OLD AGE AND BLOOD-PRESSURE PROBLEMS.

By Major R. J. C. Thompson, Royal Army Medical Corps.

And

Major R. E. Todd, Royal Army Medical Corps.

From the time that we began our closely collaborated work at the Royal Hospital, Chelsea, we have made frequent use of the Tykos blood-pressure apparatus—at first regarding it as a valuable means of estimating departures from the "normal," latterly finding it a most interesting support of our gradually dawning heresy that in dealing with old age, there is no "normal." Taught that blood-pressure in the human being pursues an inevitable course, reaching a standard level about early manhood and gradually rising with advancing years, we attempted to correlate our findings with accepted teaching. We were soon puzzled by the paradoxical readings in men of over 75 whose radial arteries were nodular "pipe-stems"—one case exhibiting a pressure of 195/100; another, apparently parallel, 140/75; a third, 115/70. We then took systematic readings of 102 in-pensioners all from 75 to 92 years of age. The resulting figures are expressed in the graph which forms the basis of this paper. We do not attempt to lay down any law: we offer our figures, believing them to be accurate as far as instrumental accuracy may be relied on, to the many who are interested in blood-pressure readings.

We add a few remarks which have materialized from our heated discussions over points which have puzzled us, and, confession being good for the soul, puzzle us still after groping in the literature for a solution.

Principal Factors of Blood-pressure.

The principal factors concerned in blood-pressure are presumably: (1) the heart—the pump; (2) the arterial system—the pipes; (3) the capillary bed—the field of irrigation; (4) the quality of the blood—the irrigating fluid; (5) the quantity of blood available and (6) the mechanisms regulating the calibre of the pipes and the rate of blood-flow, nervous, chemical, toxic, mechanical.

Up to and including middle-age, the heart, the pump, in the absence of obvious endo- and myocardial disease, may be accepted as a constant factor; as may the arteries, the pipes, in the absence of obvious sclerotic change. Under such circumstances it has been possible to formulate—by compression of the left brachial artery—a standard, an average taken from many thousands of cases—in fact, a "normal" of pressures taken at this site of election. In the physiological laboratory it is impossible to model a pump comparable with the living human heart, still more impossible to devise

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any contrivance to represent a degenerated heart, the action of which cannot be guaranteed from hour to hour, even from beat to beat.

The primary factor in the blood-pressure phenomenon is the heart, and we submit that it is impossible to formulate a blood-pressure "normal" for a period of life during which the heart is an inconstant factor. General, or localized, arterial disease again precludes the possibility of supposing a standard applicable to old people. We do not suggest that every man over 80 years of age has a degenerated heart or established disease of the arteries, but it may be presumed that after so many years of constant use they are the worse for wear. From our post-mortem observations at Chelsea we have reason to believe that the large majority of old people have deteriorated cardio-vascular systems. The quality and quantity of the blood are factors which we have not investigated.

The nervous, chemical, toxic, and mechanical factors regulating and modifying the calibre of the pipes, and the rate of flow of the blood, are subjects of which we know nothing. The graph shows that the majority of our 102 cases exhibit a mode of 130 to 169 millimetres systolic pressure, with a majority of eight cases at the lower level of 130 to 149. An undoubted preponderance, fifty-four out of 102 cases, with diastolic pressure from seventy to eighty-nine millimetres Hg occurs. Pulse pressures appear to vary mainly between fifty to eighty-nine millimetres Hg. But to apply these figures as a "normal" for this period of life is obviously impossible when one is faced with active die-hards with signs of neither hyper- nor hypotension, and no apparent answer to the puzzle that their blood-pressure readings vary from 190/100 to 95/45.

