REMARKS

ON

THE ELECTRICAL TREATMENT OF DISEASES OF THE UTERUS.

Read before the Brighton and Sussex Medico-Chirurgical Society.

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I HAVE had, perhaps, a longer and more varied experience than most men in dealing with uterine diseases, especially those which are characterised by overgrowth. I have so constantly had to regret the inefficacy of medical treatment; and the results of surgical operations, though sometimes brilliant, have often come so short of my desires that I have for many years past fallen into a frame of mind readily disposed to listen to any suggestion of a mode of treatment which offered a reasonable chance of success, and avoided the risks and perils attending the bolder practice. So, when reports reached me from Paris of what Dr. Apostoli was teaching and doing, they came with a welcome ring.

Electro-therapeutics were no novelty to me. More than thirty years ago I had put galvanism to the test, and had gathered in various ways evidence of its potency both in destroying and repairing tissues. What I had learned of the treatment of ulcers by galvanism was published in 1849 by Golding-Bird, and may still be read in an appendix to his book; but his son and Mr. Nunn are the only surgeons, so far as I know, who have made much use of the practice.

Not long afterwards I tried the galvanic stem pessaries of Simpson in amenorrhœa, and have used them until now with occasional good result. I knew also what Radford had done with galvanism in the treatment of uterine hæmorrhage, and what Simpson had taught as to the influence of galvanism on uterine contraction in labour. I have repeatedly made use of the galvanic cautery in various ways, and have very often removed masses of epithelioma, or the cervix uteri itself, by a platinum wire heated by a battery and used as an *écraseur*, with very satisfactory results. Quite recently, with Dr. Goddard, of Highbury, I removed a cervix uteri without the loss of one drop of blood. My attention was later on attracted to the electrical work of the French and American surgeons in reference to fibroid tumours of the uterus. This was so little satisfactory that it dropped out of notice. Our English experiments were not more encouraging, and surgical enterprise seemed destined to throw into the shade all less dazzling endeavours.

In the meantime, taking up the idea of the wonderful influence of galvanism upon the nutrition of tissues, Apostoli was unobtrusively resolving the problem of its right application in the treatment of abnormal growths and exudations. His published observations were so interesting, and the reports of eye-witnesses were so confirmatory, that in the autumn of 1886 I determined to see and judge for myself. I went to Paris, and was received frankly and cordially. Dr. Apostoli explained to me his views, and demonstrated his mode of procedure. He threw open the records of his daily practice, and gave me the opportunity of verifying his diagnosis, and witnessing his treatment of the cases actually under his care. Besides this, he mustered for my inspection about sixty of the patients who had passed through his hands. I heard many of their histories in their own words, and could contrast for myself their actual condition of good health and activity with the symptoms reported in the early notes of their attendance, and the deformity represented in the plaster casts of their bodies, taken before the tumours had been influenced by the galvanic current. I spent many laborious hours in what I may say was a rigidly sceptical examination of the evidence before me, seeking for weak points in the system and the resolution of the theoretical objections.

The conviction was irresistible that, though the method might not have reached its point of perfection, the work, so far as it went, was good. If the women were not radically dispossessed of

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their tumours, they were symptomatically cured. Nothing but prejudice could have turned the back upon the facts; and it would have been unjust not to put the matter to further proof. This I have unhesitatingly done. If I have hitherto been silent, it was because I did not wish to prejudge the case. But I have not been inactive, for I wished that if the utility of the method could be made as manifest here as elsewhere, it should be advocated impartially, and presented to the profession upon reasonable grounds.

The uterine diseases which come under Dr. Apostoli's care range through all degrees of fibroid development. He has to deal, as we all do, with simple cases of sub-involution, general hypertrophy of the organ, with metritic deposits all round, polypoid excrescences in the cavity, thickening, more or less irregular, of the walls, and sub-peritoneal outgrowths expanding into abdominal tumours. Practically all these cases group themselves into two classes: first, those which give no trouble and may be left alone; and secondly, those which threaten health and life by loss of blood, or, by mechanically interfering with the organic functions, cause a multiform series of distressing symptoms.

