upon. Unfortunately, it proved one of those cases in which the adhesions were very extensive, and the operation was long and tedious. Still it was satisfactorily accomplished; but she sank from a slight attack of peritonitis on the fourth day. This adverse condition of the pelvic contents could not be ascertained prior to the operation. It was not as if there were masses of inflammatory exudation which could be felt; nothing wrong but the dislocated ovary and retroflexed uterus could be made out, and only exploration of the pelvis at the operation could show how fixed in its faulty position the ovary was.

I must not, Mr. Chairman, enter more largely into the tempting subject of oöphorectomy. The object, indeed, of this unpretending paper will be fulfilled, if it elicit, as I doubt not it will, from gentlemen present, any suggestions as to the better management of cases of chronic ovaritis of either the first, the second, or the hopeless class.

THE TREATMENT OF INCREASED ARTERIAL TENSION.*

By SOLOMON CHARLES SMITH, M.D.,
Surgeon to the Halifax Infirmary.

FROM the earliest times physicians have watched the pulse, and have used it as a means of estimating the nature and progress of disease; the ancients, no doubt, merely from empirical reasons, but the moderns, not simply because experience has connected certain states of pulse with certain conditions of body, but because physiology having shown that the arteries form the main highway from the heart which propels, to the tissues which use the blood, we endeavour, by watching their condition and their varying relation to the blood stream, to gain some knowledge as to the state of affairs at each extremity of the circulation, to estimate by what force the heart is promoting the circuit of the blood at one end, and by what resistance the tissues are hindering it at the other. The pulse is the expression of a somewhat complex series of factors, the principal of which are heart force, peripheral resistance, arterial elasticity, and quantity of circulating fluid; and it is the varying relation between these different elements that produces the various forms of pulse.

The use of the sphygmograph has led to the identification of the "hard," "persistent," "incompressible," "wiry" pulse, and its description as that of increased arterial tension. This particular form of pulse is of great interest from its frequent association with serious diseases. It is so often found in relation with Bright's disease, gout, angina pectoris, hypertrophy of the heart, apoplexy, and various forms of paralysis, that it has come to be considered a symptom of ill omen; and thus, by a mental process, which does not always lead to safe conclusions, has come to be looked upon as a condition which it is desirable to remove; and as modern medicine provides means by which this can, to a certain extent, be done, it is a matter of the greatest interest to inquire in what cases increased arterial tension is an evil to be got rid of, and in what it may be considered a purely conservative effort which should be aided and encouraged. In all the operations of organic life we find such a constant harmonious relation between cause and effect, between force and work, that we cannot conceive of the existence of such an unbalanced, over effort at the heart end of the circulation as permanently to maintain an increased pressure within the arteries, and, in fact, whenever the pressure, under which the circulation is carried on, the so-called arterial tension, is raised, the cause is to be found at the other end of the stream, and arises from obstructed outflow through the arteries and capillaries. But while obstruction to the exit of blood from the arteries is an essential factor in the production of high tension, it is not in itself enough; it can, by preventing the emptying of the vessels, keep up the pressure within them throughout the diastolic portion of the heart cycle; but the tension is not raised unless the heart has power to push the blood more forcibly into these full arteries; and thus, nipping the stream between the peripheral resistance and its own propulsive force, raise the arterial tension and increase the pressure of the blood against the walls of the vessels.

A broad distinction has to be drawn between mere fulness and increased tension. Obstruction only produces fulness, hinders the normal outflow into the capillaries, and leads to a condition in which the balance between force and work must be re-adjusted either by a slowing of the blood-flow, or a quickening of the heart-force.

