children over ten and approaching puberty the chances are as good as in the young adult.

One characteristic of the prognosis in young children is its uncertainty. Changes in condition come with greater rapidity than in adults. Even the most favorable cases may go wrong. On the other hand, occasionally a peritonitis which would surely be considered fatal in an older person in a child ends in a brilliant recovery. A child's strength and general resistance may be lower than an adult's, but the peritoneum seems capable of greater recuperative power. A child is seldom in such a desperate condition that a very brief incision for drainage is not justified. The prognosis may well be guarded in favorable cases, but even a widely diffused peritonitis is not always beyond all hope.

SUMMARY.

Acute appendicitis is rare in infancy but is more common in childhood than is generally supposed.

An early diagnosis is difficult and the first stages and lighter forms of the attack may be easily overlooked.

The prognosis of the disease is more rapid in children than in adults; the involvement of the peritoneum and the appearance of pus are early features; diffuse peritonitis is probably more frequent but there is still greater tendency to the formation of a localised abscess.

A child is never so young and seldom so sick as to contra-indicate surgical interference, but the extent of the operation must always be measured by the condition of each patient. Children stand short operations well but may be needlessly lost through prolonged and ill-advised efforts to do more than is absolutely essential.

The prognosis is more uncertain in children than in adults. Age is a very important factor. In children over ten years of age the prognosis is at least as good as in adults; in children under five years it is worse, and in infants the prognosis is exceedingly grave.

The writer is deeply indebted to Dr. Herbert L. Burrell for the privilege of reviewing these cases from his clinic in the Children's Hospital.

MECHANICAL TREATMENT OF DISEASES OF THE CIRCULATORY SYSTEM WITH SPECIAL CONSIDERATION OF ZANDER METHODS.

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THE treatment of internal diseases by physical exercises was much employed even in early times, but was reduced to a regular system only in the last century. The first to work out a complete system of massage and gymnastics was Ling, in Sweden. In the middle of the nineteenth century, Traube, in Germany, and Stokes, in England, recommended the treatment of diseases of the circulatory organs not only by rest and medicine, but also by exercises. When Zander constructed his apparatuses in Stockholm forty years ago, he

was not only thinking of the treatment of diseased muscles and joints, but from the first had in view also the influencing of internal diseases, especially those of the circulatory system.

Later, Oertel, in Munich, recommended systematic mountain-climbing for the training of the heart, and in a series of cases was able to show such brilliant results that at various resorts, like Meran, Gries and others, the attempt was made, by suitable provision of promenades, to generalize his procedure and place it under the necessary control. A frequently unskilled judgment of indications, associated with lack of sufficient oversight, has brought "Oertel's cure" much into disrepute.

About the same time the brothers Schott, at Mannheim, constructed a system of manual gymnastics in connection with carbonic acid baths. This really had at bottom the principle of resistance-gymnastics which Ling had already carried out in a most able manner.

All these systems do good under the presupposition of a suitable determination of indications and careful supervision. It is not my purpose here to speak in favor of one or another system. I should like, however, in this paper to describe briefly the mechanotherapy of diseases of the circulatory system with special consideration of Zander methods, because I find that such treatment is hardly ever applied to these diseases here.

Let me preface my remarks with a few well-known physiological observations, in order to show the way in which we seek to influence the disturbances of the circulatory system; for even though a series of important physiological phenomena and pathological modifications are not fully explained, yet the circulatory organs afford many definite points of attack.

It is the blood-pressure, and still more the velocity of the blood-current, that we wish to influence. The blood-pressure indicates the relation of cardiac power and blood-volume to the peripheral resistances. These are furnished by the diminution of the lumen of the arteries, the resistance at their points of division and the friction of the blood in the vessels. The wider the arteries, the less the resistance which the blood finds in them. In active organs the arteries are dilated, probably by reflex influence. Therefore if we convey motor stimuli to a greater number of muscle groups, we can, under certain circumstances, lower the blood-pressure. Yet in practice this sort of influence can hardly be controlled, since the regulation of the variations of blood-pressure, from the cardiac side as well as the peripheral, is extremely complex. Let it suffice to point out that an increase of blood-pressure is generally not intended in our work.

Fortunately, we can, to a considerable degree, influence, by mechanotherapeutic methods, the velocity of the blood-current, the diminution of which is an essential factor of all diseases of the circulatory system. The velocity of the blood-current stands in direct relation to the functional capacity of the heart and of the peripheral factors. So far as the latter are concerned, we see a quanti-

tatively and qualitatively very different effect during rest and exercise. The more the demands on the heart are increased by physical work, the more is fresh provision for support made peripherally by increase of the activity of the accessory forces, also operative during rest, and by use of other forces.

