3. Almost complete disorganisation of the liver-cells. Yellowish brown masses, resembling the cells, could be seen here and there occupying the position of the cells; but, under the higher powers, were resolved into granular masses of *débris*.

4. The whole tissues of the organ were pervaded by small globules looking like oil, but many of them were found with higher powers to be leucine-globules.

5. The yellow colouring matter was seen to have crystallised in small rhomboidal masses, looking like minute crystals of hæmatoidine. Many of the leucine-globules obtained from the urine during life, and many of those found in sections of the liver, had lost their original yellow colour, but contained instead one or more minute crystals of hæmatoidine.

After hardening in chromic acid, these appearances were considerably modified.

1. The interlobular stroma resolved itself into a small-celled growth resembling adenoma, and the lobules were infiltrated with cells of a similar character.

2. The liver-cells were much more distinct than before, and now presented the aspect of a cohering mass of brown granules, preserving the shape of the original cells, excepting that they appeared to be smaller than the healthy liver-cell. No nucleus and no distinct oil-globules were visible.

3. The leucine-globules and the minute crystals of hæmatoidine were not present.

It will be observed that the effect of the chromic acid was to reduce the appearance to a condition resembling the early stage of *cirrhosis of the liver*; but the fact that the liver was reduced to one-half its normal size without becoming granular, and without giving rise to any indication of portal obstruction, clearly indicates that the condition was not one of simple cirrhosis. Then, again, the appearance of the hepatic cells, or rather their *débris*, when examined in fresh section not acted on by chromic acid, was characteristic of acute yellow atrophy. Indeed, such an amount of cell-disintegration does not always exist in typical cases of the disease. In one case, examined by M. Robin, quoted by Cornil and Ranvier, it was found that "les cellules, bien que granuleuses, infiltrées de pigment et en partie atrophiques, n'étaient pas détruites. On pouvait les voir en place dans toute l'étendue de l'foie". It is added that "le tissu conjonctif périlobulaire n'était ni épais ni enflammé".

The appearances of acute yellow atrophy are summed up by MM. Cornil and Ranvier as follows. "Telle est la série des lésions des cellules hépatiques, commençant par l'état trouble et l'infiltration biliaire et aboutissant à la fragmentation et en ramollissement destructifs de ces éléments. En même temps le tissu connectif périphérique aux flots et même celui qui accompagne les vaisseaux capillaires des flots, subissait, d'après la majorité des auteurs d'anatomie pathologique, une infiltration albumino-fibrineuse, et on y trouverait des cellules lymphatiques épanchées." The authors themselves have never seen such thickening or inflammation of the perilobular connective tissue; but M. Winiwarter reports a case, fatal in twenty-four hours, in which the condition was marked, and he considers that inflammation of the peripheral connective tissue of the lobule constitutes the initial lesion of the disease in question. The case reported tends to bear out M. Winiwarter's opinion, presuming that we had to deal with a simple disease; but it is quite open to us to consider whether the condition, acute atrophy, was not secondary to early cirrhosis. Pathologically, the interlobular condition was indistinguishable from that of cirrhosis; but, clinically, there had been no indication of any interlobular infiltration or of any interstitial cicatrization. The habits of the patient and his history were such that an early stage of cirrhosis would be not improbable; and the peculiarities of the case, which distinguish it from a typical one of acute atrophy of the liver, point to the same supposition. These peculiarities were:

1. The intensity of the jaundice, much more so than is usually observed in acute atrophy.

2. The fact that the hepatic dulness had diminished to one-half when the patient first came under observation, and that no further decrease occurred during the following three weeks.

3. The tardiness in the development of the special symptoms—delirium, vomiting, etc.

4. The duration of the disease. Death took place five weeks after the jaundice was first observed, and seven weeks from the commencement of illness. Frerichs states that, of twenty-eight cases, as many as thirteen died in the first week, and only four lived to the fourth week; but he also states that the stage of premonitory symptoms may be prolonged, that jaundice may supervene after several weeks, and even then may exist in the simple form for a period of eight to fourteen days.

