LECTURES ON ELECTROLYSIS.

BY

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LECTURE II.

BLOOD-TUMOURS.—Besides aneurism, there are many other forms of blood-tumour to which electrolysis may be applied, and to which I desire to draw your attention. There are three kinds of altered development in the blood-vessels, which pathologically are related to each other, and which have also this in common, that they are amenable to treatment by galvanism—viz., cirroid aneurism, aneurism by anastomosis, and nævus.

Cirroid Aneurism.—If we define cirroid aneurism strictly as a dilated and tortuous condition of a particular artery and its branches, it may be regarded as a very rare disease. It is, moreover, one with which it is extremely dangerous to interfere by any of the more usual surgical procedures. The ligation of the main trunk leading to it is frequently unsuccessful, and always dangerous. Excision has often been attempted ; and, if it have sometimes cured the disease, it has often been found necessary to abandon the operation on account of hæmorrhage, and a fatal result is not uncommon. Electrolysis, on the other hand, is exceedingly safe and successful. There are four recorded cases in which it has been used, and in three the disease has been cured. The unsuccessful case is mentioned by Ciniselli, but details are not given. Of the others, one was operated upon by Nélaton, and the other two I have already published. I can show you one of these patients on whom, in 1866, I obliterated a cirroid aneurism of the scalp four inches long by three broad. It had previously been seen by Mr. Syme, who declined to operate. Six applications of the battery effected a cure.

The conditions in these cases are favourable for electrolysis. The needle, as it passes through the dilated blood-vessels, not only coagulates their fluid contents, but cauterises and destroys also their walls, and so renders the clot firmer, assures its retention in position, and guarantees the accumulation behind it of further coagulum. Moreover, it is not essential that every part of the growth be subjected to the action of the needles. In the case to which I have referred, the obliteration of the main affluents had a marked effect in producing collapse of the remainder ; and when the tumour ceased to pulsate, the carotid artery leading to it, which previously had been much enlarged, quickly resumed its normal calibre.

In these cases, a battery of considerable power, with somewhat large cells, should be used. It is an operation which gives pain, and it is generally necessary to anesthetise. In aneurism, when insulated needles are used, there is no pain ; the blood alone is acted on. In these cases, however, you desire a powerful action upon sensitive tissue, and the pain is therefore considerable.

Aneurism by Anastomosis is, I believe, less easily treated by electrolysis, although the known risks of other methods make it right to give it the preference. The tumour appears to consist in some cases of a cavernous structure into which arteries directly pour their blood, and from which veins convey it away ; in other cases, of a mass of enlarged arteries and veins which communicate directly with one another. In these conditions it becomes necessary, the affluents and effluents being numerous and not always distinguishable, to destroy gradually the whole mass by electrolysis. It is essential, moreover, to wait between the operations until the parts already killed are at least in part absorbed, and care must be exercised not to do too much at a time. Neglect of these precautions might lead to sloughing and suppuration—possibly to consequent hæmorrhage. It is plain that the cure must be slow in any circumstances, and it is possible that the disease may increase, or reproduce itself during the process of absorption. I have met with two examples ; in both, I have been to a certain extent baffled in my efforts at cure.

The first patient, after having suffered much at the hands of many surgeons, came under the care of my colleague Dr. Bell. The tumour occupied the left cheek and parotid region, pulsated strongly, and was covered with scars. By one or two electrolytic operations, Dr. Bell arrested the pulsation, and caused the growth greatly to diminish, when the man left the infirmary. More than a year afterwards he

returned, because of a recent extension of the swelling towards the temporal region. This portion fluctuated, but did not pulsate, and blood issued through a small cannula. With Mr. Spence's sanction, in whose ward he was, I introduced the needles several times. The diminution of the growth was at first very rapid, but afterwards became slow, and the patient left before it had entirely disappeared.

