owes its good effects to its rapid action, as the attacks, though severe and sometimes very frequent, are as a rule of short duration. The dose inhaled has sometimes to be increased up to $\text{m} \times$ to $\text{m} \times \text{i} \times \text{j}$ at a time to maintain the effect, but seems to entail no unfavourable consequences. One girl, who at times during the last two years of her life suffered from six to ten sharp paroxysms daily, used to inhale as much as $\text{z} \text{ss}$ to $\text{z} \text{ij}$ amyl nitrite in the twenty-four hours, and no other drug did her any good. The next most urgent symptom is the attack of dyspnoea or suffocation, which is probably a form of angina. Here again amyl nitrite often relieves, but sometimes caffeine and ammonia is more effectual.

Not so immediately urgent, but distressing from its persistency, is the excessive or violent pulsation of the greatly enlarged heart. This palpitation is often the subject of the patient's chief complaint. I have found a mixture of liq. arsenicalis, ac. hydrocyan. dil., and tinct. veratri viridis, given for some time, most useful in the treatment of this symptom, which is often a most troublesome one, even when the patient is at rest in bed, and when there is no evidence that the heart is not able, in spite of the abnormal conditions, to maintain an efficient circulation.

In other cases, of course, this symptom is one of the expressions of the failure of the heart to do this, and must be treated accordingly.

REFERENCE.

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BLOOD PRESSURE IN MENTAL DISORDERS.

BY

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RECENT investigation tends to disprove that there is any constant correlation, as hitherto more or less generally accepted by alienists, between certain types of mental disorder—namely, states of emotional exaltation and depression—and definite modifications of the arterial pressure. It is chiefly to Dr. Maurice Craig¹ in this country that the view is to be attributed that states of emotional exaltation are usually associated with low pressures and states of emotional depression with high pressures. Of the work recently published which fails to confirm this relationship that of Dr. John Turner² is the most important. He concludes from his observations that the blood pressure bears no definite relation to the mental state, but only has a constant relation to the age period.

The observations on which this paper is based were made on cases forming a considerable proportion of the female admissions to the Suffolk District Asylum during a period of two years. The instruments used were Martin's modified Riva-Rocci, and Leonard Hill's latest pattern wrist instrument. In the majority of cases both instruments were used in making the earlier observations, and from time to time the larger one was used to confirm the readings obtained by the wrist instrument. With few exceptions both forms of apparatus were found to give similar results, but Hill's sphygmometer, besides being more portable, has advantages in dealing with the insane; it is less imposing, and in certain types of depressed patients nervous influences appear to cause unduly high readings. In these cases, by spending a quarter of an hour or more taking readings at frequent intervals, I have frequently found that the pressure gradually falls until it reaches a constant point; whereas in cases of mania, more especially those with marked excitement, the same influences do not appear to be at work. The higher readings of earlier observations have been noted by other observers. In the cases here summarized the observations were made about noon with the patient sitting, and resting the forearm on a table so that the artery being examined was approximately at heart level. In the large majority of cases an average was struck from the weekly readings, 3 to 5 in number, immediately following the admission of the patient, and subsequently in many of the cases observations were made at monthly and then longer intervals in patients remaining under treatment. There were some cases in which the number of observations was necessarily limited to one or two, and a few in which single observations were made have been included where I was satisfied with their accuracy. I only attempted to read the manometer scale to the nearest 5 mm., which is accurate enough for ordinary clinical purposes. The pulse-rate was observed at the time, and cases with marked irregularity of rhythm excluded; a note was also made as to the condition of the vessel wall as judged by the fingers. In all cases coming under the headings of mania and melancholia, the observations from which the averages were taken were made while the patients exhibited respectively definite exaltation or depression of the emotional tone.

MANIACAL STATES.

The observed cases numbered 33. They had an average age of 33 years, and showed an average systolic pressure of 115 mm. The maximum pressures were obtained in three patients aged 56, 56, and 52 years, with readings of 150, 140, and 135 mm. respectively. The minimum pressure was 100 mm., observed in 5 cases aged 19, 21, 30, 30, and 46 years. The radial arteries in these cases were not palpable or barely so. There were included among these 33 cases 10, with an average age of 29 years, of a

particularly acute type, exhibiting more intense and continuous excitement, and the average duration of whose attacks was seven days before coming under treatment; these also gave an average systolic pressure of 115 mm. Observations made during the subsequent progress of many of these cases showed in 5 instances a rise and 5 instances a fall of from 5 to 20 mm. on the return of the emotional tone to normal, 2 cases being recoveries, while 3 cases showed no change under the same circumstances.