5. The absence of petechiæ, and of the various hæmorrhages which are usually present in the later stages of acute atrophy.

6. The toughening of the liver which was found at the *post mortem* examination, and the consequent absence of flattening of the organ, which is usually so marked a feature of the acute atrophic liver.

On the other hand, the features in the case which decisively characterise the disease as acute atrophy were sufficiently prominent. They were:—1. The marked atrophy without contraction, and portal constriction or granulation; 2. The disintegration of the liver-cells; 3. The presence of leucine, detected in the urine during life, and abundant in the liver after death, and the coexistence with it of crystals of hæmatoidine; 4. The low temperature of the patient and the slowness of the pulse, together with the peculiar variations in the pulse during the last few days of life; 5. The more special symptoms of acute atrophy—vomiting, delirium, and coma—which first presented themselves five days before death.

The coexistence of cirrhosis with acute atrophy is a condition not usually recognised by authors. The case is an interesting one, whatever view we adopt concerning it; whether we consider that it establishes the above connection, or whether we regard the interlobular tissue as one of the features incidental to the changes of acute atrophy. If we adopt the latter hypothesis, the case strongly supports the opinion held by M. Winiwarter, that an inflammatory condition of the connective tissue around the lobules forms the initial lesion of the acute atrophic disease.

THE TREATMENT OF AORTIC ANEURISM.*

By HENRY SIMPSON, M.D. Lond.,

Physician to the Manchester Royal Infirmary, etc.

HAVING had, during the last two or three years, cases of aneurism almost constantly under my care, I venture to bring before the Section some of the thoughts suggested by clinical observation. Passing over the causation of the disease, and also all historical retrospect as regards treatment, on account of the brief period allotted to a paper, I will proceed at once to the special subject of my remarks.

The two objects aimed at by treatment are the solidification of the contents and the strengthening of the walls of the sac.

As regards the first, we may adopt measures for retarding the arterial flow by rest, position, diet, and medicines; or we may try to produce deposit of fibrin and coagulation by galvano-puncture, compression, etc. I purposely omit deligation and the various expedients of the surgeon in aneurism affecting the vessels of the limbs. As regards the second indication, there is some evidence that art is not wholly without power to modify the condition of the vessel-walls.

It seems to me that Mr. Tufnell has put before the profession abundant evidence of the influence of rest and the recumbent position in retarding the blood-current and so favouring the deposit of films or layers of fibrin on the wall of an aneurismal sac; and it is probable that position and rest, if carefully carried out, may, in a certain number of cases, be sufficient to bring about the cure of aneurism. I have, however, had no experience of this treatment alone, and it will rarely, if ever, happen that it cannot be aided by other measures.

To reap the full benefit of it, we have to do all we can to make the patient comfortable in body and content in mind during a period of three months, or in some cases even longer. Mr. Tufnell's directions as to the best mode of doing this are extremely judicious, and I would recommend everyone about to treat a case of aneurism to read them carefully. The patient's room should, of course, be "light, cheerful, and airy"; and Mr. Tufnell gives minute directions as to the preparation of the bed, the object being to secure a smooth even surface to lie on. It requires a good deal of self-control, and indeed courage, for a man who may feel perfectly well, with the exception possibly of some slight beating he does not quite like, voluntarily to lie down, knowing that he must not raise himself in bed for some months; but, with intelligent patients, who understand the gravity of their condition, little difficulty is usually found. There is, however, a considerable difference in the way in which patients bear the irksome monotony of enforced quiet, and this difference varies according to the temper and temperament of the individual. Your ingenuity may be well employed in devising means for diminishing the tedium of this period. Cheerful but not exciting books should be provided, which, if held by the patient, ought to be light. It is better, however, for friends to read aloud than for the patient himself to read. Cheerful but not exciting conversation

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is desirable. At the same time, all business anxieties or domestic trouble, and the insignificant but fretting worries which make up a good deal of the unpleasant friction of life, are to be avoided so far as it may be possible. A gentleman who was for some months under my care illustrated the importance of these matters very clearly. He is possessed of large landed property on a part of the coast where a scheme was brought forward to reclaim extensive sands, and I could almost always tell when he had had an interview with lawyers or other people on troublesome business. Emotional excitement will very soon tell on the impulse of an aneurism, and indicate the force of the blood-current distending its cavity.

