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THE LIMITS OF SAFETY IN BLOOD PRESSURE CHANGES.*

BY

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In raising blood pressure to the dignity of a main theme, we are in danger of forgetting that abnormal blood pressure, either high or low, is not a disease but a symptom, a mere phrase in a sentence that cannot be understood without its context. And there exists the further danger that we may exaggerate the importance of it as a symptom. This, I think, has indeed been done and the profession as well as the laity has become imbued with an unwarranted awe of abnormalities in pressure. Because some cases of high tension are short-lived, the conviction has arisen and has been promptly espoused by the laity that high pressure is a serious omen and needs active treatment.

The blood pressure reading takes rank with urine analysis and blood tests in importance as an aid to diagnosis and prognosis, hence it should become a feature of routine examination. I am inclined to think that a goodly number, perhaps the majority, of surgeons, are not deeply interested in it. If their hospital internes take the pressure well and good. They themselves care little about it. A recent English text-book on Surgery (Choyce and Beattie, London, 1912) has not a word upon the subject.

A single reading of the blood pressure is not sufficient. To be of value pressure studies must be made regularly, and I need only cite the observations of Briggs and of Crile (Blood Pressure in Surgery, Philadelphia, 1903, p. 400) with regard to typhoid fever. They found that the earliest symptom of perforation is a rise in blood pressure. This of course can be discovered only if regular studies are made. Assuming that the pressure is systematically taken

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what use can be made of it? As I have said it is only a symptom and may therefore, like other symptoms, be misleading. Thus a normal pressure reading may be obtained in a case with a bad circulation—one in which operation might be fatal. We cannot therefore depend on blood pressure alone in deciding whether a given patient is a good surgical risk. When the pressure is abnormal, the case is in some respects simpler. If the pressure is very high, that of itself will act as a "temporary stay of execution" until the case can be more fully studied. What shall our attitude be in the high pressure cases? First of all, we must find the cause of the high tension, for some causes are grave obstacles to successful operations while others, as I hope to show, are not. From the operative standpoint, the most serious cause is chronic nephritis. As this is practically never monosymptomatic, a careful search will show in addition to the hypertension other characteristic signs—polyuria, low content of solids in the urine, hypertrophy of the heart, etc. I need scarcely say to you that an operation should not be undertaken in such patients unless it be to save life. There are, however, cases of nephritis in which the urinary changes are very slight. In them the discovery of high tension, let us say 200 mm. or over, is of very great significance. The factors of safety in such cases are apt to be overestimated, because the ordinary urine examination reveals but little departure from the normal. In such cases the phenolsulphonephthalein test ("the red test") is of great value. It will give information as to the functional capacity of the kidneys and will afford a better idea of the margin of safety than the blood pressure and the urine analysis combined. This is another of the many illustrations of the need in modern times for the cooperation of physician, surgeon and laboratory worker.

Another cause of high pressure that plays an important rôle in surgery is arteriosclerosis. Rigid arteries and high tension are a serious handicap for the patient needing an operation. Nevertheless, many operations have to be done or at least are done on arteriosclerotic subjects, not only those of necessity but many more or less elective in nature. Owing to the frequency with which renal changes accompany the arteriosclerotic process, it is well, if the urine arouses suspicion, to proceed as I have advised in the case of nephritic hypertension, that is to make the functional test of renal sufficiency. Taking arteriosclerosis cases by and large I may say that syphilis is the most frequent cause of the uncomplicated type of the disease. This in certain circumstances is of decided importance; for example, in cases of obliterative endarteritis with threatened

gangrene. The discovery of syphilitic infection through the history or the Wassermann test may deter the surgeon from amputation until a trial of therapeutic measures has been made. Operations are fairly well borne in arteriosclerotic subjects provided the heart is competent, and that point a medical man with experience can determine in the majority of cases. I have seen men with arteriosclerosis pass through prostatectomy, radical cure of hernia, gall-stone and other operations with remarkable ease and freedom from complications. But even in the case of heart lesions, particularly valvular defects, the factors of safety are often considerable and unless there is evidence of myocarditis with dilatation and perhaps fatty change, operations are reasonably safe.

When arteriosclerosis is associated with diabetes, and this is the rule in elderly diabetics, then the problem of deciding upon an elective operation is more difficult. My opinion is that even in such cases operation is fairly well borne, provided, of course, that the kidneys are sound, and that the proper precautions are taken to fortify the patient by diet and by alkalies against coma.

There is another form of hypertension which is clinically more or less mysterious. The urinary findings indicate intact kidneys or at least kidneys but little diseased and the superficial arteries as well as the retinal vessels show no change. This form is rather common in middle-aged, stout women, and may give very high pressure readings (190–270 mm.). Some writers see the cause in disease of the kidneys but I am not sure that this is the true cause. Be that as it may, the important fact is that these patients bear operations better than one would expect from the height of the blood pressure, granted that the heart is fully competent. It is among this group of cases that the greatest harm is done by telling the patients of their blood pressure and by subjecting them to more or less violent treatment calculated to upset a circulation that is of necessity geared high and should not be thrown out of balance. These patients are frequently gall-stone subjects and are thus brought to the notice of the surgeon.