**ABNORMAL BLOOD-PRESSURE AS A MORBID SYMPTOM.**

Rapid variations—e.g., the fall with hæmorrhage, the rise with perforation, are valuable diagnostic signs in enteric fever. Gross, more or less constant, variations from the "normal" are commonly associated with the "red granular" kidney and Addison's disease, but it is not perhaps sufficiently recognized that abnormal blood pressure may be only one of several symptoms and often the least important. It is sometimes a useful indicator in estimating the progress of the particular disease and the results of treatment. Categorically to deny, as some do, that blood-pressure having attained a certain level can change to a lower level, compatible with the well-being of the individual, is to discredit the extraordinary adaptation of which the system is known to be capable, and of which further evidence and proof are continually forthcoming as scientific research proceeds.

Our findings have compelled us to become agnostics so far as blood-pressure problems are concerned; there are so many clinical findings for which there is no satisfactory explanation. Take the part played by the kidney, for example. Granted that signs of disease may not be demonstrable until a large proportion of the kidney is out of action, at what stage...
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in the disorganization of renal tissue does the kidney take a part in the production of hypertension? To what extent do the conditions grouped together as nephritis come into the hyperpiesia picture?

We have referred to the heart and arterial system as being two of the blood-pressure factors which preclude the possibility of establishing a "normal" for old age. The capillary bed, the field of irrigation, is a field of controversy in which even the wisest men tread very gently, and we dare do no more than sit on the fence and throw into the field a few conjectures from our clinical observations. Our notes are founded so obviously on the work and writings of such authorities as Clifford Allbutt, Rose Bradford, Herringham, Dale, Norris, Batty Shaw and others, that in this short paper written round our figures we do not attempt a bibliography.

Further study of primary hyperpiesia may mould facts out of theories. Histamine is a toxic body and a "depressor." In surgical shock normally closed irrigation beds are said to be opened, the volume of circulating fluid reduced, and the blood-pressure is lowered in consequence. It may be found that toxic "pressor" substances, either by contracting the general pipe system or by shutting off certain irrigation beds, increase the rate of
flow or the volume of fluid to be dispatched throughout the system, and so increase, even temporarily, the pressure in those areas remaining open for irrigation.

**RED GRANULAR AND ARTERIO-SCLEROTIC KIDNEY.**

It seems to be generally agreed that the "red granular" kidney and the "arterio-sclerotic" kidney are histologically the same as far as the vascular elements are concerned. Lawrence discriminates: "The red granular kidney is entirely due to occlusive endarteritis of the small arterioles of the kidney, of the afferent vessels of the tuft, and of the capillaries of the tuft. The scarred kidney—i.e., the arterio-sclerotic kidney—is due to occlusive endarteritis of the larger interlobular arteries, or arteries arciformes."

Though we see many arterio-sclerotic kidneys from the period of life under review in this paper, we do not see the syndrome associated with the red granular kidney. In our experience, a man who has reached the "old age stratum" seems to have passed the era of angina pectoris, the red granular kidney, and the higher grades of hypertension. Out of five fatal cases of cerebral haemorrhage in our series, three were in men of over 75 and two were men of 65. Pipe-obstruction seems more common than pipe-breaking in the furred-up and more rigid pipes of the damaged machines we have dealt with. It seems a reasonable suggestion that the more early fatal red granular kidney may be a condition, toxic in character, primarily renal in origin, which works back along the arterial system to the heart; while the arterio-sclerotic kidney, as a distinct condition, may result from primary hypertension operating centrifugally from the heart. We have seen in younger men the red granular kidney with obvious left ventricular hypertrophy and the textbook post-mortem findings. We have seen many arterio-sclerotic kidneys with hearts very little, if at all, hypertrophied, and in many cases with the myocardium, particularly of the right ventricle, definitely degenerated and atrophied.

Our blood-pressure figures from a number of men who may be presumed to have arterio-sclerotic kidneys—or Councilman's "chronic atrophic nephropathy"—do not point to resistance in the renal capillary bed as being an unimpeachable factor in the production of hypertension. The outstanding fact is the similarity in the histological picture of the "red granular" and the "arterio-sclerotic" kidney as far as the vascular elements are concerned. It is certain that, wherever the starting point, whatever the cause, whatever the specific difference in effect between these differently named but similar conditions, an adaptation compatible with extended life can be arrived at between the weakened but willing heart and the damped-down furnace of old-age metabolism.