The first force which even in rest determines the current-velocity in the venous system is the force from behind. As in all parts of the vascular system, so also in the capillaries the elasticity of the vessels as well as of the surrounding tissue plays a large part in the current-velocity. Stasis in the venous system diminishes this elasticity by direct injury to the capillary walls and by accumulation of fluid. By this the blood-pressure is increased, or, what is the same thing, the *vis a tergo* diminished, and thereby, also, the velocity of the blood-stream.

The second factor always to be found acting is the aspiration of the blood by the negative pressure prevailing inside the thorax. To this is added further the suction of the heart itself during diastole. The longer the diastole, the greater will be the amount of blood aspirated.

For the standing or sitting body, the gravity of the blood flowing down from the head and neck plays an adjuvant part. In horizontal position this factor disappears, but in compensation the return flow of blood from the lower half of the body is facilitated.

The accumulation of carbon dioxide in the blood, increased during all active work, causes increased activity of the respiratory apparatus by stimulation of the center in the medulla oblongata. The inspirations become augmented and deepened, the amount of negative pressure rises, the aspiration of the blood ensues more vigorously. At the same time, however, is added the special influence of bodily movement and muscular activity.

The width of the main venous trunks in the extremities varies with various positions of the latter. For example, the abduction of the arm widens the brachial vein, the blood flows in more strongly and at subsequent adduction is driven out centripetally to a certain degree, since the valvular mechanism prescribes this direction.

A contracting muscle presses the blood out of the veins which traverse it and its immediate neighborhood in a centripetal direction. In subsequent relaxation the blood is again aspirated all the more strongly.

The activity of the smooth muscles of the intestine plays for the portal system a part not yet surely determined, but certainly important. I will speak of this point in another place.

I have gone somewhat closely into these physiological relations because they show us how to proceed if we wish to accomplish our task. I think I need not separately speak of the pathologic changes of the circulatory organs.

We cannot, as a rule, remove the causes of various diseases of the heart and circulatory system, but we can and must make the conditions for their functional capacity as favorable as

possible. To this end there stand at our disposal the two agents which F. A. Hoffmann, in his excellent textbook of general therapy, calls the fundamental factors for the treatment of diseases of most organs, — rest and exercise. Rest is bringing the body into a situation so that it uses the diseased organ as little as possible; exercise, on the contrary, is intended to fit the organ to perform its work permanently better than before. These definitions are essential, since both ideas have here, as we shall see, a somewhat different sense than in the speech of everyday life.

I will illustrate this by an example. When we confront the problem of treating a disturbance of cardiac compensation, we shall endeavor to lighten the work for the heart as much as possible by rest in bed, withdrawal of fluids ("Karrell cure" or "Oertel cure") and establishment of the best possible hygienic condition, factors which naturally fall under the category of rest. At the same time we give digitalis, which augments the pulse-volume of the heart and reduces the frequency of the beat. In a certain sense, therefore, we are already dealing here with a sort of exercise.

If the condition of the cardiac muscle has not been too severely damaged by the primary cause of disease, and such cases defy every kind of therapy, we must now attempt so to strengthen the heart that it may be in as high degree as possible equal to the ordinary demands of life. Mere supplying of work would not lead to the goal; rather we must so regulate the exercises that, on the one hand, as motor stimuli, they may increasingly produce work, and, on the other, by promoting the velocity of the blood-current, may lighten the work for the heart. This we seek to attain by stimulating to increased practical activity the above-mentioned peripheral factors which promote the blood-flow.

In now going into the particulars of the method, I will, in accordance with the plan of the work, devote the largest space to the Zander method and later consider how far, according to the condition of the case, the other methods of Schott, Oertel and so forth may be employed in appropriate manner. It would take me too far here to discuss in detail the Zander apparatus; I must be contented with giving the outlines.

Among the Zander apparatuses, 34 serve the active movements of the individual muscle-groups. They are so constructed that a weight movable on a lever exerts a resistance whose minimum in most of the apparatus represents almost a condition of equilibrium. For example, in the apparatus very important for our purpose, which abducts the arms in horizontal attitude, position No. 1 (of the weight) is such that a minimal exertion of strength suffices to carry out the movement as well as to restore the arms to the starting point. The action expended is thereby even less than the same movement demands without apparatus, since the body is relieved of the fairly considerable effort of holding the arms in a horizontal position. But this slight exertion of strength is constantly sufficient, by muscular contraction and relaxation, to stimulate the circu-

lation in the region concerned in the above explained sense. With higher position of the weight (we have 20 numbers at our disposal), the work for the muscle-groups to be influenced now increases in such a way that finally neighboring muscles must be brought into action. The demands on the antagonists are the greater the more slowly the return to the starting point is made. To that end, on the basis of careful mathematical computation, the weight of the lever is greatest in that position in which the contracting power of the muscle is greatest, which, for a normally movable knee-joint, for example, is the case at an angle of 120° .

