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of the Author.

ELECTRICITY

AS A

RESTORATIVE AGENT

IN

NARCOSIS AND ASPHYXIA.

[*Reprint from VIRGINIA MEDICAL MONTHLY, November, 1874.*]

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AS A

Restorative Agent in Narcosis & Asphyxia.*

I propose in this paper to consider briefly the results of the electric current in the resuscitation of cases suffering from the poisonous effects of opium and other narcotics, as well as of suspended animation from drowning, &c.

I would call the attention of practitioners to the necessity of greater care and caution in the restoration of suspended vital functions. And, in this connection, I beg leave to refer to some of the wonderful results of the application of electricity (faradism) in the accomplishment of such restoration; to the theory of the application of the current in these cases; and to the necessity of proper batteries and instruments being placed in all life-saving stations, police headquarters, hospitals, and other institutions; while I shall also briefly refer to the kind of battery most to be recommended in such cases.

CASE I.—In the latter part of the summer of 1873, I was called, late in the night, to see a little child, Jennie C., suffering from a poisonous dose of laudanum. The messenger bore a note from her professional attendant, Professor Murray, of this city, stating that as he had exhausted all other means without benefit, he had concluded to try faradism, at the same time inviting me to join him with my battery. We found the patient to be deeply narcotized from an accidental dose of laudanum, taken some twelve hours previously.

The current was passed by placing the positive pole over the pneumogastric nerve at the angle of the sterno-cleido-mastoid muscle, whilst the negative pole was placed upon the epigastrium. A powerful primary current was applied and continued for more

*The Committee (Drs. Buikley, Edgar and Frothingham) to whom this paper was referred at the late session of the American Medical Association, just prior to the adjournment of the Section, for such action as they might deem proper, returned the paper to the author with permission to publish.

than three hours, with the happy result of complete restoration, encouraging and urging the respirations from eight or nine up to eighteen or twenty per minute, at which point the pupils became dilated, the pulse normal, and the sensorium capable of acknowledging the previous remedies. Hence vomiting and purging followed, and the patient's life saved thereby. Here we present a typical case of profound narcosis, as well as the antidote.

We were induced in this, as in many similar cases, to try the efficacy of the current from the interesting experiments made upon living rabbits, detailed by Dr. Wilson Phillip in his dissertations in the *Philosophical Transactions* at the London Academy of Science. In one instance, after incision in the neck, severing the pneumogastric, the parsley that had been eaten remained in the stomach undigested; and, after evincing much difficulty in breathing, the animal seemed to die of suffocation. In other rabbits, similarly treated, when the galvanic power was transmitted along the nerve, no difficulty of breathing occurred, though the voltaic action was kept up for twenty-six hours. The rabbits were then killed, and the parsley found in a perfectly digested state. Hence it appears that the galvanic energy is capable of supplying the nervous influence, so that, while under it, the stomach, otherwise inactive, digests food as usual.

The same experiment was tried upon dogs, with like results—the battery current, however, never being so strong as to occasion painful shocks.

Case II.—On May 11th, 1874, I was summoned to the "Maryland Inebriate Asylum" to attend the case of an attempted suicide in the person of one of the inmates, who had taken a poisonous dose of opium. The usual remedies having been ineffectually resorted to by the accomplished physician of the institution, Dr. Parrish, he requested my attendance, with a battery ready for use. We found the patient in an unconscious state. A faradic battery was applied about 3 A. M., and continued constantly in use until 7 A. M., during which time the respirations were increased from seven per minute to eighteen, with the same results as we had in the foregoing case.

Case III.—Mr. S., aged 50, suffering from *delirium tremens*,

with insomnia. Here, owing to complete alcoholism, every nerve centre of importance was terribly irritated, and, as a consequence, general agitation, with insomnia, prevailed.