MELANCHOLIC STATES.

In 49 cases, with an average age of 48.5 years, there was an average systolic pressure of 125 mm. The maximum readings were 165 and 155, in women aged 50 and 64 respectively; both had sclerosed radial arteries. The minimum pressure was 95 mm., in a woman aged 36 with radials scarcely palpable. This class includes 18 cases of the agitated, excited type, having an average age of 54 years, but the same systolic pressure of 125 mm. Continued observation of many of these cases showed a rise in 5 instances of from 5 to 20 mm. on the improvement in the emotional tone, 3 of them being recoveries. Two cases showed a fall of 5 mm. under similar circumstances. One case on becoming excited rose 10 mm., and 2 cases fell 15 and 20 mm. on failing physically. One case gradually rose from 120 to 160 mm., associated with amelioration of the mental symptoms; she had marked arterio-sclerosis. Two cases showed falls of 10 and 20 mm. on passing into stupor, the second of these rising to the original point on improvement in the mental state. The average duration of the attacks in this class was one and a half months.

STUPOROSE STATES.

In 6 cases of an average age of 28 years the average systolic pressure was 110 mm. The maximum and minimum were 125 and 95 mm. One case rose 5 mm. and another 20 mm. on mental improvement.

DELUSIONAL STATES.

There were 15 undifferentiated cases of this type which showed no noticeable excess in the emotional tone. The average age was 43 years and the average systolic pressure 125 mm. The maximum was 170 mm., in a patient aged 63 with a markedly sclerosed radial artery. The minimum was 100 mm., in a case aged 37 with soft arteries. One case rose 10 mm. on improving mentally, and one fell 35 mm. on developing phthisis.

CONGENITAL STATES.

In 12 cases, mostly epileptics, with an average age of 25 years, there was an average pressure of 100 mm. The maximum and minimum were 120 and 85 mm., and in all cases the radial arteries were not palpable, or barely so, with the exception of the case giving the maximum reading, in which the artery was readily palpable.

SENILE STATES.

In 10 cases, with an average age of 74 years, the average systolic pressure was 140 mm.; the maximum and minimum were 200 and 115 mm. One case aged 78 with a pressure of 125 mm., and one aged 77 with a pressure of 135 mm., showed marked sclerosis of the radials, both being well physically; while in all the others the thickening was about normal for their age.

High pressures have been recorded in confusional states, but there were only 2 cases of this type observed; one aged 65, and with not abnormally thickened arteries, gave a reading of 145 mm., and the other, with marked arterio-sclerosis, gave most variable readings between 115 and 165 mm. at different times.

INFLUENCE OF DRUGS.

In 2 of the maniacal cases, while taking potassium bromide, which had a favourable influence on the excitement, there were falls of 10 and 15 mm.; 2 melancholic cases fell 5 and 20 mm. under the same drug, becoming more composed mentally. Under the administration of opium and veronal two melancholic cases maintained a lower level by 15 mm., with accompanying amelioration of the symptoms.

ALBUMINURIA.

Two cases with a transient trace of albumen but no departure of the blood pressure from the normal, are included in the foregoing results, but 3 cases having a

persistent and considerable quantity are omitted. One (a case of quiet melancholia, aged 22 years) had an average pressure of 140 mm., rising on improvement, ending in recovery, to 180 mm. A second, aged 34, a delusional case with no excess of the emotional tone, had a pressure of 150 mm., rising gradually to 190 mm., with no obvious change in the mental state. A third case, aged 74, was of the quiet, depressed type, and maintained a pressure of 175 mm.

In several cases, irrespective of the mental state, considerable variations in the systolic pressure were observed from time to time without any appreciable change in the affective tone. Of six patients who at later periods developed tuberculosis, five had pressures below the normal for their age periods. I think Sir Lauder Brunton has similarly observed a relation between low pressures and phthisis incidence.