In the treatment of these conditions, instead of scraping and cauterising the cavity with a curette, or caustics, or fire, Apostoli does the same thing with a pole of the galvanic battery. We give ergot, or mercury, or iodine, or bromine in the hope of altering the nutrition of the diseased mass; he sends a disintegrating current through it. We castrate to cut short a woman's sexual existence; he seeks to quiet down neurotic sensibility, and induce regularity of ovarian function. Where we proceed to a root and branch extermination, he proposes a denutritive paralysis of the uterine substance. Time will show whether, and how far, he surpasses us in his results.

But the novelty at present is not so much in the fact of electricity being used, as in the mode of using it. Others have tried the same means, but not in the same way; former methods were uncertain, dangerous, and insufficient. The point that Dr. Apostoli has arrived at is this: he has studied the effect that certain currents will produce, he measures the intensity of those currents, and he has found the means of safely directing them, of proper force, through the diseased tissues, to ensure the partial if not complete disorganisation of these tissues with the desired coincident relief of suffering, and often with restoration of general health.

It is the continuous galvanic current which is generally brought into action. For this purpose the operator must be provided with an apparatus which will guarantee him an unflinching current of at least 250 milliampères, or electro-therapeutic units. I may say, in passing, that it may probably be found convenient to speak of milliampères as "units" of current strength—10, 20, or 60 milliampères, for example—would be 10, 20, or 60 units. In practice at the hospital or the surgeon's residence a battery of Leclanché cells answers admirably. It is enduring and easily manageable. For work at the patient's home a portable battery of the bisulphate of mercury is convenient, but it requires great care and frequent renewal. An indispensable accessory is the galvanometer. With a fractional deviation it gives a measure of the intensity of the current passing. The graduation should rise to 250 units or milliampères, though this intensity is rarely wanted. Before every operation the perfect working order of battery, galvanometer, and conducting wires should be ascertained. As it is a characteristic point in the Apostoli practice that the galvanic current should be carried either into the cavity of the uterus or into the substance of the tumour, appropriate sounds and trocars are essential. To avoid loss of power by action on the metal, the sounds are made of platinum. For punctures with a negative current steel trocars are equally good, but when it is intended to transmit a positive current, a certain length of the sharp end of the trocar must be of gold. All that portion of the sounds and trocars passing through the vagina from the handle of the instrument to the mouth of the uterus or point of puncture must be insulated. Before every examination or operation the closest attention should be given to antiseptic precautions, both as regards the patient, the operator, and the instruments. During the whole course of the treatment vaginal irrigations, with sublimate or phenol, are never to be neglected.

The labours of Apostoli have expanded and given a definiteness to our knowledge of the special power of galvanic currents in the treatment of uterine diseases, and of the mode of applying the currents in a way which I may thus resume.

In the first place, we have learnt from him better to under-

stand the double action of the uninterrupted, continuous, galvanic current. The one action is purely local, and coincident with the flow; the tissues immediately in contact with the pole which delivers it are decomposed: the bases and acids of the substances and fluids acted upon are set free, and, according to their nature, produce cauterisation of the surrounding parts, independent of any thermic influence. This effect is local, immediate, and visible. The second action is due to the interpolary passage of the current. It is a trophic action influencing the nerves, vessels, and lymphatics, followed by molecular changes, so as to modify the nutrition of the tissues through which the current goes, and varying according to the pole employed. The effect of the direct and of the secondary counter-current is durable, and, whatever may be our interpretation of it, it is remedially of far more importance than the mere galvano-chemical cauterisation.

Secondly, though the coagulating power of the current passing from the positive pole was known from the writings of Ciniselli and A. Tripier, we have had disclosed much more since as to the distinctive character of the action of the currents from the two opposite poles. It was with the positive current that Apostoli began his attack upon uterine fibroids, because of the more striking nature of the hæmorrhagic symptoms, and it was the speedy relief of this grave trouble by the production of a hard, dry eschar, and resisting cicatrix, which encouraged him to persevere. The eschar resulting from the alkaline caustic action at the negative pole is just the contrary, softening and liquefying, and tending to promote discharge and hæmorrhage. Logically enough, its dissolvent powers were applied to the opposite class of cases, where there was no hæmorrhage, and the object was rather to reduce the bulk and solidity of compact masses of fibroid material. Experience has proved this to be as good in practice as in principle. The positive pole is therefore designated as "anti-hæmorrhagic" or "hæmostatic," while the words "hæmorrhagic" or "denutritive" are applied to the negative pole.