Adjustment may take place in either of these ways; sometimes with lowered circulation, and enfeebled tissue-life the patient leads a slow, lethargic, burdensome existence; sometimes the recuperative power, the formative energy of the system is such that the heart hypertrophies in response to the increased work thrown upon it, forces the blood more powerfully into the arteries, keeps them in a state of high tension, and by means of this extra pressure drives the nutrient fluid into the resistant tissues, and thus keeping up an almost normal interchange between cell and pabulum produces a condition of apparent health; the arteries may burst, or the heart may fail, but in the meantime the tension is kept up, and by means of that tension the tissues are fed. If, then, we can remove the blood impurities which produce the obstruction, we relieve the tension in the best possible way; but if this blood state be due to a cause which cannot be altered, such as imperfect elimination in consequence of organic kidney disease, or if there be obstruction in the vessels themselves in consequence of thickening or rigidity, we must at all hazards keep up such a blood-pressure as is necessary to overcome the resistance, keep up that arterial tension the maintenance of which is necessary for the maintenance of at any rate active life.

To prevent confusion we must here for a moment consider the physical signs of this condition: if the pulse be hard, prolonged, and not easily compressed; if at each beat it raise the fingers applied to it even when greater pressure is used than generally suffices to stop all pulsation; if the relation of the heart-sounds over the aortic valves be disturbed, the second becoming loud, and the first being almost abolished; if the heart's apex beat lower down and further out than it should do, and gives a diffused heaving impulse, we are justified in saying that the arterial tension is increased—that with some peripheral obstruction to the circulation there is hypertrophy of the heart, and that the arteries between the two are distended by a higher pressure than the normal. Now in these cases it is common to find a particular alteration in the form of the pulse trace, so common that this particular outline has been spoken of as the trace of high tension. The peculiarities of a high tension trace are that the tidal wave is well marked and high, often level with the percussion stroke; that the aortic notch is high up in the trace; and that the dicrotic wave is small, not rising much above the bottom of the aorta notch. Now, according to my view this form of pulse is merely an indication of obstruction to the outflow of blood from the arteries, but is no sure sign of increase of tension; and as a matter of fact it is often found in association with a pulse which can be stopped by even less than the average weight.

The sphygmograph shows fairly accurately the range of variation of blood-pressure during the different portions of the heart-beat, but it shows only the variation not the actual pressure. The tracing is a record of the manner and rate at which the tension is raised to the maximum by the cardiac systole and falls to the minimum at the end of the diastole, but it tells nothing as to whether this oscillation is at the top of a high pressure or a low one. We know, by the trace taken during an intermission, that even the base line represents a considerable tension, but what that tension is, the sphygmograph is unable to say.

It is no doubt a fact, that the so-called trace of high tension is generally found in connection with tense, hard arteries: but as we know that the existence of this arterial tension pre-supposes the presence of peripheral obstruction, the pulse curve found in association with it may as logically be taken to indicate the one condition as the other, and if in even one single case we find this form of sphygmogram produced by a soft and easily compressed pulse, we may be sure that, as it cannot then indicate tension, it probably, even when occurring with a hard pulse, shows the associated peripheral obstruction, rather than the increased arterial tension. I have taken some pains to measure carefully, in ounces, the pressure required to stop the pulse in a considerable number of cases, and have found (rather to my surprise at first) that there is no sort of relation between the weight so required in each case, and the nature of the sphygmographic curve.

As it was certain that the harder the pulse, *i.e.*, the greater the pressure within the artery, the greater would be the force required to stop the pulse by pressing on the artery outside, I naturally supposed that the greater the weight I found was required to stop the pulse, the nearer the trace would correspond to that associated with high tension; but nothing of the sort happened, and I have pretty well satisfied myself that the form of trace which has been so long accepted as indicative of high tension, *i.e.*, one with a large tidal wave, an ill-developed dicrotism, and an aortic notch situated high up near the summit of the curve, is really a sign only of peripheral resistance, and consequent slow emptying of arteries; and that the

*Read before the Leeds and West Riding Medico-Chirurgical Society.

most feasible way of estimating arterial tension is by observing the amount of pressure required to stop the arterial pulsation, which may be done either by an instrument contrived for the purpose, or by the application of two or three carefully educated fingers.

