

Static electricity / by John H. Burch.

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Publication/Creation

[New York] : [publisher not identified], [1906]

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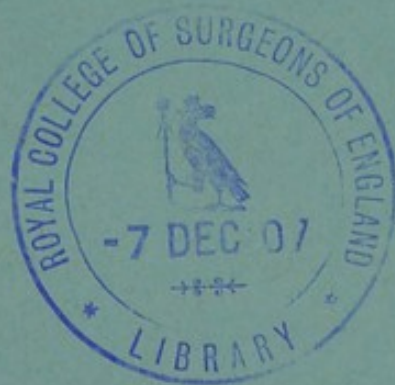
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STATIC ELECTRICITY.

BY JOHN H. BURCH, M. D., BALDWINVILLE, N. Y.



Reprinted from THE JOURNAL OF ADVANCED THERAPEUTICS,
March and April, 1906.





STATIC ELECTRICITY.

BY JOHN H. BURCH, M. D., BALDWINVILLE, N. Y.

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Although frictional electricity was the first form of electrical energy to be utilized in medicine, it was the last to receive its deserved recognition as a therapeutic agent. This would appear strange from the fact that the early workers in this field of research grasped with marvelous accuracy the efficacy of this agent. They also deduced with remarkable precision from clinical results the physiological effects of high-potential electrical currents. The classical observations of Manduyt, Cavallo, and Adams stand unique. In fact, the more modern methods of precision have added but little to the results achieved by these early workers. The lower voltage continuous current discovered by Galvani, and later the induced current of Faraday, displaced for a time the frictional machine, not so much from the greater efficiency of the former as from the fact of its being more portable, less expensive, and new. From this early period of popularity little seems to have been known of Franklinic electricity until Charcot revived its use at the Salpêtrière, from whence Dr. W. J. Morton became interested in its possibilities.

In the year 1881 Morton's first communication appeared in the Medical Record of April 2, 9, and 13. In this remarkable memoir the static-induced current was first described and the possibilities of oscillating currents of high potential and frequency were suggested as therapeutic agents. Dr. Morton's second communication appeared in the year 1899 describing the Morton wave-current. In 1897 Monnell published the first edition of "Static Electricity in X-Ray and Therapeutic Uses." This valuable work did much to stimulate an interest in the static machine as a therapeutic agent. The very valuable early communications of Dr. William Benham Snow; his first monogram, "Electro-Static Modes of Application, Therapeutics, Radiography, and Radiotherapy"; and his recent publication, "Currents of High Potential, of High and

Other Frequencies," have placed electro-static modalities upon a firm and scientific basis.

The physical properties of high-potential electrical currents have been accurately worked out. The therapeutic indications of electro-static modalities are fairly well established. The physiological effects, however, are presumed rather than proven from clinical results. So far as I can learn, the only accurate laboratory research work published in regard to the physiological effects of the various modalities derived from the static machine are the observations of Maître and Florence of Montpellier. Their work consisted of a series of accurate urinary examinations that demonstrated that these currents affect metabolism by increasing the amount of urea excreted.

Notwithstanding the fact that the therapeutic indications for the various Franklinic currents are apparently pretty thoroughly defined, it seemed feasible that still greater results might be achieved were the physiological effects of these various modalities better understood. In 1902, in connection with my student Mr. George Shaw, I began a series of experimental research work in regard to the comparative physiological effects of electrical currents of high potential and frequency. The result of these studies was presented at the St. Louis meeting of the American Electro-Therapeutic Association. This experimental work seemed to prove that while spark discharges from a coil or resonator actuated by this source of energy is less potent in its effects upon photographic plates and micro-organisms, it was found that upon living animals the effects of the electrical discharges from both the coil and static machine were identical in regard to time and appearance. It was also shown that the static machine possesses an advantage in regard to quiet discharges, from the fact that it is a continuous current generator having distinct polar effects, as was demonstrated by means of our experiments upon blood pressure.

It was also found that the effects of d'Arsonvalization, the direct application of the high-frequency current, and the Morton wave-current were identical in regard to their action upon metabolism, as was demonstrated by careful urinary examinations.

This series of experiments convinced me at the time that the physiological and therapeutic effects of these forms of elec-

trical energy are almost wholly the result of potential. The static machine was found to possess distinct polar effects that were apparently of considerable therapeutic value, from the fact that the clinician may utilize with accuracy a modality capable of combating specific morbid conditions, without resorting to the unsatisfactory methods of pure empiricism in each case presented. The clinical application of the deductions from our experimental work with quiet electrical discharges has convinced me that we may, in fact, prescribe with precision these modalities. I have therefore come to look upon the sphygmomanometer as essential to the physical therapist as is the fever thermometer to the general clinician.

