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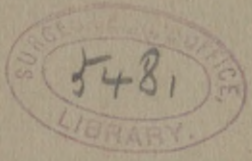

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ELECTROLYSIS BY A CURRENT CONTROLLER FOR THE REDUCTION OF SPURS OF THE NASAL SÆPTUM.*

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Customarily spurs or excrescences of the nasal sæptum are removed by surgical means by the knife, saw, and drill, and I wish to disclaim now, as I did in a recent preliminary report on the same subject, any idea of indorsing electrolysis as a universal substitute for the surgical method, for the latter, in skillful hands, is more rapid, more precise, and in the case of bony spurs certainly more effective than is electrolysis. Certain European operators have advocated the method by electrolysis; a few have praised it with perhaps a degree of extravagance, and yet it would seem that a modicum of actual fact must underlie so much enthusiasm.

My own experiments have been undertaken to determine the scope or, better stated, the exact limitations of

* Read before the American Laryngological Association at its seventeenth annual congress. For the discussion, see page 246.

this method—in what class of cases it is possible by means of it to avoid a more or less sanguinary operation, and to what extent one can utilize it to reduce spurs and thickened areas of minor degree, those which are scarcely deserving of surgical treatment with its possibilities of troublesome hæmorrhage, but which one would like to see resolved for the sake of the additional nasal space and better drainage which would thereby accrue to the patient.

A *résumé* of the previous literature of the application of electrolysis to the treatment of nasal spurs need be but brief. Miot,* of Paris, was the originator in 1888, and following him Garel,† of Lyons, reported his results in thirty cases; but my attention was first drawn to the method by Moure‡ at the Ninth International Medical Congress at Berlin in 1890, where he read an elaborate paper on the subject and described minutely the technique. Moure and Bergonie # have since embodied their studies in a monograph, published in Paris in 1892, and Moure‖ again in 1894, before the Eleventh International Medical Congress at Rome, discussed in a paper the Comparison between Electrolysis and other Methods of Treatment for the Destruction of Deviations and Spurs of the Nasal Sæptum. Moritz Schmidt, in his book (*Die Krankheiten der oberen Luftwege*), published in 1894, confirms the efficacy of the method as advanced by the French operators, a significant fact which tends to remove the sense of skepticism with which the subject was first viewed in America.

* *Revue mensuelle d'otologie et de laryngologie*, cited by Garel (*loc. cit.*).

† *Annales des maladies de l'oreille, du larynx*, etc., tome xv, 1889, pp. 638.

‡ *Verhandlung des X. internationalen medicinischen Congresses*, Band iv.

\# *Du traitement par électrolyse des déviations*, etc., Paris, 1892.

‖ *The Journal of Laryngology, Rhinology, and Otology*, May, 1894.

Among others may be mentioned Peyrissac, Meyer, and Heryng, all cited by Newcomb.

Only two papers by American authors have come under my observation; one by Newcomb,* of New York, with a report of two cases and an excellent review of the bibliography and technique, and the other by Ballenger,† of Chicago, with a report of three cases.

All of these operators have employed as the source of the electricity a primary galvanic battery of about thirty cells. The inconveniences of this apparatus, and especially its unreliability when called into use only at irregular and prolonged intervals, has deterred many from trying the electrolytic method. I have sought to avoid these annoyances by adapting the Edison electric-light circuit to the purpose by means of lamp resistance and the McIntosh current controller. The controller, together with a milliampèremeter, cords, and needles, is contained in a small drawer within easy reach as one sits in position for the treatment of patients, and is always ready for immediate use without waste or corrosion. It is as easily and readily applied as the galvano-cautery, except for the few minutes' additional time that its energy needs to accomplish the work. When used it is necessary only to pull out the drawer, adjust the milliampèremeter, and insert the needles.

The current strength necessary for electrolysis of nasal spurs is from fifteen to forty milliampères, measured with the resistance of the spur in the circuit, and, to supply this current, from fifteen to thirty cells of a galvanic battery would ordinarily be used with a corresponding electromotive force of from twelve to twenty volts or more. A current suitable for electrolysis should be characterized by

* *Medical Record*, August 5, 1893.

† The *Journal of the American Medical Association*, November 10, 1894.

moderately high tension or voltage and comparatively low current strength or ampèrage.

The Chicago Edison current has an electro-motive force of one hundred and ten volts, which must be reduced by the current controller. The ampèrage, of course, depends on the amount of resistance in the circuit, but it also can be correspondingly reduced by the resistance of lamps and the controller so that with the spur in the circuit it measures the requisite number of milliampères.