The other case, a patient of Dr. Balfour's, was one of great pathological interest. An immense pulsating mass reached from the right clavicle backwards, under and over the scapula to its inferior angle. A loud whirr could be heard all over, but was especially sonorous in the lower part of the posterior triangle of the neck, where lay an immense mass of dilated veins. These veins communicated by several orifices with great subjacent arteries, of which apparently the subclavian was one. By pressing upon these orifices simultaneously, you could arrest the blue-bottle *bruit* ; but it was only by strong pressure on the subclavian that the pulsation could be much diminished. I attacked the posterior portion of the tumour, and, although I succeeded in producing in it large masses of hardness, I did not succeed in greatly diminishing the size of the tumour or arresting pulsation. I confess to a certain timidity in interfering with the anterior portion of the growth on account of the free communication with the large veins so near the heart. It is undoubtedly in that part, however, that the operation must be performed if a cure is to be accomplished. The patient has now returned home pending further procedures to be determined by the progress of the case, and Dr. Balfour tells me that he has lately seen him in the country, and that he is now exactly as he was before the operations were performed.

Nævus.—The third group of cases which consist of dilatations of blood vessels is nævus. In the two groups which we have just considered, the danger from the disease itself is, I believe, not great ; and we are warranted in interfering only when the tumour is manifestly progressing, and even then we should adopt measures which, like electrolysis, involve little risk to life. These remarks apply with yet greater force to nævus. A large proportion of nævi disappear spontaneously ; a fatal issue is almost unknown. We are justified in interfering surgically only on account of deformity ; we are bound, therefore, to await the spontaneous cure in (children at least) so long as the disease is not progressive, and when we do operate, we ought to choose measures which do not seriously hazard the life of the patient.

Our remedies may be divided into two classes : 1. Those which necessarily leave a scar ; and 2. Those which do not implicate the skin. Electrolysis may be included in one or other of these classes according to the mode in which it is used. It is most commonly employed with the view of destroying the whole growth and causing it to slough off. This can readily be done. The negative pole destroys tissue with much greater rapidity than the positive, and it therefore ought to be mainly brought into action. But the positive pole should also be inserted, that by avoiding the resistance of the skin, the fullest effect of the battery may be obtained. A current of considerable strength should be used, and the positive needle having been inserted, a number of small points, such as Dr. Althaus has proposed, and calls his "serres-fines" (see Fig. 2), may be thrust through the growth with a view to its entire destruction ; or the negative needle may be placed at various points under the base of the tumour, so as to insure its separation by the production of a slough between it and the rest of the body.

Those methods, however, which, as this does, necessarily leave a scar, ought in my opinion to be reserved for parts of the body which are usually covered. Moreover, we have other operative procedures which, in these circumstances, are more rapid, precise, and certain. The old method by ligature is undoubtedly the best for nævi of moderate size, which implicate at once the skin and subcutaneous texture. Excision has preponderating advantages where the skin is not affected, and in very large nævi the subcutaneous ligature, which is best made with Dittel's elastic cord, is less severe than excision, avoids destruction of skin, and is more rapid than the electrolytic process. I do not, therefore, advocate this method. In the port-wine staining of the skin, to get rid of the cutaneous portion of a nævus, the "serres-fines" may be beneficial. If they be pushed under the skin and parallel to its surface at short intervals, sloughs and suppurating spaces are produced, which, as they leave portions of cutaneous texture undestroyed, induce an improvement in the colour without the unsightly aspect of a large scar. I think there is no other condition in which I should be inclined to use uninsulated needles.

But electrolysis may be employed so as to leave the skin perfectly unaffected by the employment of insulated needles (see Fig. 2). On exposed portions of the body some method which leaves no scar should always be employed. Of these, I believe, the best to be injection of perchloride of iron or of carbolic acid. This is rapid and effectual. It

labours, however, under two disadvantages; that it is difficult to apportion the strength of injection to the viability of the nævus; and that it is unsafe, unless the circulation be temporarily controlled. I recommend this form of electrolysis in all cases in which the circulation cannot be commanded; in others, it is equally certain with injection, but more slow.