In Table I the various mental states have been correlated with three grades of systolic pressure, and the middle grade (110-120) may be taken as representing the limits within which fall the pressures of the majority of normal adults up to middle life. In calculating the average age for each grade of pressure the congenital and senile states have been excluded, as their relation to lower and higher pressures respectively, which is fairly constant, would tend to obscure the results.

TABLE I.

Type of Mental Disorder.	Under 110 mm.	110 to 130 mm.	Over 130 mm.
Maniacal states	11	19	3
Melancholic states	5	31	13
Stuporose states	3	3	—
Delusional states	2	9	4
Congenital states	7	5	—
Senile states	—	4	6
Average age (excluding congenital and senile states)	32.5 years	40 years	56 years

In Table II it is attempted to correlate all the cases with the exception of the congenital, according to their pressure grades, with the three age divisions suggested by Sir Clifford Allbutt, and these latter subdivided so as to show a relation between the various pressures and the condition of the radial arterial wall as estimated by palpation. This is perhaps a somewhat rough and arbitrary method.

TABLE II.

	Under 30 years.			30 to 60 years.			Over 60 years.		
	Vessel Wall.			Vessel Wall.			Vessel Wall.		
	Not Palpable.	Readily Palpated.	Sclerosed.	Not Palpable.	Readily Palpated.	Sclerosed.	Not Palpable.	Readily Palpated.	Sclerosed.
Under 110 mm.	6	1	—	12	—	2	—	—	—
110 to 130 mm.	13	3	3	21	15	2	—	6	4
Over 130 mm....	1	—	—	—	5	5	—	1	14

INFLUENCE OF ARTERIAL WALL ON OBSERVATIONS.

The influence of the vessel wall on the manometer readings is still a doubtful point. Although a soft artery may have little effect in obscuring the real pressure, it seems to me that marked sclerosis must modify the readings considerably. I have records of 3 cases of arterio-sclerosis which, owing to a poorly nourished bodily condition, allowed of the arteries being palpated with particular ease, and of the point of oblitative pressure in the posterior tibial artery, where it passes behind the internal malleolus, being ascertained with considerable accuracy. With the patients in the horizontal position as nearly as

possible, simultaneous observations were made by means of two armlets connected to the one manometer. In this way differences were observed in all the cases varying from 6 to 25 mm.; the differences in the limbs of the opposite sides did not correspond. In some instances the tibial reading was higher, and in others lower, than the brachial, but I have generally found both brachials to correspond. In a few cases also, when using the Riva-Rocci and Hill's instruments together, I have found a constant difference of 30 mm. or less between brachial and radial arteries, the latter being the lower. I assume that in all these cases the difference may be regarded as an expression of the variation in the resistance of the vessel walls under observation, but it of course gives no idea of the total resistance offered to compression. Then, on the other hand, one not infrequently obtains low readings in marked arterio-sclerosis.

CONCLUSIONS.

1. That maniacal and melancholic states are not associated with any constant modification of the arterial blood-pressure, nor any marked departure in it from the normal.
2. That the same applies to other types of mental disorder with the exception of congenital states in which the pressure tends to be low.
3. That the pressure bears some relation to the bodily tone, and increases as age advances; and that as melancholia is on the whole a disorder of more advanced years than mania it is only associated with higher manometer readings on this account.
4. That sedative drugs have a slight influence in lowering blood pressure.
5. That the manometer readings bear a fairly close relation to the sclerosis of the vessel wall.

REFERENCES.

¹ Blood Pressure in the Insane, *Lancet*, vol. i, 1898. ² Blood Pressure and Vascular Disease, *Journal of Mental Science*, July, 1909.

THE INTERPRETATION AND SIGNIFICANCE OF SOME IRREGULARITIES OF THE PULSE.*

BY

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In the textbooks of medicine the scanty accounts which are given of pulse irregularities do not elucidate their sources of origin. Of late years, however, an immense amount of work has been done upon this subject, both experimentally and clinically, and we now possess some real information as to the mechanism by which irregular pulses are produced. In clinical medicine methods of recording and interpreting irregularities of the pulse at the bedside have been elaborated.

Of this work Dr. James Mackenzie has been the pioneer. In 1902 he published his book on *The Study of the Pulse*, in which he gave descriptions of apparatus which he had invented for recording the movements of the various chambers of the heart, and he classified and described the various pulse irregularities. Since the publication of his book numerous workers have followed along his lines, and an immense amount of literature on the subject has arisen. The result has been to confirm Mackenzie's work in nearly all points, and to afford an insight into the mechanism of the heart's action which was previously unknown.