**VARIATIONS OF READINGS.**

We have found the old men very tractable in tolerating our blood-pressure examinations. For the most part they hold the arm to be
examined well relaxed and in an unstrained position. Even their original idea that the Tykos and a stethoscope meant some form of vaccination did not unduly agitate them. We have noticed that little spurts of temper, disagreements as to which man was next for examination, etc., caused readings higher than usual for that individual. The readings from these very old men undoubtedly fluctuate to a disconcerting extent from causes which might easily escape the consideration of an observer not accustomed to senescents en masse. Perhaps the most interesting variations have been observed in a series of forty-six men, aged 76 to 92 years, whose readings were taken, for no particular reason, between 5 and 7 p.m. on Sunday and Monday, May 21 and 22, 1922, on which days the shade temperature suddenly reached 84° to 86° F. We compared these readings with previous figures of the same men and found that this sudden introduction of summer had, we suppose, either by depressing the heart’s action, or by dilating the pipes and irrigation field, or both, caused a remarkable fall of pressure in seventy-two per cent of the cases. These new figures were graphed in order of age against the previous readings, and still further convince us that there can be no dogmatic “normal.”

Certain cases gave particularly interesting readings. A man, aged 78, whom from several previous observations we had recorded as 200/100 showed 165/75 on the Sunday evening. Another man, aged 89, showed 182/72 as compared with our previous record of 200/95. Thirty-three out of forty-six cases showed a fall in pressure, both systolic and diastolic, of at least ten millimetres Hg. The figures of three men corresponded with previous readings. In ten cases the systolic pressure was higher by five to twenty millimetres Hg, with a slight correspondence in rise of the diastolic pressure. These differences in pressure seem to indicate the necessity, when making a “normal” standard for any series of ages, of ensuring that the readings are made under parallel conditions, climatic and otherwise.

Possible Prognostic Value of Pulse Pressure.

There is a class of case in which we suggest that further observation may perhaps show the pulse pressure to be a valuable prognostic sign. A man, aged 82, clinically myocardial degeneration, was admitted to the infirmary with the failing heart syndrome, oedema of legs, dyspnœa, etc. Pulse pressure twenty-five to thirty millimetres until he began, presumably, to rebuild his myocardial reserve. He returned to his bunk in the main building with pulse pressure sixty-five millimetres, able and glad to do his own light jobs for himself. A similar case, aged 83, showed a pulse pressure of thirty-five to forty millimetres while still very ill, but this figure became sixty-five as he recovered and had turned the corner. The diastolic pressure remained fairly constant, the load remained the same, but the systolic pressure rose with the increase in force of beat. We infer that the pulse pressure may be an indicator as to whether the myocardium
is or is not taking unto itself a new lease of reserve power and can combat, reasonably for the individual, that important factor the "diastolic load."

**Small Practical Value of Readings.**

The net result of our clinical blood-pressure observations on very old people is that the readings are more of theoretical interest than useful in diagnosis or treatment. A man of over 80 with no subjective or objective signs whose mechanism has become adapted to a 200/100 pressure is not a case of hypertension to be dosed with iodides and nitrites, to be carefully dieted and subjected to balneo-therapy. His medical attendant may be thankful that the man has been fitted with what is probably a compensatory and beneficent high systolic pressure. He will be wise in not tampering with the individual in order to treat a diagnosis.

We submit that his, or her, high or low blood-pressure is not a subject to be discussed with the patient either directly or by suggestion. There are already too many people who quote their blood-pressure figures. It is enough that such people regard their "nerves" and intimacies of metabolism as topics of general conversational interest. Freedom from anxiety, business, domestic and personal, is therapeutically most important for the subject of the hypertension which requires treatment. Patients who brood over their own blood-pressure figures, or the fact that their doctor has told them that they "suffer from high blood-pressure," are very prone to become the subjects of a vicious circle in which the processes revolve the faster the more introspective the patient becomes.

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