The McIntosh current controller was described at length in my preliminary report. It will suffice now to say that it is composed of a number of resistance coils of varying size, arranged in two rows, with sliding contacts to each, so that the patient may be placed in a shunt circuit to one or more coils. The coils on the left divide the electro-motive force into tenths, and its contacts I have named the decimal slide, while the coils on the right divide the electro-motive force into hundredths, named in consequence the centesimal slide. Thus, if placed in direct connection with the one-hundred-and-ten-volt Edison circuit, and the decimal slide be advanced to 1, enough coil resistance is removed to secure a current intensity of one tenth of a hundred and ten volts, equal to eleven volts. In like manner, if advanced to 2, two tenths of a hundred and ten volts is secured, equal to twenty-two volts. If now the centesimal slide be advanced to any given contact, say 4, there will be added four hundredths of a hundred and ten volts, or four volts, equal now to twenty-six volts.

But the decimal division of an initial one-hundred-and-ten-volt circuit is still too painful to the patient on advancing the contacts, so I have resorted to the expedient of placing a sixteen-candle-power lamp in the circuit (in series), the resistance of which reduces the original electro-motive force aside from the action of the controller to an

initial current of fifty-five volts. The result is, that on advancing the decimal slide of the controller to 1, enough coil resistance is removed to secure a current of one tenth of fifty-five volts, or, on advancing to 2, two tenths of fifty-five volts, equal to eleven volts; and on advancing the centesimal slide there will be added at each successive coil contact one one-hundredth, two one-hundredths, three one-hundredths, or four one-hundredths of the initial fifty-five volts, or, if stopping at 4, equal to two volts, which, added to the eleven volts of the decimal slide, makes in all thirteen volts. This is about the arrangement of the mechanism with which I have treated most of my cases. The controller has been constructed and has been thoroughly tested with a view to absolute safety, the details of which have previously been described.

I have used exclusively the bipolar method, as it is conceded by all to be equally if not more effective than the monopolar, and it is more convenient to the operator and less disagreeable to the patient. Not more than two needles, one representing the positive and the other the negative pole, should be employed, as there is no advantage in the use of multiple points, and it is thought to be more difficult to estimate the exact amount of destruction when more than two points have been inserted.

The parts of the needles intended for insertion into the spur should be from fifteen to twenty millimetres in length, about half a millimetre in thickness, and they should lie parallel and distant from each other about three millimetres.

The material which I have found best adapted to the purpose, all things considered, is irido-platinum, in which enough iridium is placed to make the composition very hard and stiff. A very sharp point can be given this sub-

stance, and its penetrating power is almost equal to steel. Not being oxidizable, irido-platinum needles can be used repeatedly, and hence can be permanently soldered to metallic conductors running through a light handle, which then constitutes the needle-holder. I have devised and had constructed by the McIntosh Company such an instrument, which meets all requirements, and it has the advantage of being always ready for immediate use, without loss of time in screwing and unscrewing steel or gold-plated needles into an adjustable needle-holder (Fig. 1). Moure and others recommend steel needles, especially such as are

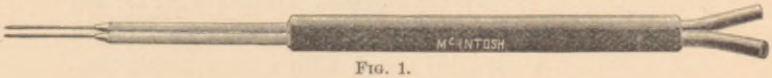

Fig. 1.

used by sailmakers. That connected with the positive pole will oxidize, which does not harm the patient, but necessitates replacing the needle by a new one at each treatment, and I have been unable to obtain a neat, light adjustable needle-holder which would firmly fix and carry two needles, and to use separate needle-holders is awkward. Even steel will not penetrate bone, and irido-platinum will easily penetrate cartilage.

I have treated by the electrolytic method ten cases, and for the sake of brevity, and to enable us the better to draw definite conclusions therefrom, these may be classed in three types according to the composition and location of the spur and the degree of success attained. Three of these cases have already been reported in detail, so that others will be selected for elaboration as representatives of the various types.

Type I. Strictly Cartilaginous Spurs.

Case I.—Mr. R., a medical student, has witnessed in my clinic at the Northwestern University Medical School opera-

tions for the removal of sæptal spurs by both the surgical and electrolytic methods, and he willingly submits his spur to treatment by the latter process. It happens to be of the strictly cartilaginous class, the sort of spur best adapted for reduction by electrolysis.

It is an ovoid excrescence, truncated or flat at the base, projecting from the right side of the sæptum, a distance at its point of greatest thickness of about five or six millimetres, sufficient to occlude almost entirely the right nostril. It is confined to the quadrangular cartilage and is implanted upon the convexity of a slight but, in itself, not material deviation of this part of the sæptum.