It is most desirable to be able to distinguish between these two conditions of retained fullness and increased tension, because, although they are so frequently associated clinically, the one process is deleterious, and the other in a way salutary; and whereas, in therapeutics we have constantly to aim at diminishing the peripheral resistance, and thus the retained fullness, we have, on the other hand, rather to encourage the propulsive power of the heart, by which the increased tension is produced, and it is only very occasionally that we have specially to treat the high blood pressure itself, and then rather to ward off accidents to the heart or the vessels, than to cure or palliate the disease itself.

As the peripheral resistance is, in the first instance, often the result of blood-impurity, and as that is the outcome of some deficient or abnormal performance of those functions by which nutriment is absorbed, heat and force are produced, and effete material is eliminated, it is obvious that the range of remedial measures to which one can have recourse, in the treatment of increased arterial tension, is exceedingly wide, and, in fact, embraces everything by which we can restore that equilibrium of physiological processes which we call health; thus exercise, fresh air, sunlight, substitution of intellectual play for mental work, worry, and care, a simple diet proportionate to the work done, baths and frictions to the skin, are all of service in their proper place; but of medicine, actual bottles of physic, those on which we have to place most reliance, are alternatives, liver stimulants, and saline and magnesian purgatives, medicines which alter or stimulate the functions of those large glands and mucous tracts whose abnormal action is often at the root of the evil. A mercurial followed by a saline is the time-honoured way of dealing with temporary attacks of blood impurity, and a very effectual method it is: a calomel pill followed by a black draught often producing as great a change in a man's pulse as it does improvement in his temper; but it is a medication which does not bear frequent repetition; and in its place, of late years, the use of saline mineral water has become very popular.

Now, there is no doubt that Hunyadi water, Friedrichshall, Pullna, and a host of other waters, are exceedingly useful, and, when properly administered, are capable of removing some of the commonest causes of obstructed circulation; but their use is so easy, and their effect is often so immediate, that people are apt to look upon them merely as a ready means of correcting the evil effects of their wrong doings; and thus, instead of carefully taking a course in such a manner as to restore health, many people habitually keep a bottle at hand, and take a few doses whenever, as the result of over-feeding, or over-worry, or deficient exercise, they begin to feel that they are not, as they say, quite up to the mark.

In this way, instead of aiming at a cure, they merely try to enable themselves to do again the very thing they ought not to have done at first. The evil of the great consumption of saline aperients is not that they themselves do so much harm, but that they enable people to persist in a mode of life which they would soon give up if the natural pain and penalties ensued after each indiscretion. It is like the mediæval sale of plenary indulgences, which led to endless wickedness, which would never have occurred if each sin had been followed by its own appropriate penance.

The proper and efficient use of saline aperients involves the application of a principle, for which the public cares little. The public wants immediate relief, the doctor wants to cure the patient. If what I have said about the relation between capillary obstruction and arterial tension be true, it is necessary not merely to purge the patient, but, while eliminating effete material on the one hand, to strengthen the heart and increase its propulsive power on the other. This is true, not only of the milder degrees of temporary obstruction, but especially of those more serious cases where, with permanent kidney-disease, and lessened power of elimination, with a general fibrosis of the vessels, and a condition of blood-impurities which we cannot hope entirely to remove, our only hopeful treatment lies in lowering the work of the body, and so lessening the amount of effete material to be removed, in stimulating to the utmost all the other excretory organs, and in so supporting the energy of the heart, that it may be able to overcome the obstruction, even although in so doing it may increase the arterial tension. In this way iron is of constant service, and digitalis is often of extreme value.

To some it has seemed illogical to give digitalis in chronic Bright's disease, a disease which is proverbially attended with hard tense arteries. It has seemed the reverse of common sense to urge the

heart to drive the blood with still greater force into vessels already overfull; but if we look upon the arterial tension as the measure of the success of the heart in its efforts to overcome a resistance which we cannot materially reduce; and if we recognise that the failure of the heart to maintain this effort would lead to the failure of the patient, we can see the way in which such drugs as iron and digitalis may be of service in maintaining the propulsive power of the heart at the one end of the arteries, even while we are endeavouring, by salines and elaterium, to lower the resistance at the other.