Thirdly, Apostoli has taught us a much more satisfactory way of utilising these currents in uterine diseases. His predecessors had used currents which were generally uncalculated and ineffective. They were often not strong enough to do much good, yet at other times sufficient to bring about mischievous results. They were brought into play in an ill-judged fashion, and, when used by means of puncture, the punctures were made through parts which ought to have been left untouched. Now the operation is performed under such control as to be a matter of measurable certainty. A strong and regular current is at command. By means of the galvanometer a knowledge of the exact intensity of the current employed is insured. The dosage can be regulated in proportion to the cauterising and trophic effects considered necessary. A current of high intensity can be made to traverse the tissues inoffensively, and brought out through the abdominal integuments in a dispersed fashion, without more than a temporary blush, and made to complete the circuit through the cutaneous electrode imbedded in wet clay. Than this clay nothing as yet has been found more effectual. Then, by insisting upon the intra-uterine introduction of the current by means of the uterine sound, or its direct interstitial application through the inattackable trocar, a certainty of action is obtained which was otherwise out of reach. The whole performance is thus strictly at the will and under the control of the operator, who, granted his mastery, wants no other guide either as to the dosage, direction, or duration of the current than the facial expression of the patient, or her declaration of tolerance.

Fourthly, other important points upon which we have clear and definite information are the modifications which this treatment requires according to the varying nature of the cases, and the successively changing circumstances of each case as the treatment is going on, and the wide range of uterine affections to which it is adaptable. Given a tumour and a current, there is no such thing as reciprocal automatic action. At every step of the process of cure, deliberation, judgment, and promptitude of resource are challenged. One day there is an unaccountable power of endurance, another an exaggerated sensibility, one day a perplexing structural resistance, another an easy flow of current, all which have to be taken cognisance of, and throw an ever-recurring strain upon the mindfulness of the surgeon, enough to baffle book-guided novices, and make inestimably valuable the more than five years' experience to which we can recur for counsel. A field, too, is opened up for exploration among the infinitely multi-form presentations of disease of the female generative organs, untraversable by the limited powers of any one man, but to

which Apostoli has pointed the way. This will be the work of the coming generation.

Lastly, there are several interesting questions upon which the work of Apostoli has thrown a new ray of light, such as the dangers and difficulties of the procedures; their being a cause, or the reverse, of subsequent sterility; the practicability of applying the treatment in cases where the uterus is impenetrable; the permanence of the benefits derived from the treatment in the mitigation of the symptoms and the reduction of the tumours; the relation of the menopause to the production or dispersion of fibroid enlargements. It would take up too much of your time if I were to consider these in detail, and it is needless, as Apostoli himself is here, on the invitation of your President, to give any required information.

But, admit that there may be danger in treating our patients by electricity. Is this a reason for rejecting it? What surgical operation is free from risk? Would common sense sanction our leaving disease alone till science has reached completion and skill infallibility? The danger lies not in the method but with the operator, and the moral is, that no man should undertake this work till he has qualified himself to do it well.

Then, as to the permanence of cure, where cure there has been, one can only say that though five years and a half is but a short term to form estimates upon, when we are assured that during that time the return of symptoms, or the necessity for further measures has been quite exceptional, it augurs well for the future, and the objection of the possibility of relapse becomes of little weight.

Again, when Apostoli tells us that some of his patients now under treatment are women in whom the tumour developed after the menopause, no trace of such a growth having previously existed, what are we to say to the principle of Hegar's operation? To say the least, it would limit castration in the treatment of uterine disease to the cases where loss of blood is the prominent symptom in younger women. I might go on much further, but I think I have said enough to show that whatever may be, or may not be, the merits of Apostoli's method, we have made since he began his work a distinct scientific advance. And coupling the specific information we have thus acquired with our previous diagnostic tact and pathological exactitude, it appears to me that we are in a better position, even supposing that circumstances hinder the personal practice of the method, not only to discuss the abstract principles upon which it is based, but as consultants to pronounce upon its respective applicability to the cases submitted for our opinion.