Faradism was applied, as in the former cases, but with this difference, that the poles were simply reversed, with the view of obtaining the sedative instead of the tonic effect of the current. After a few hours' application I was enabled to subdue the irritation, so that this, with the use of large and frequent doses of digitalis, produced quietude, sleep, and healthier action of the emunctories.

CASE IV.—George, a colored boy, aged 30, was so frightened by his pursuers, that he threw himself off the dock into deep water. He was fished up after half an hour, apparently drowned, much to the alarm of the by-standers, who applied the usual means in such cases. A short time afterwards I was sent for, with the view of applying the current; but when I reached him, such was his condition that I had but slight hopes to encourage me, though, upon examination, I found some heat about the spinal cord and brain, and through these organs I applied a powerful secondary current for several hours. At length I discovered faint heart actions, with occasional sighs, which gradually augmented, until at last the organs resumed their functions, and the patient was restored.

I have no hesitancy in stating as my belief, that were these batteries generally recommended to be placed at life-saving stations, &c., many of the apparently drowned could be saved—even after all semblance of animation has ceased, or even as long as there remains one spark of vitality and heat in the great centres.

I would recommend the remarkably powerful battery now pretty generally used in the Navy, known as that of the Galvano-Faradic Manufacturing Company, Double-cell, Double-helix, Hard Rubber Battery. By it we can obtain the most gentle current, as well as one powerful enough to rend the muscles of an ox, possessing the widest range of application, and the most controllable current yet known in that division of electricity termed faradism.

CASE V.—The following is extracted from the *Virginia Medical Monthly*, May, 1874, entitled "Resuscitation after thirteen

and half minutes of apparent death:" "At a meeting of the College of Physicians and Surgeons, N. Y., March 11th, Dr. Lewis A. Sayre exhibited a string of beads, one of which had been taken from the trachea of a child seven years of age. *** She was relieved by tracheotomy. *** She coughed out the bead, gave one inspiration, and died. *** Alcohol was injected into the rectum, and the galvanic current passed through the phrenic nerve. *** She immediately rallied, and then had no further trouble."

CASE VI.—The following is a remarkable case of narcosis, which came under the charge of Ed. C. Harwood, M.D., of New York, and which I found in the *Medical and Surgical Reporter:* An infant, aged 19 days, was thoroughly narcotized by the careless administration of morphia by the nurse. A faradic battery was brought into requisition. One pole was applied over the phrenic nerve and the other over the sterno-cleido-mastoid muscle. The current was kept up for several hours, with good results.

CASE VII.—The following is from the Hospital Reports, Philadelphia, of a surgical *clinique* of Prof. W. H. Pancoast (*Med. and Surg. Reporter*, May 9th, 1874): The patient, a female, suffered so much, that on one occasion, about a month ago, while out on leave, she bought and used some morphine and chloral in a four ounce mixture, which, on investigation, was found to contain 120 grains of chloral and 8 grains of morphine. She fell into profound narcotism, from which she was aroused with the greatest difficulty. Dr. Miller was compelled to use the battery for fourteen hours, and saved her life.

These are only typical cases, and I think will indicate that, of the many thousands of accidents or suicidal attempts through the agencies dwelt upon, life, in the great majority of cases, might be saved by the timely and scientific application of the current.

This paper would be incomplete if I failed to refer to the electro-motor properties of the animal body, in order that we may have a clearer understanding of the changes produced by the action of the electric current on the various animal tissues.

E. Du Bois-Reymond "was the first to succeed in demonstrating the presence of specific muscle and nerve currents, by the

deflection of the magnetic needle;" and it was he, also, who ascertained that "if the nerve or muscle be excited by electric currents or by mechanical or chemical irritants, so that the first is rendered physiologically active, and the latter caused to contract, and then placed at two symmetrical points in connection with the galvano-multiplier, a less deflection of the needle is produced than when the nerve or muscle is in a quiescent state. This is called the negative variation of the current." The conclusion arrived at by Du Bois-Reymond was, that nerve and muscle contain innumerable positive and negative electric molecules, which move with great regularity throughout the tissue.