The judicious use of anodynes will aid in lessening the bad effects of excitement, which, in these times of eager restlessness and arduous struggle, no doubt, plays a more important and more injurious part in illness than in the less ambitious days of our forefathers, when tasks were simpler and wants fewer. The bowels and bladder must be relieved, without raising the patient, by the use of the bed-pan and urinal. With some there is a little trouble as to the bowels, especially at first. The alteration of diet which usually accompanies this treatment, and the loss of exercise, sometimes produce constipation, which, if not speedily overcome, may give great trouble and discomfort. On the whole, I think it is better to give enemata than aperients; but your own judgment will tell you how to deal with any individual case. There is not usually much liability to bed-sores; but, if the skin over any of the bony prominences should threaten the least tenderness, it should be rubbed with brandy or whiskey.

Mr. Tufnell speaks with more confidence as to the effect of position in reducing the pulsation than I should do; for, though it is, I believe, the best means we have, it is one that I have found in some cases almost inoperative. One man, who was under my care for a long period, was so susceptible that I could seldom, if ever, get his pulse down even to the ordinary standard. In this way, the temper and disposition come to be of importance as affecting the circulation, and so influencing the success of treatment. In some cases, the pulse falls readily to 66 or 64, and these, of course, are in a condition much more favourable for the consolidation of the aneurism than where it remains, as in some of my cases, in spite of treatment, as high as or higher than 100.

Next, with regard to the diet; I have been accustomed to recommend a diet almost identical with that which Mr. Tufnell gives, the aim being to reduce the fluid to as small a quantity as the patient can comfortably do with, and so to diminish the quantity of the blood, but, at the same time, to maintain nutrition at a sufficiently high standard. Some patients are comfortable and free from thirst with the quantity of fluid recommended by Mr. Tufnell, *i.e.*, with eight ounces of fluid in the twenty-four hours: two ounces of milk or cocoa at breakfast, four of water or light claret at dinner, and two of milk or cocoa at tea or supper. I have not given the wine, but have often substituted milk for it; nor do I think that, theoretically, it ought to be given. If small quantities only be used, it will perhaps have no bad effect, but is useless, while larger quantities may be mischievous from its effect on the circulation.

With some patients, however, a good deal of discomfort, and even suffering, would have to be endured if this quantity were rigidly enforced; but it is desirable to exceed it as little as possible, and two or four ounces more will meet the requirements of most cases. In a gentleman who had at one time a good deal of sugar in his urine, thirst was a very troublesome symptom, and I was obliged to increase the drink for a time, as he was falling almost into a typhoid condition. Fortunately, the sugar decreased in quantity, and finally disappeared, and, so far as I know, has not returned, as I heard, about a week ago, that he remained in good health. This happy disappearance of so formidable a symptom took place while he was taking salicylic acid.

The amount of solid food can often be kept down to Mr. Tufnell's standard; namely, for breakfast two ounces of bread and butter; for dinner three ounces of cooked meat, with three of potatoes or bread; and for tea or supper two ounces of bread and butter again. If, however, the patient wish more solid food, I should give some more; but, as a rule, a small addition would suffice. It is of importance not to bring it down too low, as our object is by no means to impoverish the blood, but, on the other hand, to maintain it in a healthy condition. I have seen irritability of the heart and a quickened pulse brought on by cutting down the supplies too much, and the heart's action has been quieted by food. It is remarkable, however, that patients will sometimes get comparatively fat on what to many would seem a starvation diet. This was notably the case in a man named Evans, who was for a good while under my care in the Manchester Infirmary with abdominal aneurism, and who left greatly improved in health, and with his aneurism apparently consolidated.