Although, however, we must generally look kindly upon raised arterial tension, there are two conditions to which it may give rise, two accidents we may call them, which make it necessary at all hazards to reduce the vascular pressure. Under the constant strain, the cerebral vessels may give way, producing apoplexy or paralysis, or the heart may become so overtaxed, that angina pectoris, or even sudden death, may take place, from its inability to cope with the high pressure in the aorta. Under each of these circumstances, we have rather to put on one side the future progress of the case, and, even at some sacrifice of the patient's reserve strength, to save him from immediate peril by lowering the arterial tension.

When apoplexy threatens, when, with a tense pulse and hypertrophied heart, there are attacks of loss of memory, giddiness, or unconsciousness, with numbness in the limbs, the best treatment, if there be time for it, is free purging with calomel and colocynth, followed by salines; but, in some cases, the danger is too imminent; one feels that every hour is of importance, and then bleeding is the great resource, either by leeches or by cupping, or by actual venesection. If the danger be real, the loss of half a pint of blood is nothing to the risk of apoplexy or hemiplegia. There may be a doubt as to the benefit of bleeding after a hæmorrhage has taken place, but there can hardly be a question as to its propriety if our diagnosis be correct, that a vessel is on the point of bursting, from the great blood-pressure within it.

The treatment of angina pectoris has to be carried out on rather different lines, although in it also it is urgently necessary to lower the vascular pressure.

It has been shown that in some, and probably in many cases, of angina, there is a condition of increased arterial tension, and that, when this is removed, the pain passes away; it is, however, tolerably certain that this raised vascular tension is not in these cases a persistent condition, but is one which comes on somewhat rapidly, and, if the patient lives through this, the attack gradually passes away, only to return again, when the same causes are repeated; hence, in the treatment of such an evanescent condition, a remedy is required which will act exceedingly quickly, and will not entail any permanent loss upon the patient, but will pass rapidly out of the system, leaving it again *in statu quo*. This we have in nitrite of amyl, and in a somewhat different degree in nitro-glycerine, the effect of both of which drugs is most striking, and has now been attested by a large number of observers.

But in my view of the case it is as great a mistake to sum up the whole treatment of angina in the administration of amyl, as it is to look upon it as wholly due to arteriole spasm. If one were able to watch and analyse the pathological processes involved in the production of disease, we should probably find that, in all cases of angina, there is primarily weakness of the muscle of the heart; and that in many there is also peripheral obstruction, due in some to present blood-impurity, and in others to a condition of vascular rigidity, due to a blood-state which may have long since passed away; but that the actual attacks are due to a sudden increase of the strain upon the already fully burdened heart, resulting either from some over-exertion, or from arteriole spasm; and that the comparative importance of these varied elements in the production of the totality called angina pectoris varies in every individual; the disease sometimes principally arising, as in gouty cases, from blood-impurity, at others chiefly from vascular rigidity, or it may be almost entirely from cardiac weakness; in some being brought on by a chill, or by indigestion, or by over-effort; in others being due to a simple spasm of the arterioles, a kind of epilepsy of the vessels. While, then, we are always right in giving vaso-dilators, and, by enlarging the area of the arterial system, lowering the tension in front of the heart, the treatment ought not to end there, but should include a careful effort to correct every error which is concerned, even remotely, in the production of the disease.

I do not, however, wish to appear to make light of amyl and nitro-glycerine; the benefit gained by their use is not limited merely to the advantages of escaping from the pain in a shorter time; it is a great thing even for the future, as regards the heart, to shorten the present attack. We have many of us, I have no doubt, seen cases of

dilatation of the heart which were going on very well, till some foolish effort, perhaps a run of not more than twenty yards, produced a strain of the cardiac muscle which has not been recovered from for weeks; even if the heart has ever reverted quite to its former state; if, then, angina is due to over-strain of the heart, may not its attacks also each produce a lasting mischief?