Then, perchance, the power of electricity, in these cases, may be to restore the suspended electrical forces of the body to a normal condition, and thus re-animate the failing vitality.

The toxic condition produced by chloroform may be remedied much in the same way; that is to say, by appealing to the vaso-motor centres through the pneumogastric axis.

For experiments illustrating the influence of *anæsthetics* on the vaso-motor centres, permit me to extract briefly from a late and able paper by Drs. Bowditch and Minot, read before the Boston Society of Medical Science, and reported in the *Boston Medical and Surgical Journal* of May, 1874:

"Anæsthetics in producing insensibility to pain accomplish such result by antagonizing the effects of irritation of sensitive nerves. One of the most constant physiological results of irritation of a sensitive nerve is a rise of arterial blood tension, due to a reflex stimulation through the vaso-motor centres of the muscular walls of the smaller arteries, especially those of the intestines. It is ascertained that in the majority of cases the rise of blood tension consequent upon the irritation of the *saphenous* nerve, is less marked when the animal is under the influence of ether than when the anæsthetic is not used."

The first object was to determine the effects of anæsthesia on this reflex rise of blood tension. This was accomplished in the following manner:

An animal, being placed on the operating table in the supine position, a solution of *curare* was injected into the jugular vein, when paralysis ensued. When the respiratory movements ceased, the trachea was connected by means of a glass canula inserted

into it with the apparatus for artificial respiration, which was so adjusted as to imitate, as closely as possible, the normal respiratory rhythm. A canula was then placed in the carotid artery and connected with a mercury manometer, carrying a pen, by means of which the blood tension was recorded on a long strip of paper, which was kept in uniform motion by clock work. The saphenous nerve was then placed upon electrodes.

The irritation of the nerve was produced by closing the currents, by means of a key provided with a pen; thus recording the blood tension, which could be seen at a glance. After the anæsthetic had been administered, the nerve was again irritated. Then the blood tension was notably decreased, and so continued to be as long as these experiments were tried.

But far more constant and obvious were the results obtained from chloroform. Here the irritation of the saphenous nerve caused a less marked rise in the blood—tension, and sometimes there was no rise whatever.

These facts present to my mind the clearest evidence in favor of the electrical remedy in cases of deep chloroform toxæmia, and the propriety of having accessibility to a faradic instrument, complete and ready for immediate use, in chloroform administrations. It is also more than probable that electricity would be serviceable in many cases of still-birth.

P. S.—Since the above was written, I have read the interesting report in *The Baltimorean*—an excellent weekly paper published in this city—taken from the Yonker's (N. Y.) *Gazette*, of a case of resuscitation from drowning by the galvanic battery, which occurred at Ocean Grove, Monmouth Co., N. J.:

A youth, aged 17 years, while bathing, suddenly disappeared, and was beyond the aid of spectators or other bathers. "After awhile the tide drifted him ashore far below the place he was last seen, and he was taken up for dead, and a barrel made ready for the old process of resuscitation." In a short time a female physician, Dr. Hastings, of Philadelphia, arrived with her battery and applied the electric poles "to his stomach and back, thus contracting the muscles of the stomach, causing the water to pour from his mouth; then inflated his lungs, and injected stimulants and medicine into his bowels. When she first examined the body, there was no heart-beat, no pulse, no circulation

whatever. In less than an hour, she had caused an artificial circulation through the heart, and he breathed, and shortly after that was screaming for help with the agony of a drowning man. *** After six days he has been restored to his right mind, and is now able to walk about the house; but his memory of the event is gone, as much so as if his life had been entirely cut off. It is probable that after awhile, as strength returns and old associations surround him, the memory of the fearful event will return."

Dr. Scheling reports in March No. *New York Medical Journal* that, after several hours' continued use of Dr. A. Murrey's double-celled electrical apparatus, he succeeded in saving the life of a patient who had taken *seven and a half* grains of morphine.