There are conditions of fibroid tumours in which it would seem to me almost idle to suggest electricity. A polypoid growth from the mucous surface of the uterus projecting into the cavity, or perhaps through the os, can be so easily and expeditiously taken away that I should not think of any slow or gradual process. Neither does it appear very probable that a subperitoneal outgrowth from the body or fundus of the uterus could be in any great degree affected by any current that could be made to reach it. Myomectomy would be the work of minutes, and the risk scarcely worth mentioning. Even large solid tumours, the removal of which means the removal of a great part of the uterus, have been successfully removed by me and by others, and success has increased with experience. But the risk must be always great, and there are tumours so large, or with such intimate connections, that no prudent surgeon would meddle with them. Here, surely, is the occasion for the electrician to show his power. His method is a new resource for a desperate condition, and should be welcomed as such. It has been successful in such cases, if not completely so yet to a degree which has rendered life enjoyable. No weak prejudice should stand in the way of recommending a trial under experienced guidance.

Where the object is mainly to suppress hæmorrhages, electrical treatment has decided advantages over other practices. Should the tumour be growing, but not advanced beyond the limits of reasonable surgical interference, balancing the comparative risk, I should be disposed to put the matter to the test; since in case of failure, the more hazardous operation of removal can still be done. In my opinion, with the option before her, it would be neither wise nor charitable to give a patient strong advice in favour of an immediate cutting operation.

Experience seems to show that there is a group of cases, numerous as they are troublesome, of chronic metritis with enlargement and surrounding deposits, which may be cited as pre-eminently eligible for electric treatment. They are, as regards

the patient, painful and exhausting. To the judicious surgeon they are exasperating by their rebelliousness, and in some rash hands they have opened the way to practice more lamentable than the disease. It will be one of the crowning merits of electro-therapeutics if proved to be equal to bring relief to these patients. Recent reports give good reason to hope that this end may be realised by a careful use of the positive galvanopuncture.

We have not, I am inclined to think, taken heed enough of the work of Tripiér and Apostoli in reference to various disordered states of the uterine appendages. The soothing effect of the vaginal or uterine bipolar application of the induced current in some distressing forms of ovarian neuralgia and vaginismus is said to be marvellous and enduring.

As a last word, I may say that we are face to face with an important revival; and though some American surgeons have gone before us in its acceptance, nowhere more than in our own country has there been shown an open-minded readiness to weigh fairly all the evidence which Dr. Apostoli has to set forth in support of his system.

In London we have heard, through the medical journals, of some failures, of one death, and of more than one accident, probably due to the inexperience of the practitioners. But we have far more encouraging reports from Edinburgh: and if some member of this Society who combines sufficient knowledge of electrical science with practical experience of the diagnosis of uterine diseases, and of the treatment by other methods, will carefully put to practical test the conclusions already arrived at by Dr. Apostoli, I am very hopeful that the result will not be disappointing.

THE ELECTROLYSIS OF FIBROIDS.

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WHAT takes place when an electric current is passed through a fibroid tumour? Does any change take place in the substance of the tumour or only at the points of application of the electrodes? An interesting paper on this subject was read by Dr. J. Inglis Parsons before the British Gynæcological Society on March 14th and 28th of this year. The human body contains about fifteen elements combined in different proportions to form the several tissues. These elements, arranged in an electro-chemical series, are as follows:

Electro-negative.	Electro-positive.
Oxygen	Hydrogen
Sulphur	Iron
Nitrogen	Manganese
Fluorine	Magnesium
Chlorine	Calcium
Phosphorus	Sodium
Carbon	Potassium
Silicon	

But each element in the series is electro-negative to the one which follows it, and electro-positive to the one which precedes it.

In the electrolysis of animal tissues the electro-negative elements are freed or appear at the positive electrode forming at once new chemical compounds, and the electro-positive elements are liberated or undergo similar recombinations at the negative electrode.