Electrolysis by means of the Edison current and McIntosh current controller, one sixteen-candle lamp in the circuit; bipolar method, with the author's needles of irido-platinum, which were inserted into the body of the spur well toward the bottom, the thickest part, one needle above the other and extending almost through the spur, a distance from the front to the back of about eighteen millimetres. A ten-per-cent. cocaine solution on cotton had previously been applied to both sides of the sæptum for fifteen minutes. The decimal slide of the current controller was pushed to 1; the needles then being inserted, the milliampèremeter registered twenty milliampères; the slide was then advanced to 2, which equals a current of eleven volts, the meter registering forty milliampères. On making contact 2, a slight shock was felt. No further increase was made in the current in this case, as forty milliampères is adequate. This was maintained for eight minutes, during the last five of which the patient complained of feeling faint, but it was not necessary to change position or suspend the treatment. The pain was slight, the patient not regarding it as of any moment. There was evolution of gas with crackling sounds, and at the end of eight minutes the larger part of the spur had assumed a mottled bluish and whitish aspect.

At the end of one week the slough had not yet separated, although some shrinkage in size was apparent. Annoyance occasioned by incrustation was at once relieved by the use of

an ointment of yellow oxide of mercury in vaseline, two grains to the ounce.

At the end of two weeks the slough had disappeared, leaving a granulating, grooved surface through the lower part of the spur. The loss of substance is pronounced; had it been more so, perforation must have resulted.

At the end of three weeks the treatment was repeated, but for a shorter period of five minutes, to the upper part of the spur, which is not so thick. This followed much the same course, and the result is satisfactory, abundance of space and a fairly even surface having been obtained.

The chief difficulty in the reduction of cartilaginous spurs is to determine exactly when sufficient destruction has been effected. One does not wish to produce a perforation, and a close watch should be maintained in the opposite nostril and the electrolytic action discontinued on the slightest mottling in hue or escape of gas from that side of the sæptum. But there is reason to think that too great destruction can be effected even short of the production of these danger signals, and other safeguards, such as not inserting the needles too deeply, nor permitting the treatment to endure too long, should be kept in mind. The duration necessary depends somewhat, of course, upon the current strength; but with the meter registering from fifteen to forty milliampères I have not found it necessary to exceed from six to eight minutes for the devitalization of cartilage. The continental authors cited mention fifteen to twenty-five minutes as the duration of their séances, which would seem unnecessarily long.

To Type I may be assigned four other cases of the entire number treated.

Case II of this type.—Mr. A. G. M. complained of inability to breathe through the right side; the cartilaginous sæptum was deflected to the right and, in addition, situated toward the base of the convexity was an excrescence which pro-

jected sufficiently forward to approach the partially collapsed ala and so close the nostril. Electrolysis was selected because of the nervous disposition of the patient, he having so little self-control that the surgical method might have involved unusual difficulties. The reduction of the excrescence was effected in three treatments at intervals of about three weeks, the process being unusually tedious for the size of the spur because only six-minute applications, with from ten to twenty-five milliampères, were employed, unusual care being necessary, on account of the adjoining deviation of the sæptum, not to produce a perforation. It has been wisely alleged as a disadvantage that perforation is especially liable to result from electrolysis; but this case satisfied me that it could be avoided by proper care in any case in which it would be avoidable by the surgical method.

The result was satisfactory; by the removal of the excrescence without interference with the deflection, enough space was gained for comfortable respiration.

Case III of Type I was quite an elderly gentleman, who was under treatment for nasal polypi. A cartilaginous excrescence, which prevented the ready transmission of light and the passage of instruments to the seat of polyp growth, was effectively reduced by electrolysis. His age and somewhat feeble condition led to the adoption of this substitute for the surgical method in his case. His was the only one of the ten cases in which there was any noticeable reaction after the treatment. His temperature rose slightly, he complained of heat, pain, and tenderness of the nose, and of a sense of malaise and headache for a day or so.

Case IV of Type I was a small cartilaginous excrescence with which I might not have deemed it necessary to interfere by the surgical method, yet the patient is much improved by its reduction. The only noteworthy feature is that the slough did not separate as a whole, but seemed to liquefy and be in part discharged and in part absorbed, without complete destruction of the mucous membrane, which has therefore been reproduced more perfectly than is usual after the cutting operation. This is an advantage, as the tendency to in-

crustation so frequently observed after the surgical method due to the poor quality of reproduced mucosa will be avoided. It is an advantage, however, which does not invariably follow electrolysis, since if the slough produced be large it will separate as a whole, with corresponding complete destruction of the surface mucosa.

Case V of Type I presented no features not already noted in connection with the others.

Type II. Mixed Cartilaginous and Bony Spurs.