In most cases of irregular pulses it is impossible to know what the various chambers of the heart are doing without some graphic method, and without such a method it may be impossible even to detect an irregular pulse. Previous to the knowledge which graphic methods afford, I think that the main tendency has been to regard most pulse irregularities as having some unfavourable significance, though in reality sometimes an irregularity of the pulse has an important bearing, and sometimes appears as a harmless accident.

On the one hand, an irregular pulse may have an important bearing in disease. For instance, an occasional irregularity of the pulse during the course of pneumonia

may be the first sign of a fatal termination. On the other hand, I know a family in which all the sons possess an irregularity of the pulse in the form of ventricular extrasystoles. They are all perfectly strong, middle-aged men, and their father, who had a similar pulse irregularity, lived to the age of 82. In such cases a just opinion can only be formed by a comprehensive consideration of all factors. Again, it sometimes happens that a pulse may appear quite regular to the palpating finger, but when the movements of the heart are analysed, it is found to possess a gross irregularity. For example, in conditions of heart-block the radial pulse may appear to be quite regular, as in an instance which I shall show you, but by a graphic method it can be shown that the auricles and ventricles are absolutely dissociated. The factors which govern the normal beat of the heart are—first, stimulus formation; secondly, excitability; thirdly, contractility; fourthly, conductivity; and fifthly, tonicity.

The bias of opinion at present very strongly favours the view that the heart initiates and conducts by its own muscle fibres the proper orderly contraction of auricles and ventricles. This is known as the myogenic theory. Even if it is ultimately proved that the nervous system plays a considerable part in the normal beat of the heart, we have obtained from the myogenic theory a very good working explanation of many irregularities of the pulse. This theory assumes the muscle fibre to contain some physico-chemical material, which gradually accumulates until it is present in sufficient quantity to stimulate the muscle fibre to contract. Cardiac muscle has the peculiar characteristic that during contraction the stimulus matter is used up, and immediately following the contraction the property of excitability is temporarily lost. In other words, no further contraction can take place until the stimulus matter has been regenerated, and until the property of excitability has been restored. This period of enforced rest is known as the refractory period of the heart. It will be apparent that the heart, unlike ordinary muscle fibre, cannot be continuously stimulated to a tetanic condition, or even made to contract immediately after a previous contraction.

I wish to emphasize very strongly the fourth property of the heart—namely, that of conductivity. Any particular cardiac muscle fibre during its contraction has the power of exciting a contraction of the contiguous fibres, so that by causing the contraction of a single cardiac fibre a wave of contraction is conducted along the neighbouring fibres.

Can this principle of fibre to fibre stimulation be applied to the human heart? You will remember that the auricles are separated from the ventricles by distinct rings of fibrous tissue—that is to say, there is no direct continuity of ordinary cardiac muscle fibre between auricle and ventricle. A wave of contraction, beginning in the ordinary auricular fibres, will be arrested at this fibrous ring, and would not be conducted to the ordinary ventricular fibres. To obviate this difficulty a specialized band of muscular fibres, however, exists, which extends across the fibrous ring from auricle to ventricle, and is capable of conducting stimuli from auricle to ventricle. This specialized band, which is composed of cardiac muscle fibres of an embryonic type, is known as the "bundle of His." By this band of specialized muscle tissue the stimulus is conducted in an orderly manner from the auricle to the ventricle.

Lastly, the fifth property which the heart muscle possesses is that of tonicity. In other words, the heart muscle fibres, like the muscle fibres of the body generally, are never completely relaxed, so that the heart wall always maintains a certain degree of rigidity.

In a normal heart these five properties of heart muscle fibres are interdependent. In pathological conditions, however, they may be affected independently of one another. In some diseases of the heart they all suffer. In some cases we find a depression of the property of conductivity, and in others an increase of excitability. Certain poisons seem to have a discriminative effect upon the properties of the heart muscle. For example, digitalis depresses conductivity and increases the tonicity of the heart. Other poisons, like alcohol and muscarin, diminish the tonicity of the heart. As it is the orderly exercise of these five properties which determines the normal rhythm of the heart, it is only by the analysis of these five properties of the heart separately and collectively that we

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