To sum up, then, I would say that the presence of increased arterial tension or blood-pressure involves the existence of obstruction at one end, and increased heart-force at the other; that it is important to distinguish between these two conditions; that the form of trace usually considered indicative of high tension really only shows obstruction, which, while necessarily occurring with it, may also occur by itself; that the measure of the tension is the pressure required to stop pulsation in the artery or the circulation in the limb; and that while we should always try to reduce abnormal obstruction, we should but seldom interfere with the tension as such, unless it threaten danger to the heart or vessels.

ON A CASE OF PSEUDO-HYPERTROPHIC PARALYSIS.

By JAMES ROSS, M.D., F.R.C.P.Lond.

Assistant-Physician to the Manchester Royal Infirmary.

My thanks are due to my friend, Dr. Brown of Burnley, for the notes of the following case of pseudo-hypertrophic paralysis.

W. T., aged 10, came under Dr. Brown's care in November 1879. The patient, during infancy, was, according to the statement of his parents, fat and plump, and did not suffer unduly from dentition, or from any of the usual infantile complaints. At twelve months of age he had an attack of inflammation of the lungs, from which he made a good recovery. He began to walk at sixteen months of age, but it was observed that his gait was awkward, and that he was more liable to fall than other children. At five years of age, the parents observed that the boy's arms were somewhat wasted, and, soon afterwards, the flabbiness of his thighs attracted attention; but the calves of his legs were supposed to be particularly well developed and strong. The awkwardness observed in the gait of the boy at an earlier period now became more marked, and the difficulty he experienced in getting up after a fall attracted special attention; but even at this time he could walk three miles into the country, and his condition had not yet caused serious uneasiness to his parents. At six years of age, however, the wasting of his arms and thighs, and the difficulty of walking, had become so apparent, that several medical men were consulted, and the general treatment recommended consisted of cold-water sponging with subsequent strong rubbing with a dry towel, cod-liver oil, and milk and lime-water. But this treatment did not appear to retard the progress of the disease; the wasting of the upper extremities, body and thighs, became more and more manifest, the prominence of the calves became more pronounced, and walking became progressively more difficult. The patient's father and mother were both healthy, and no special proximity to any nervous disorder could be discovered on either side. This boy was the third child of his parents. One brother died at fourteen months of age from inflammation of the lungs; another brother and three sisters are living, and all are strong and healthy. The father of the patient was a clerk in a manufactory; he was in comparatively easy circumstances, and the boy had been well-fed and clothed, and had never been exposed to cold or damp, or to any particular hardship. The patient was of moderate intellectual capacity; but, although he could read and write a little, his education was neglected for the last three years.

When first seen by Dr. Brown, the patient was an intelligent-looking boy, with cheerful expression of face and fair complexion. His face was round and plump, but there did not appear to be an unusual prominence of any of the facial or masticatory muscles. The muscles of the neck, the scapular muscles, and the serratus magnus on both sides were developed in proportion to the rest of the body, but the latissimus dorsi and the pectoral muscles, especially the sternal portions of the latter, were much wasted. The deltoids on both sides appeared prominent, probably less from an absolute increase in their size, than from the great wasting which all the muscles of the arms had undergone. The muscles of the forearms and hands were not specially affected. The erectores spinæ muscles were of fair volume, but the gluteal muscles were prominent, and felt doughy to touch. The thighs were comparatively slender, but the calves were prominent, and the muscles felt inelastic and indurated, and became specially dense and hard when contracted. Each arm measured $6\frac{1}{2}$ inches, the forearm 6 inches, thigh $10\frac{1}{2}$ inches, and the calf 10

inches. The feet were maintained in the position of talipes equinovarus; the toes were inverted and overextended with the metatarsophalangeal and flexed at the phalangeal articulations.