It is in pregnancy that the blood pressure, taken as a single symptom, acquires its greatest significance. Dr. Hirst has, both to-night and on other occasions, contributed much to this phase of the subject and I need only say that a rising pressure is one of the early signs of toxemia—a pressure of 130 or 140 is deserving of more attention than at other times. The factors of safety in pregnant women cannot be large, else we should not have the sudden explosions, the eclamptic attacks; but it would be a mistake to hold the

high pressure itself, even if it reaches 200, responsible for eclampsia. It is merely a sign of something much more subtle that has not yet been fathomed. But there is an exception to every rule and eclampsia has been noted when the pressure was not raised. Nevertheless, high tension is such a valuable sign in pregnancy that blood-pressure taking ought to become a habit among obstetricians.

Can we do nothing to reduce pressure and thereby increase the factors of safety in operations? Yes, we can, but pressure-lowering drugs of all measures are the least helpful. History repeats itself, and the experience with the use of antipyretic drugs in fevers is being duplicated in the drug treatment of hypertension cases. Our predecessors thought that in reducing the temperature by means of drugs they cured the disease, and many men have fallen into a similar error in thinking that to reduce high pressure by means of vasodilators means a permanent advantage to the patient. If by altering the metabolism of the patient we can lower the temperature or lower the pressure we have made a greater gain. I would not, however, decry the judicious use of vasodilators—just as hyperpyrexia is dangerous *per se*, so great hypertension may be dangerous, and then the *nitrites* are both indicated and valuable.

In cases intended for operation, much may be accomplished by a preliminary period of rest and low protein diet. For example, in exophthalmic goiter, in which high pressure is the rule, rest and milk diet are useful in direct proportion to the severity of the case. Not only does such a regimen affect the pressure favorably, but it lessens, and this is of great importance in goiter patients, the thyroid toxemia. In nephritic cases these same measures accomplish a good deal. In all circumstances free bowel action tends to lower pressure. An interesting observation on prostatic cases comes from the Mayo clinic (D. C. Balfour, Mayo Clinics, 1913, p. 73). It has been found that the preliminary drainage of the bladder either by a retained catheter or by a suprapubic stab of the bladder lowers the pressure (in fifty cases on an average from 166 to 145) and cuts down the mortality to a considerable degree. Chilling must be avoided. In ether cases it causes a rise of pressure and congestion of the internal organs thereby predisposing to pneumonia.

The relation of *low blood pressure* to surgical conditions, like the whole subject of hypotension, is still very obscure. Only in connection with shock has much scientific work been done upon it. When in an adult a low blood pressure exists (a systolic pressure under 100) the margin of safety possessed by the circulation is small

and a grave operation, unless extra precautions are taken, must end disastrously. I am sure a large number of this class of patients would not die if blood pressures were regularly taken. Under the head of low tension, we may consider shock, the salient feature of which is a great fall of blood pressure. Crile showed in 1903 (Blood Pressure in Surgery, Philadelphia, 1903) that this fall was due to exhaustion of the vasomotor center and not to any large extent to cardiac failure. It is of medical interest here to note that the work of the Leipsic school has shown that a similar pathogenesis underlies the circulatory failure in typhoid fever and other grave infectious diseases. In his more recent publications Crile (*Lancet*, 1913, II, p. 7) states that shock is accompanied by certain degenerative changes in the brain, the supposed result of so-called "noci impulses." The noci impulses are in a large measure preventable. They are for the most part psychic in nature, and while as a medical man it is not in my place to speak of the value of nerve blocking, I will say that from observation I am fully convinced of the inestimable benefits obtained by surrounding the patient before operation with an environment conducive to mental tranquility. I have seen a conscious patient brought into an etherizing room in which an assistant surgeon, with hands and gown covered with blood, was sewing up a gaping incision in the abdomen. The effect upon the patient can be imagined. Such things should not be.

I shall not enter here into a discussion of the relative merits of the theories advanced to explain surgical shock—those who are interested will find a lucid discussion of Henderson's acapnia theory and of Crile's views in the proceedings of the last (1913) International Medical Congress (*Lancet*, 1913, II).

Hemorrhage during operation, rough handling of the viscera, sudden changes of posture, prolonged operation and improper administration of the anesthetic, as every surgeon knows, make for fall in blood pressure, which will often pass unnoticed because the pressure is not taken. Ether itself, unless inordinate amounts are given, has a tendency to raise pressure (Guy, Goodall, and Reid, *Edinburgh Medical Journal*, August 1911) and would therefore be in all cases of hypotension the anesthetic of choice.

I have been much impressed with the recent suggestion of an English surgeon, who instead of waiting until the operation is nearly over before administering saline solution to combat a possible fall of pressure, starts the flow into the loose axillary folds with a Y-shaped tube at the beginning of the operation. He calls this the "axillary sup."

I have tried to point out as briefly as possible the bearing of blood pressure studies upon surgical operations and to show the factors of safety possessed by patients under varying conditions. If these factors of safety are not known, the surgeon may on the one hand undertake an operation from which he should keep aloof, and on the other hand, he may deprive a patient of the benefit of an operation which it might be safe to do.

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