In conducting the above referred to experiments fifteen healthy subjects were selected and divided into groups of five. A series of preliminary tests were instituted for the purpose of determining as near as possible the normal arterial tension. The Cook modification of the Revi Rochi sphygmomanometer was employed with, unfortunately, the two-inch armlet. For this reason the readings are higher than they would have been had a wider armlet been employed. By means of these preliminary tests the psychical influence of the procedure was eliminated to a great extent, and we were enabled to approximate the normal blood pressure of each subject.

Twenty experiments were made with the Morton wave-current. Of this number, ten applications were made by piling a bundle of journals upon a foot-plate that was connected with the positive side of the static machine, the negative side being grounded. The subject sat upon the insulated platform with his feet upon the journals. The spark-gap was from eight to ten inches. A Holtz machine was employed with ten revolving plates of thirty inches in diameter, run at a speed of 420 revolutions per minute. The duration of each séance was fifteen minutes. Of these ten applications there was in eight instances a rise of arterial tension averaging 10 mm. In the remaining two there was a slight fall of 2 mm. in one and 3 mm. in the other. The remaining ten applications were made by means of a long spinal electrode of malleable metal placed over the entire length of the spinal column and attached by a flexible rheophore to the positive side of the static machine, the negative side being grounded. The speed of the machine and the length of the spark-gap were the same as in the other

experiments. The duration of the séance was also fifteen minutes. Of these ten applications there was a rise of arterial tension in nine averaging 10 mm., while in the remaining one there was a fall of 1 mm.

I observed a very peculiar phenomenon in connection with this modality. In the treatment of a case of arterio-sclerosis with interstitial nephritis, the blood pressure registered at the beginning of the treatment 250 mm. After a séance by means of a metallic electrode, as above described, there was a fall of 15 mm. I later made a large number of tests among patients suffering from interstitial inflammation of the kidney with high arterial tension, and found in every instance a marked fall of the blood pressure. In the treatment of two cases of parenchymatous nephritis by means of this current I observed the same phenomenon, only in these cases there was not an abnormally high tension.

During the past year I have treated two cases of parenchymatous and one of interstitial nephritis. In each of these cases there was an unusually high arterial tension. In one of the parenchymatous cases the average was 240 mm. and the other 210 mm. There were also albumen, granular casts, cast-off epithelial and red blood cells. The case of interstitial nephritis presented an average blood pressure of 280 mm. There was well-marked arterial sclerosis and traces of albumen. These cases have been under observation for nearly a year and have received treatments at regular intervals by means of the Morton wave-current. I have made twenty-five blood pressure observations in each case, both before and after treatment. In one of the cases of parenchymatous nephritis there was an average fall of tension of 8 1-2 mm. after a séance of twenty minutes' duration by means of the Morton wave-current, the number of observations being twenty. The same number of observations also revealed an increase of the amount of urea excreted averaging .02 of 1 per cent. In the other case of parenchymatous nephritis the average fall of blood pressure was 7 1-4 mm. and the increase of urea .01 of 1 per cent. In the case of interstitial nephritis there were twenty-five observations made with the result that there was an average fall of arterial tension equal to 12 1-2 mm. after each treatment of twenty minutes' duration by means of the Morton wave-current. There was also an average increase of .05 of

1 per cent. in the output of urea excreted. These cases were treated by means of a long spinal electrode of malleable metal, placed over the entire length of the spinal column and attached to the positive side of the static machine, the negative side being grounded. In all of these cases the amount of albumen was decreased while the patients were under observation. In each case, however, both the blood pressure rose to its former height, the amount of urea decreased, and the albumen again appeared after discontinuing the treatments for a period of from two to three weeks. At the present time I can see no permanent improvement in any of these cases.

These observations would lead one to believe that little dependence is to be placed upon normal blood pressure findings as a clinical guide in the application of this modality. Yet a large number of tests in other conditions have led me to believe that, as a rule, a lowered blood pressure is an accurate indication for the employment of the Morton wave-current, the only exception that I have found being arterio-sclerosis with renal insufficiency, as is manifested by a decrease in the normal output of urea.

The following is a typical case, of several others, in which I have found the Morton wave-current of inestimable value.