It would require a most accomplished analytical chemist to decide what actual changes take place at the relative poles, but what we know is that oxygen and chlorine are liberated at the positive pole and give an acid reaction; and that potash and soda are formed, and hydrogen liberated, at the negative pole. Some of the most likely bodies to be found in the substance composing a fibroid tumour are: Albumen, which contains C H N S O; mucin (C 52.2, H 7.0, N 12.6, O 28.2 per cent.); gelatine (C 50.4, H 6.8, N 18.3, S 4.0 24.5 per cent.); keratin (C 50.3-52.5, H 6.4-7.0, N 16.2-17.7, S 0.7-5.0, O 20.7-25.0 per cent.) (Hermann's *Physiology*), and the saline solutions of the body containing potassium and sodium phosphates. In these compounds "the molecules of the simpler bodies, as OH, CH₃, NH₂, C₆H₅, occur in the most varied and intricate combinations." "Of these complex substances"

which occur in the human body, "only a few can be obtained in a pure condition; the remainder cannot, either because they are too unstable, or because they are not crystallisable; with regard to the majority, we do not therefore know even their composition by weight, much less their constitution. The greater the number of atoms which combine to form a compound, the greater becomes the complexity of its composition, so that elementary analyses are insufficient clearly to indicate its formula. The formulae of the substances are for this reason unknown to us" (Hermann's *Physiology*).

All we can say with regard to the electrolysis of these bodies is that the oxygen and sulphur have a tendency to be liberated at the positive pole, and the hydrogen and potassium would traverse the space between the two electrodes, and appear upon the surface of the negative electrode.

The fact that elements are only liberated at the surface of the electrodes is explained by the theory of Grothüß, which is, that the molecules of any electrolyte, under the influence of an electric current, turn themselves so that their electro-negative constituent is directed towards the positive pole of the battery, and their electro-positive constituent towards the negative pole. The molecule nearest to the positive electrode yields up its electro-negative constituent, and it escapes free, but the electro-positive constituent acts upon the next molecule in the direct line between the two electrodes, attracting its electro-negative constituent, and again repelling the electro-positive atom or atoms. This action, continued in each contiguous molecule, forms a direct chain of decompositions and recombinations across the substance being electrolysed, until the negative pole or electrode is reached, and then the last molecule of the chain having yielded up its electro-negative constituent in the direction towards the positive pole, and there remaining no further molecules for the electro-positive element to split up, it is therefore discharged free at the negative pole. Such is the theory of Grothüß, propounded in 1805, and, as applied to water, it is explained by the accompanying diagram:

A is the positive electrode, and B the negative one. In the upper line the molecules are seen arranging themselves so that the electro-negative element, the oxygen, is turned towards the positive electrode (A). In the lower line the molecules are arranged in a chain across the liquid. The atom of oxygen nearest the positive electrode is then liberated as free gas, and the two atoms of hydrogen combine with the atom of oxygen directed to it in the next molecule, and form a new molecule. This action extends throughout the chain, and ultimately the two atoms of hydrogen of the last molecule, having no further molecules to split up, are liberated as free hydrogen gas at the negative pole (B). Therefore the volume of gas liberated at the negative pole is double that liberated at the positive pole. No appreciable action or change can be seen or detected at any point across the fluid; the gases are liberated only at the points of contact with the electrodes. A similar diagram would explain the electrolysis of hydrochloric acid; only for the oxygen (the electro-negative atom) would have to be substituted one atom of chlorine, and for the two atoms of hydrogen only one would be liberated by the decomposition of each molecule, because chlorine and hydrogen combine in equal volumes to form hydrochloric acid gas. This is the case with a simple compound composed of two elements, and constitutes primary electrolysis. When the compound is more complex, what is called secondary electrolysis takes place. This would be the case in a solution of sodium sulphate Na₂ SO₄. We should obtain at the anode, from the splitting up of the water, an equivalent of oxygen O, and also an equivalent of free sulphuric acid H₂ SO₄, while at the cathode we do not obtain sodium Na, but we have instead of it hydrogen H, and in the solution we have also caustic soda Na HO. This results also from the secondary splitting up of