Two or more needles are inserted according to the size of the tumour, and one is connected with the positive electrode. A battery of considerable strength is used, and the operation is continued until a large portion of the nævus feels hard. Too much should not be done at one sitting, lest slough and suppuration be produced, and, if the slightest lividity of the skin show itself, the action should at once be stopped, as the slough spreads a little even after the needles are withdrawn, and always leads to suppuration if allowed to extend. The insulated portion of the needle should be well buried in the tissue, as the caustic products of electrolysis tend to find their way backwards along it.

I could show you many examples of complete cure without the slightest scar by this process. In this patient, the nævus occupied the upper eyelid and extended into the orbit. The eye was entirely closed. There remains now only, as you see, a slight staining of the skin. That staining you sometimes cure by this process, as by any other which obliterates the subcutaneous growth, but in many cases it resists everything except destruction of the skin in which it lies; in time it commonly goes away spontaneously. I need only show you, besides, this cast of a hand from a patient of Mr. Spence's, concerning whom he asked my advice. It was perfectly cured. I believe nothing else could have been thus successful. (See Fig. 1.)

Fig. 1.—Nævus of Hand. It was perfectly cured by electrolysis.
Fig. 2.—Galvano-puncture Needles. *a*, Insulated by vulcanite; *b*, Uninsulated and multiple, a simple form. The positive needles should be made of gold or platinum; the negative of steel. The size, of course, varies with the case.

Varicose Veins.—Success in the diseases I have been describing, might lead one to attempt obliteration of varicose veins by electrolysis. Schuh of Vienna was, I believe, the first to try it; but, in one case, he met with a fatal result from inflammation. Independently of this danger, however, which with care should not be great, I do not think it is to be chosen as the best operation for these cases. If the coagulation of the blood is to be attempted, the injection of carbolic acid is preferable, because it does not require so long an application of the tourniquet, and is not more obvious to the usual risks. I should personally prefer to operate otherwise than by either of these modes.

BRONCHOCELE.—In this disease, treatment has not hitherto proved very successful. Internal remedies and external applications rarely cure; setons, caustics, and injections add an element of danger to a success not very much greater. In extreme forms of the disease, Dr. P. H. Watson has shown that excision can be performed, but it is plain that only necessity can warrant the operation. The simple character of the growth, and its composition, into which blood-vessels enter largely, would lead one to anticipate that electrolysis judiciously applied would probably be found useful. Experience shows that it is so, and that in safety it is greatly superior to any of the surgical methods to which I have referred. A considerable number of successful cases have been recorded without untoward result. As might have been anticipated, it may be laid down that it is better adapted to the vascular and cystic bronchocele than to the fibrous.

I do not wish to multiply cases, but I am anxious to mention one,

because it bears upon the proper manipulation of electrolysis in these and all other growths. The patient was a little girl, eleven years old, and came under my care while I was in charge of Mr. Spence's wards. She had a soft bronchocele of the whole thyroid gland, in which were two large cysts. These cysts had already been tapped, and the fluid was found to be of a dark red brown colour. I operated twice, producing considerable diminution in size, and Mr. Spence is now continuing the treatment with good effect. There was no constitutional disturbance or other unfavourable sequel of these operations, with one exception. In that instance the two needles connected with the negative pole were so displaced by a movement of the patient that the uninsulated parts of the needles touched the skin, and a small slough, of the size of a pea, formed at each before the displacement was observed. The consequences were inflammation, the formation of an abscess, and elevation of temperature to 103 deg. [This patient subsequently died of pleuropneumonia, septic as I believe, and due to the suppuration. The bronchocele was nearly cured.]

I think there can be no doubt that in all tumours the needles ought to be insulated (see Fig. 2). It makes the difference between a subcutaneous and an open wound. The negative needle should be relied on mainly, and multiplied if necessary, but the positive ought also to be inserted that we may get the maximum effect of the battery. Doubtless electrolysis is a tedious process in bronchocele, requiring many repetitions; but in this respect it is not worse than any other treatment which has been advocated, with the sole exception of excision.