We see, therefore, that these active apparatuses, or at least the greatest part of them, produce at the lowest position of the weight a sort of passive action, whereas, with higher position, they combine active and active-passive.

Certain passive motions are produced by mechanically-driven apparatuses. These are movements for the hands and feet, the pelvis, the trunk muscles and, above all, for the respiratory muscles. The so-called breathing chair is for our purpose the most important apparatus; we are accustomed to begin and end the series of exercises with it. This apparatus draws the shoulders and ribs in an exactly graduated scale in slow time, about twenty to the minute, upward and, by means of a cushion gently pressing into the back, somewhat backward, and so produces passively a degree of inspiratory action which otherwise could be attained only by co-operation of all the accessory muscles. Expiration ensues by the dropping of the thorax and shoulders from the force of gravity. We thus aim at a considerable rhythmic increase of the negative pressure inside the thorax without appreciable muscular exertion. Secondly is added further the rhythmic dilation and collapse of the axillary veins by a certain degree of abduction and subsequent adduction of the arms. Not infrequently one can see the influence of this apparatus in the diminution of the pulse-beats during and after the exercise.

While with this apparatus, then, we are dealing with passive respiratory gymnastics, most of the active apparatuses besides subserve active respiratory exercise in a very practical way. Zander has given for the several apparatuses precise respiratory prescriptions, which mostly depend upon the fact that motions of the extremities away from the body are associated with inspiration. The advantages of this respiratory gymnastic are obvious: in the first place the respiratory muscles are used at the same time with the muscle-groups to be exercised; secondly, respiration is rhythmically deepened; thirdly, the simultaneous breathing guarantees the proper performance of the exercise in slow time.

The action of the aforesaid apparatuses is further supplemented by the massage and vibratory machines. By some physicians massage has been recommended as an essential means for the treatment of circulatory diseases. I can concur with this only very conditionally. To be sure, by massage we can influence the tone of the

muscles, further the resorption and mechanical disposal of the products of stasis, as well as accelerate the circulation by emptying the veins; but the action of massage alone is always only very limited. From the foregoing it is clear that we should have to give up a series of important forces. On the other hand, massage gains in value if we combine it in suitable cases with medico-mechanical gymnastics. Up to a certain point we are assisted to this end by the mechanically driven massage apparatuses, which in and for themselves do not raise the claim to replace manual massage. We assign these apparatuses mostly so that, after one or two active ones, there follows a massage or passive apparatus whereby at the same time there is interpolated a certain pause for rest, which we ordinarily prolong by several minutes of complete quiet in the sitting posture.

The action of the vibratory apparatus is emphasized by all authors who possess a large experience in the Zander method. We customarily employ it by placing in the back, between the shoulder-blades, a cushion the size of the hand, and during or after its operation can often establish a decline in the pulse-rate. Precisely upon what this action rests is a still very hypothetical and much-debated point.

Of these numerous apparatuses we now put together 8, 10, 12 or more, and usually change the prescription after several days of exercise in order that all the muscle-groups may be employed in as short a time as possible. To go further into details does not lie in the plan of this paper, the less that the special prescriptions can be given only by the supervising physician. Likewise particulars of determining indications are not here to be considered. I think that in the discussion of the physiological questions it is plain that in general those cases are especially favorable for mechanical treatment in which the affection of the peripheral circulatory organs stands in the foreground. Nevertheless, many cases of valvular defects, diseases of the cardiac muscle, and others are also open to beneficial influence. The indication must always result from the consideration of the particular case, over which the physician in charge naturally has the best judgment.

The limits of the Zander method, in short, do not coincide with those of the mechanotherapy of circulatory diseases. If we disregard external agents, such as change of locality and so forth, yet there still remains a greater part of cases in which the general condition does not permit regular exercise in a Zander institute. Here there come to our aid the above-mentioned methods of Ling, Schott and others. Since in most cases it will hardly be possible for the physician himself to undertake these time-consuming exercises, he needs for this purpose a conscientious, well-trained staff. In hospitals attention can of course more readily be paid to this demand.

Only a few words more about the "Oertel cure." The field of indication is here the smaller

that in a high degree we rely on the intelligence and trustworthiness of the patient himself. In the special resorts, to be sure, we have at our disposal a certain number of provisions for control, but for how few of our patients can we procure the benefit of making use of such resorts? Even though the opportunity of exercising in the fresh air and under favorable climatic conditions gives the "Oertel cure" a considerable advantage, this is yet many times compensated by the fact that the Zander method, considered from its greater attainability, offers an important guarantee for proper and careful employment. But just as in determining indications, we ought never to fall into partialities, so in therapy, be it far from me to advocate one method when, according to the condition of the case, another commends itself more.

FINAL REPORT ON A CASE OF STOKES-ADAMS DISEASE.