As regards treatment by drugs: anodynes and opiates should be given, when necessary, to relieve pain, allay cough, and procure sleep, in such doses and at such periods as the individual case may require. Your own judgment will be a safer guide than any suggestions of mine; but it seems to me better to give them when needed, and then to omit them, than to let them be taken in a routine fashion, whether required or not. Digitalis is a medicine I have not used much, if at all, in the treatment of aneurism, because, although it might be convenient at times in reducing the frequency of the pulse, the increased force of the cardiac beat would, I think, more than nullify this advantage.

The drug that has attained the greatest popularity of late in this disease is doubtless the iodide of potassium. It seems now almost universally accepted as being beneficial, though as to this there may still be exceptions. One of those sceptical as to its virtues in aneurism was our ever to be lamented friend and associate the late Dr. Sibson. I had some correspondence with him as to a case in which I believe it was very useful, a few months before his death, and the adverse opinion he then gave was subsequently repeated in conversation. He seemed to think that, if it were ever of service, syphilis was concerned in the production of the disease. In the case referred to this could, I think, certainly be excluded; and I should by no means limit its employment to cases where we either know or suspect a syphilitic influence.

Two opinions have obtained with reference to its action: one that it helps to solidify the contents of the sac by increasing the coagulability of the blood, and the other that its influence is in some way exerted on the walls of the vessel. Its latest and warmest advocate, Dr. G. W. Balfour, has brought forward strong testimony as to its beneficial effects, and, from his large experience, any opinion he may have formed of its action is entitled to our greatest respect. He thinks that, in some way or other, its influence is exerted not on the blood, but on the vascular walls; "that relief is obtained by some peculiar action on the fibrous tissue, whereby the walls of the sac are thickened and contracted; while, if coagulation should take place within the sac, it plays but a very secondary and unimportant part, depending for its occurrence solely on the remora of the blood, and is in no respect due to the iodide of potassium". I entirely agree with this view of its action, and am not aware of the existence of any evidence showing that it does in any way cause coagulation of the blood in the aneurism, or directly bring about the deposition of fibrin on the walls of the sac. The only point that suggests itself to my mind is that, if it favour the induration of the sac-wall and the production of calcareous plates, a projecting fragment or roughened surface may lead, in some instances, to a minute deposition of fibrin which would serve as a nucleus for further accretion. My experience also leads me to endorse his statements as to the remarkable effect it so often has in relieving the pain accompanying aneurism. Sometimes it produces coryza, but certainly, I think, as seldom in large as in small doses, if not more seldom. How this is I do not pretend to say, nor do I attempt to explain its action in syphilis or rheumatism, though, in all these cases, we may believe that it is chiefly exerted on the fibrous tissue.

When first I began to use iodide of potassium in aneurism, I gave about five grains for a dose, and gradually increased it to twenty or thirty; but, for some time, I have at once put the patient on full doses, as saving time and more quickly producing saturation of the system. Tolerance of the drug is the rule; and, when exceptions occur, the dose may be diminished or its use given up for a day or two, or various combinations may be employed. I frequently give with it small doses of carbonate of ammonia and a vegetable bitter. By some, the administration of the iodide is dreaded from the fear of its depressing effect; but I cannot recall an instance where it has had to be omitted on this account, and have often remarked on the fact that it may be given for long periods, not only without injury, but apparently with benefit to the general health. The assimilation of food and the nutrition of the body go on unimpaired; and one patient, as I mentioned before, contrived to lay on flesh under the somewhat rigid diet recommended by Mr. Tufnell, while he was taking half a drachm of the iodide three times a day.

But, while it gives great and even wonderful relief to the patient, who, in consequence, is apt to think in a few days that he is almost well, and will be so very shortly, I am bound to say that, even with the important auxiliaries of perfect rest in the recumbent position and a carefully regulated diet, some of my cases have not improved as I could wish, and the aneurism has progressed. How far this could be prevented by increasing the dose of iodide I cannot say, and shall be glad to know the experience of the members present. I have seldom, if ever, pushed the dose beyond two scruples thrice a day. It is important, I think, to bear in mind the injurious effect of any im-

poverishment of the blood in keeping up an irritable condition of the heart, and to try to remedy this by giving some mild preparation of iron.