Case VI.—Mr. M. J. H., aged twenty-five years, has lived in Colorado for two years on account of suspected incipient pulmonary tuberculosis, but has now resided in Chicago again for a year and a half. Maternal grandfather, mother, and sister died of tuberculosis. The physical signs and general condition indicate tuberculosis in a comparatively quiescent or arrested state. He now complains especially of nasal obstruction and consequent irritation of the throat, which is due to hypertrophic rhinitis aggravated by a sæptal spur. This excrescence is of the kind which commences anteriorly and runs upward and backward, following the sutural line of the vomer and cartilaginous plate of the sæptum, gathering volume and thickness and terminating opposite the middle turbinal, into which body its point presses, reaching at this plane quite across the nasal space.

March 1st.—The same needles as were used in Case I were inserted into the projecting point of this excrescence. They met bone and could not be inserted as deeply as desired. The controller was adjusted gradually as in Case I to a maximum electro-motive force of thirteen volts, at which time the current registered from twenty to thirty-five milliampères, the action being maintained for seven minutes. The patient is uncomplaining, and he regarded the pain as trivial. No hæmorrhage.

6th.—He suffered no discomfort after the treatment. The excrescence point is soft and smaller.

19th.—The spearlike point of the excrescence having been

destroyed, a second application was made in like manner to the part of the ridge next adjoining anteriorly.

April 30th.—The final result is fairly satisfactory, the spur being very much reduced in prominence, but not wholly removed. Both cartilage and bone entered into its composition, and the reduction in volume was probably commensurate with the proportion of cartilage contained in it.

Doubtless a flatter surface might have been made by the surgical method, but on account of the latent tuberculous state of this patient one would not have wished to risk either the shock or possible hæmorrhage of the surgical method.

Case VII.—Mr. H. had a spur similar in location and composition to the last described; only the anterior lower part of it, however, yielded to electrolysis. The larger part of it proved to be of bone, which was unaffected by the treatment. Slight improvement only.

In one other case of this type the treatment is not yet completed, but the indications point toward a partial reduction only.

Type III. Bony Spurs.

Case IX.—Mr. E. R., aged nineteen years, has been under treatment for hypertrophic rhinitis, adenoid vegetations, and hypertrophy of the tonsils, which are now remedied. He has also a sæptal spur of the kind which commences anteriorly and runs upward and backward, terminating opposite and projecting into the middle meatus of the right side.

March 20th.—Electrolysis applied to the spur—eleven volts, twenty milliampères, for four minutes—when the patient so nearly fainted that it was necessary to discontinue the treatment. The needles would not penetrate thoroughly into the spur, the bone seemingly being of ivorylike hardness.

April 27th.—The spur is practically unchanged, and electrolysis again attempted, the method with two lamps in the circuit for the more gradual application of the current being selected. This treatment was also a failure, for the needles

could not be made to penetrate adequately, and besides the patient nearly fainted after three minutes of a current of only eight volts and ten milliampères. A subsequent effort to insert steel needles into this spur resulted in failure.

Case X of Type III was a similar bony spur in which, failing to get a proper insertion of the needles, the process by electrolysis was abandoned and the surgical method substituted.

Conclusions.—1. As demonstrated by the cases reported under Type I, strictly cartilaginous spurs can be thoroughly removed by electrolysis—one, two, or at most three operative sittings being required. It is more tedious and less brilliant than the surgical method, but is not accompanied by any liability to immediate hæmorrhage and by only a remote possibility of secondary hæmorrhage. It is not to be indorsed as a universal substitute for the surgical method in even this limited class; but the number of individual cases, both in this type and in Type II, for which it is applicable is large, and with the efficiency, convenience, and compactness of the McIntosh current controller which adapts the Edison electric circuit to its use, together with properly constructed irido-platinum needles, I consider it a valuable addition to our resources.

2. As demonstrated by the cases reported under Type II, it will not thoroughly remove spurs which belong to that large class of mixed cartilaginous and bony substance; but it will reduce them in size, the amount of reduction being commensurate with the proportion of cartilage of which they are composed. The majority of such cases would therefore better be treated surgically, as being the more thorough method; but instances will arise in which the surgical method being declined or being for some reason inexpedient, benefit may accrue from the use of electrolysis.

3. As demonstrated by the cases reported under Type III, spurs composed wholly or largely of hard bone can not be successfully treated by electrolysis, for the reason that needles can not be caused to penetrate properly, and further, it is doubtful if the process is adequate, even if the needles should penetrate, to the resolution of hard and dense bone.

4. Spur or excrescence, and not deviation of the sæptum, is the subject of this paper. Electrolysis is powerless to correct deviated sæpta of any form.

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FRANK P. FOSTER, M.D.

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