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IN the BOSTON MEDICAL AND SURGICAL JOURNAL for Dec. 19, 1907, I reported a case of Stokes-Adams disease, with arteriosclerosis and a limited degree of hepatic cirrhosis. The patient died Dec. 15, 1907, and an autopsy was performed by Dr. Oscar Richardson. His report is below, preceded, however, by a very interesting description of the fundi oculi furnished by Dr. F. E. Cheney some days before the patient's death.

OPHTHALMOSCOPIC EXAMINATION.

There was no pulsation of the retinal artery, but the venous pulsation was much more marked than is seen under normal conditions. In the right eye there was almost a complete obliteration of the blood-stream at the point of exit of the central vein from the eye, following the pulsation, and this obliteration extended at times from the center (point of exit) to the edge of the disk. In the left eye the marked decrease in the size of the blood-stream was not noticed. This may have been due to a difference in the anatomical arrangement of the vein in relation to the physiological cup of the disk. Another condition of interest was noted, however, in the vein extending upward along the extreme edge of the cup border, and that was a slight venous contraction between the well-marked pulsations. This secondary contraction was not constant but seen at irregular intervals.

AUTOPSY BY DR. OSCAR RICHARDSON.

A man, sixty-eight years of age, 164 cm. long, well developed and poorly nourished.

Head. — On section the pia is slightly thickened and generally is infiltrated with a considerable amount of pale fluid. The vessels of Willis are not remarkable. The sinuses and middle ears are not remarkable. The brain weighs 1,295 gm. On section it presents no lesions.

Trunk. — The skin of the anterior abdominal wall in the region between the umbilicus and pubes shows several old scars, stated to be tap wounds.

On section, subcutaneous fat very small in amount, muscles thin and pale.

The peritoneal cavity contains a considerable amount of thin, pale, amber-colored fluid.

The appendix is not remarkable.

The anterior margin of the right lobe of the liver is four fingers' breadths above the costal border in the right mammillary line.

The pleural cavities contain a slight amount of pale fluid.

The bronchial lymphatic glands are slightly enlarged in instances, pigmented, and a few of them show small fibro-calcareous masses.

The right lung shows a few adhesions posteriorly and laterally. On section the tissue presents no areas of consolidation, is somewhat leathery and yields a considerable amount of yellowish red, frothy fluid.

The left lung is free. On section the tissue presents no areas of consolidation and is similar in character to that of the right lung.

Heart. — Weighs 390 gm. On section the myocardium generally is a little lax and rather pale.

The left ventricle wall measures 13 mm., the right, 2.5 mm.

The ventricular walls as a whole are rather thin and the columnæ carneæ flat. The auricular walls are slightly if at all thickened. The cavities of the left side are definitely enlarged, while those of the right side are but slightly enlarged. The auricular appendages are free. The mitral valve measures 9 cm. in circumference; the aortic, 7.5 cm.; the pulmonary, 7.5 cm. and the tricuspid, 12 cm. The pulmonary and tricuspid valves are not remarkable. The curtain of the mitral valve is smooth on its auricular and ventricular surfaces. The ventricular surface of the anterior cusp of the mitral valve shows a very few small, yellowish streaks and areas. These are situated near and just below the left posterior cusp of the aortic valve. In the region of the fibrous ring of the mitral valve, where the valve curtain is inserted, there is a slightly curving column of fibro-calcareous material, resting immediately beneath the insertion of the valve curtain of the posterior cusp and extending from there directly across and beneath the endocardium of the left ventricle wall and reaching finally to a point close to the base of the anterior cusp of the aortic valve and in the region of the bundle of His. This fibro-calcareous mass measures about 6.5 cm. in length, and where it rests in the fibrous ring of the mitral valve, in the region of the insertion of the curtain of the posterior cusp, it measures 7 mm. in width by 7 mm. in thickness. Beyond this it gradually tapers to its end in the region of the bundle of His. The fibro-calcareous mass rounds up under the endocardium and on section extends for a short distance into the myocardium all along its course. The chordæ tendineæ, where they are inserted into the papillary muscles, show a very slight amount of fibrous thickening, but otherwise than above mentioned the valve is not remarkable.

Aortic valve. — The cusps all show fibrous thickening and at their bases some fibro-calcareous change. Each cusp shows in the region of the orange body small, firmly adherent, grayish yellow, irregularly shaped, rather firm, slightly leathery, vegetationlike masses measuring about 1 cm. by 6 mm. by 4 mm. The endocardium below the cusps shows several small, yellowish, fibrous-like areas. The sinuses of Valsalva are enlarged and pouchlike and the intima of the aorta at the upper margins of the sinuses shows areas of fibro-calcareous change. The wall of the anterior sinus of Valsalva shows one or two small masses of fibro-calcareous material and about the orifice of the right coronary artery some fibro-calcareous plaques. The great sinus of the aorta is well marked but the intima of the aorta here is fairly smooth, showing only a few small