The patient was unable to rise from the ground without assistance. When unaided, he could only get on his hands and knees, and even when he could place both hands on a chair he could only raise his body into a semi-erect attitude, and so far as to enable him to plant one foot upon the ground. When assisted to the erect posture, he could stand and walk without extraneous support. On standing, the shoulders were thrown well back, so that a plumb-line let fall from the most prominent vertebrae cleared the sacrum; the abdomen was protuberant, and the vertebral column was arched, so that a deep concavity was presented by it in the lumbar and lower dorsal regions; his feet were kept widely apart, and the heels could not be brought to the ground so that the patient had to balance himself on his toes, which were well turned inwards. On walking, the body was alternately balanced on either leg, so that the gait was waddling. The patellar tendons were absent, but the cutaneous reflexes were normal. All the muscles reacted to the faradic current; there were no sensory disorders. The general health was good, and the other organs of the body did not present any feature worthy of being recorded.

In the autumn of 1880 I had an opportunity of seeing the patient along with Dr. Brown. He was sitting on a bench, his body being propped up between the wall and a table, on the latter of which he leaned heavily, supporting himself with his elbows. The vertebral column was now arched forwards, the convexity being directed backwards. He was quite unable to stand; and, on an attempt being made to place him in the erect posture, his legs doubled up under him in a perfectly helpless manner. When he was laid on his back on a sofa, with his legs extended, he was unable to raise either heel; but when placed on either side, he could abduct the uppermost thigh, and the gluteus medius could be felt to contract during this action by the hand placed above the trochanter.

The boy was subsequently admitted to the Manchester Royal Infirmary, under the care of Dr. Leech, and was kept for some time under observation, but during this period no symptom appeared requiring special description. During his residence at the Headle Convalescent Hospital, whither he was sent from the infirmary, both his father and mother died after a short illness, and the patient was subsequently transferred to the care of a sister, living at Burnley. The patient gradually became more and more helpless, but was able, almost to the last, to sit in a chair, his body being propped up between the back of the chair and a table. His face became plumper, the temporal and masticatory muscles being manifestly hypertrophied. On April 6th, 1882, he was seized with a severe attack of diarrhoea and vomiting, accompanied by great prostration, and he died from exhaustion early on the morning of April 9th.

Post mortem Examination.—The *post mortem* examination was conducted by Drs. Brown and Mackenzie, and myself, thirty-two hours after death. The body was placed with the face downwards soon after death, and *post mortem* lividity was well marked on the anterior surface of the body. *Post mortem* rigidity was well pronounced, and even the wasted muscles of the upper extremities presented some degree of rigidity. The most prominent part of the calves of the legs measured, each, $9\frac{1}{2}$ inches; the middle of the thighs, each, $10\frac{1}{2}$ inches; the middle of the upper arms, each, $5\frac{1}{2}$ inches, and the thickest part of the fore-arms, each, $5\frac{1}{2}$ inches. The subcutaneous fat was $\frac{1}{2}$ inch thick over the calves of the legs, and $\frac{3}{4}$ inch over the gluteal region, while there was very little subcutaneous fat in the lumbar and dorsal regions, but it was more abundant in the back of the neck. The gluteal muscles were of a pale yellow hue, with the slightest perceptible pink tinge. The conversion of these muscles into fat was so complete, that almost every appearance of muscular structure was lost. The gastrocnemii had more of the pink tinge than the gluteal muscles, and also presented more of the appearance of muscular structure. The erectores spinæ muscles were much wasted, and of a pale colour, but they were by no means so much changed in appearance from healthy muscles as either the gluteal muscles or the gastrocnemii. The scapular muscles were considerably altered, the supraspinati being nearly as much changed as the gluteal muscles. The muscles of the back of the neck were wasted, but presented almost the normal colour and texture of muscle. The latissimus dorsi muscles were thin and pale, and more like fibrous membranes than true muscles. The brain and spinal cord did not present any abnormal appearances to the naked eye. The spinal cord was placed in a 2 per cent