Sometimes I have found, when an aneurism has enlarged rather rapidly and begun to protrude externally, good effects from the application of ice, which has been soothing to the patient, and has apparently had a sedative influence on the vascular system. But, in several instances, more striking benefit has followed the employment of galvano-puncture. He was a bold man who first passed a needle into an aortic aneurism, and we who follow are sometimes apt to forget the sagacity and courage of our pioneers.

I have employed this method in five patients, and, in some of these, have repeated it several times. Two cases have been recently reported in the *BRITISH MEDICAL JOURNAL*: one patient, a man named Butler, is now in the Manchester Infirmary, and I have twice assisted my colleague Dr. Dreschfeld with one of his cases. It has also been used by Mr. Heath in a case of subclavian aneurism under the care of our President Dr. Wilkinson. I ought not to omit another case operated on several years ago by my colleague Dr. Browne, where it was very beneficial. The only instance where any ill-effects have followed was in Bowker's case reported in the *JOURNAL*.

The conclusions at which I have arrived so far, subject of course to correction or modification as experience increases, are briefly as follows. I do not look upon galvano-puncture as the treatment for aneurism generally; it can be used only when the tumour projects on the surface, or when we are sure that it is in contact with the parietes, no viscus intervening. The last condition is one which will very easily allow of its being used in abdominal aneurism.

In aneurisms of the thoracic aorta, it is more likely to be useful when they are sacculated than when fusiform. Sacculatation is an important element, as the contents of the sac, being out of the main channel, are comparatively quiet, like the gentle eddy close to the current of a rapid stream, yet are not altogether motionless, and so are in a favourable condition for the deposition of fibrin.

I may remark that the statistics collected by Dr. John Duncan show a better result in external aneurisms than in those of the aorta; but of its use in these cases I have no personal experience. My impression would be that they would be better suited for the ordinary surgical proceedings, such as deligation and the various modes of compression, which are inapplicable, of course, to the cases we have to consider. But, even in those most fit for galvano-puncture, I should abstain from its use until the other means mentioned had been carefully and thoroughly tried, except possibly where the patient could not or would not submit to prolonged rest, or where hæmorrhage seemed imminent. Two objects have been aimed at by this method: the coagulation of the whole contents of the sac, on the one hand, and, on the other, the production of a comparatively small but firm clot, which may serve as a nucleus for the further deposition of fibrin. When two needles connected with the poles of a galvanic battery are introduced into a solution of albumen, it is well known that a large loose clot containing much hydrogen gas in bubbles entangled with it is formed at the negative pole, while at the positive pole the clot is small, firm, and white, which fact lies at the foundation of the electrolytic treatment both of tumours and aneurism. Dr. Poore gives a good summary of the subject in his very useful book on *Electricity in Medicine*. The method I have employed in the treatment of aneurism is briefly as follows. Most frequently I have inserted one, two, or, in some cases, three needles into the aneurism, endeavouring to make sure as to the penetration of the sac, which is pretty clearly indicated by the oscillation of the needles, but not passing them more deeply than from one-fourth to one-half an inch. The object of this is to have the clot formed in contact with, and adherent to, the sac-wall, so that, on the withdrawal of the needle, it will not be floating loose in the cavity of the aneurism. These needles I have connected with the positive pole of Foveaux's battery, with few exceptions, while the negative pole has been applied to the walls of the chest by means of a large sponge moistened with salt and water, and moved about if the skin have become reddened. This proceeding was adopted, of course, from the wish to produce a small firm clot on which further deposit might take place. Twice or three times recently, I have introduced two needles and connected one with each pole of the battery, because we are thus most certain of producing electrolysis of the blood. The results, however, have not been so much more favourable or better marked than those following my first procedure, though no bad effects have followed, that, on the whole, I feel disposed to return to it.