SIMPLE TUMOURS.—In other tumours of a non-malignant character, this tediousness becomes important. Electrolysis is so prolonged a process, and at the same time so uncertain, when compared with excision in fatty, fibrous, or cystic growths, that I cannot recommend it merely because it may be to some slight extent safer. I think it possible that in hydatid tumours it may yet be proved a good means of cure. I have not as yet had an opportunity of trying it, but the experience of others shows that galvano-puncture with insulated needles is deserving of further experiment.

MALIGNANT TUMOURS.—There have been so many "cancer-cures" that no one will be astonished to learn that electrolysis is among the number, and that it is not more potent than other caustics. If a malignant tumour be removable, the knife is, in the great majority of cases, the instrument with which it should be removed. In certain examples, the galvanic cautery, and in a few, perhaps, powerful escharotics, may be preferred to it, but I do not know any circumstances in which I should be inclined to treat by electrolysis a malignant tumour otherwise removable. In the books of some specialists, you will find cases of epithelioma, scirrhus, and sarcoma recorded as cured; but on examining their records, it is impossible to avoid coming to the conclusion either that the diagnosis was faulty or that the treatment was erroneous. Nevertheless, under certain conditions, electrolysis may prove beneficial in cancer. As has been remarked by various observers, it possesses a wonderful power of relieving the pain which often attends this disease. There is nothing more capricious than the pain of malignant disease, nothing more inexplicable. In some cases extremely severe, in others it is entirely absent. I have, therefore, no theory to offer as to the mode in which electrolysis relieves it. I simply record the fact, because it consists with my own experience and the observations of others. Moreover, in using it for this purpose in hopeless cases, one may also have some expectation of retarding the disease—I can hardly say of curing it. My colleague Mr. Annandale has just made trial of it in an exceedingly vascular sarcoma of the thigh, in which amputation was the only possible resource. To this the patient refused to submit, and Mr. Annandale tells me that, after one application of the needles, not only has the pain been relieved, but the tumour has diminished in circumference by one inch.

In a patient, aged 65, sent to me by Dr. George Balfour, there were some points of interest which, I think, render it worthy of mention. The tumour of the root of the neck from which he suffered had existed for fourteen years, having grown rapidly only of late. Its adhesions and want of definition made it impossible to excise it. It pulsated strongly, and rendered his nights miserable from pain. On account of its long duration and vascular character, I approached its treatment by electrolysis with some hopefulness. The first operation decidedly diminished the size of the growth, and so completely freed him from pain that for a whole week he passed his nights in quiet sleep. Subsequent attempts, however, proved less successful. The ease they gave was of shorter duration, and ultimately the treatment was abandoned, because I came to the conclusion that the progress of the tumour was rather hastened by the irritation than retarded by partial obliterations.

From this and my experience of other cases, I am of opinion that

electrolysis should be tried in painful cancers; that it may sometimes retard or even diminish the growth; but that, with this latter object in view, the greatest care should be taken to avoid irritation, whether from too frequent, too severe, or too prolonged operations, or from the use of uninsulated needles.

Fig. 3.—First case of Aortic Aneurism treated by Electrolysis in this country. Case 1, Lecture I. After death.

Fig. 4.—Case 3, Lecture I. Aortic Aneurism before operation.

Fig. 5.—Case 3, Lecture I. The same two months after operation by Electrolysis.

LOUTH.—Dr. R. Domenichetti says that in Louth, of which the population is estimated at 24,308, and is chiefly agricultural, there were 713 births, and 382 deaths, representing 29.3 per 1,000 of population for the births, and 15.7 for the deaths. There were 26 deaths from zymotic diseases, of which 3 were from typhoid and 13 from diarrhoea. In two of the typhoid fever cases, pollution of the well-water was discovered; and, as there were not any other cases of typhoid in the neighbourhood, Dr. Domenichetti considers these cases as affording conclusive proof of the generation of typhoid *de novo*. One case of diarrhoea was choleraic, and was caused by impure well-water.