The first method would produce a firm though comparatively small clot, highly favourable as a nucleus for further deposit. The second would produce a larger though looser clot, and, in some instances, coagulation of the whole contents of the sac might take place. But,

when a large coagulum has been rapidly formed, it has not always been stable, and pulsation has returned in the sac. This suggests the danger of embolism, though I am not aware of any record of its actual occurrence, unless we consider the peculiar and remarkable case mentioned by Dr. Clifford Allbutt as one of this nature.

It seems to me that the first method is safe, and, so far as my experience goes, it may be called satisfactory, and that there are fair grounds for the hope that it will be more so in the future, as our knowledge of its uses and limitations becomes more exact.

With regard to the second, though Dr. Duncan gives the weight of his great authority to the rapid coagulation of the whole contents of the sac, I should be disposed to use it as a sort of forlorn hope to avert death, if rupture or hæmorrhage were imminently threatened. Great pain has been said to attend galvano-puncture; but such has not been my experience, except on one occasion when Stöhrer's battery with large elements was used, and then only when ten or twelve pairs were in action. This freedom from pain was, no doubt, due in great part to the perfect insulation of the needles where they were in contact with the skin, and also to the employment of a battery consisting of small elements. In all the cases where the positive needle was passed into the aneurism, the point became blackened and sometimes much corroded; but increased firmness and consolidation of the tumour have certainly taken place when the amount of action on the needle has been small.

And this suggests the question whether, in some cases, part of the effect may not have been in some measure due to the needle merely acting as a foreign body. I may say that, in all my cases, the condition of the battery has been tested. The current has been passed through the tumour for a variable period, most frequently for about two hours; and, where pain is not produced, there seems no reason why this should not even be exceeded.

Dr. Duncan gives the dangers of galvano-puncture, as hæmorrhage and inflammation of the sac or its contents; for we may practically exclude embolism. The first is best avoided by using well insulated needles, which we may almost take for granted will be invariably employed. In Riley's case, recorded in the *JOURNAL* of July 14th, death took place from syncope, preceded by slight hæmorrhage; but, in his case, galvano-puncture was used almost as a forlorn hope. Should a similar case occur to me again, I should probably introduce two needles and connect one with each pole of the battery, in the hope of producing rapid coagulation of the whole contents of the sac.

In Bowker's case, recorded in the same *JOURNAL*, though no bad symptoms occurred for a fortnight after the operation, I am disposed to blame the battery—Stöhrer's, with large elements—rather than galvano-puncture itself for the abscess involving the sac and its contents, which led to his death from hæmorrhage. The best mode of avoiding this danger seems to be by using a battery of small elements.

I have had no experience of the ligature of a distal branch of the thoracic aorta as used by Mr. C. Heath, nor of compression of the abdominal aorta, as successfully adopted by Dr. Philipson, and therefore will not discuss them in this paper.

Such is a brief and fragmentary sketch of the principles and practice I have been led to adopt in the treatment of aneurism. They are very simple. Rest in the recumbent position, maintained for a long period and most carefully and thoroughly carried out. This is of importance if benefit be looked for. The avoidance as much as possible of all sources of excitement. The use of suitable anodynes to relieve pain, allay cough, and procure sleep. A careful but sufficiently nutritious diet, with as small a quantity of fluid as the patient can comfortably bear; the exhibition of iodide of potassium in full doses for a long period, and of iron if there be any anæmia. Where these means have been insufficient, I have used galvano-puncture with a sufficient amount of success to justify me in adopting it again in suitable cases.

In all my patients, life has been prolonged and much relief obtained. In four, what we may almost venture to call a cure has been effected, though I should always be cautious in speaking positively as to the cure of a disease where, when things look most promising, a thin film or a portion of clot hidden from view and inaccessible to observation may be all that separates life from death. Three deaths have occurred: two already recorded, and the third where the patient was removed from treatment by the occurrence of violent mania, though even here he only succumbed after many months of apparent health. Other cases are still under treatment with prospects more or less encouraging. I must not burden this paper with cases, but hope shortly to give a brief record of them.

In conclusion, I would venture to hope that my experience, though chequered, is not so dark as to discourage those who have to undertake the treatment of internal aneurism.