ABSTRACT OF A CLINICAL LECTURE

ON

A SEVERE CASE OF CHOREA, ATTENDED WITH DELUSIONS DURING CONVALESCENCE.

Delivered in Addenbrooke's Hospital, Cambridge.

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CASE.—Charles Crannell, aged 20, single, living at Wicken, was admitted into Griffith Ward, April 1st, 1876, suffering from severe chorea. Up to last Christmas, he had enjoyed perfect health. At the beginning of the year—viz., in January and February—whilst living near Nottingham, he had three attacks of ague. He had another attack about a month ago, which left him pale and thin. Six days ago, he began to feel nervous and restless, and unable to sit still even for a short time. There had been for the last three weeks a slight pain in the right knee, but no other evidence of rheumatism. From day to day he became more and more nervous, and his limbs more unsteady. Both hands seem to have been affected from the first. On the night of March 31st, he was startled in his sleep, and his limbs began from that moment to move about in the most violent manner, nearly throwing him off the bed. He had to get up and remain up all night. The following morning (day of admission), finding he was unable to sit in a cart, he walked a distance of five miles on his way to the hospital, feeling very exhausted at the end of his journey, and more convulsed than ever. There was no history of any neurotic tendency in his family.

On admission, there were violent and irregular movements of all his limbs. He was ordered thirty grains of chloral-hydrate immediately, and again at bed-time.

April 2nd. There was violent excitement, both mental and physical, after the chloral. There was intense heat of skin from friction, and he complained of great thirst. The movements were so violent that he was, on one occasion, jerked out of bed, and he had to be allowed to dress and walk about. About noon, ice was applied to the spine. In the course of the afternoon, he became rather quieter. In the evening, he had two or three short dozes, after which the excitement returned with all its intensity. Thirty grains of bromide of potassium failed to afford any relief.

April 3rd. At 12 at night, morphia injections (hypodermically) were resorted to, a solution containing one-fourth of a grain of the hydrochlorate being first used. At 12.30, one-sixth of a grain more was injected, and this took effect. He slept, with short intervals of violent excitement, from 1 A.M. till 7 A.M. Morning temperature, 99.4 deg. Fahr.; evening temperature, 100.1 deg. Fahr.; pulse 108. He was restless during the day, but had three or four hours' sleep.

April 4th. He was very restless during the night, only sleeping one hour and a half. The urine was lithatic; it contained no albumen. The bowels acted freely, after an aperient of calomel and jalap. The movements were still very active, but not so violent. He could talk very much better. He was ordered thirty grains of bromide of potassium and a drachm of tincture of hyoscyamus in an ounce of water thrice daily. Morning temperature, 99.4 deg. Fahr.; pulse 100; evening temperature, 100.1 deg. Fahr. The buttocks and elbows, and the nose, were chafed. The skin of the back was very red. There were black sordes about the lips. The tongue was moist. A fourth of a grain of hydrochlorate of morphia was injected at 9.30 P.M., and another quarter of a grain at 12 o'clock.

April 5th. He slept three hours and a half in the night. Morning temperature, 99.4 deg. Fahr.; pulse 84. He was restless the greater part of the day, but his speech was more distinct. The mouth was still parched and covered with sordes. The tongue was dry. He had taken nourishment well, one egg every two hours. In the evening, ten minutes after taking forty grains of chloral, he fell asleep for one hour and a half; after which he was violently excited for about twenty minutes, shouting loudly, and throwing himself about more recklessly than ever. He then had another sleep of about three-quarters of an hour duration, followed by ten minutes of wakefulness, during which he was also very excited.

April 6th. At 3 A.M., he took thirty grains more of chloral, after which he slept, with short intervals of waking. This morning, he felt