H. Q., æt. thirty-one. Occupation, plumber. Family history, excellent. Has always enjoyed good health until two years ago he suffered from an attack of spinal neurasthenia, brought on by overwork. He rapidly recovered from this attack and remained in perfect health until July, 1905. He was then overcome by the excessive heat and was confined to his bed for several weeks with what was diagnosed as meningitis. His recovery from this attack was only partial. He suffered from a continual sensation of throbbing and fullness in the occipital region and undue excitement or overwork would cause him to suffer from most excruciating pain in the occipital and upper cervical regions. He at times would lose consciousness during these seizures. The duration of the attacks was from four to six hours. I first saw him October 2, 1905. A careful examination revealed normal reflexes and pupillary reaction. There was absence of Kernig's sign, there was no retraction of the head, nor could I find contraction of the cervical muscles or points of spinal tenderness. The thoracic and abdominal organs were normal, and an examination of the urine

revealed no abnormality. There was also a diminished arterial tension, it being only 120 mm. with a two-inch armlet. Notwithstanding the fact that there was neither contraction of the cervical muscles, points of spinal tenderness, or displaced atlas, I began the treatment of this case by means of mechanical vibration. The first treatment brought on an attack of pain that caused my patient to pass a most wretched night. He came back the next day exhausted from the effects of the treatment. His blood pressure at this time was only 110 mm. I asked him to sit upon the platform, a long spinal electrode was carefully adjusted over the entire length of the spinal column and was attached to the positive side of the static machine, the negative side being grounded. The spark-gap was gradually lengthened until he was able to bear without discomfort a gap of six inches. The duration of the séance was twenty minutes. As he stepped from the platform I again tested his blood pressure and found it to be 130 mm., a gain of 20 mm. He felt much better and continued to improve. He now works ten hours daily, with no return of his trouble. He received in all six treatments.

To demonstrate the difficulty of accurately selecting the proper modality for a given case, I will report the following clinical history, that is apparently in many respects similar to the case above reported.

Miss N. E., æ. thirty. Occupation, school teacher. Her mother has always been a neurasthenic, as well as her only sister. Her maternal grandfather died of paralysis at the age of sixty years. From childhood she has suffered from a severe pain in the upper dorsal region on the right side of the spinal column. There have never been points of spinal tenderness upon pressure, although deep pressure for a time relieves her pain. Shortly after puberty she suffered from severe vesical irritation that was accompanied by frequent desire to urinate, followed by very painful tenesmus. This was always aggravated by excitement and never troubled her at night. It became worse as she grew older until she became almost a wreck physically and was obliged to give up her work as teacher. She consulted several physicians, who advised the removal of the ovaries, hoping that by so doing she might find relief, as the condition was thought to be an ovarian reflex. One ovary was removed, together with the greater part of the

other, five years ago. This did for a time seem to relieve her. In a short time, however, the vesical irritation was substituted by the former pain in the back, that became almost unbearable. The pain at times was so intense that she became unconscious. She came to me in March, 1905. I found her extremely anemic and almost a physical wreck, although a careful examination failed to reveal any marked abnormality except a slight trace of indican in the urine as the result of constipation. A very careful examination of the spine failed to reveal any abnormality. There were neither tender points, muscular contraction, or bony deviations. Yet pressure on the right side opposite the 2d, 3d, and 4th dorsal vertebræ relieved her pain. I began treating her by means of vibration. Each treatment aggravated her condition and caused her to pass a restless night. I examined her arterial tension several times, and found it to average 170 mm. (narrow armlet). Notwithstanding this high blood pressure there was no evidence of arterio-sclerosis, as the output of urea was normal. After failing to relieve her by means of mechanical vibration, I resorted to the Morton wave-current. The long spinal electrode was employed attached to the positive side of the machine, the negative side being grounded. Each treatment aggravated her pain and after the third séance she was obliged to remain in bed for twenty-four hours. She was then treated by means of d'Arsonvalization. This modality relieved her at once, and she is at present gradually improving.

These two cases were similar in many respects, yet one presented a lowered arterial tension and was relieved by means of the Morton wave-current, while the other showed a persistent rise of blood pressure and was aggravated by this modality. Thus far I have never failed to relieve this class of cases, accompanied with a lowered arterial tension, by means of the Morton wave-current. It seems to recharge, as it were, the fagged and weary cells with increased activity. I have also treated many similar cases with normal arterial tension by means of this modality with success.

Referring again to our experimental work: "To the next group was given positive insulation. In fifteen of the twenty tests there was a rise of blood pressure averaging 5 mm. In four there was no appreciable change, and in the remaining one a slight fall of 3 mm."

From these findings this modality would seem to be indicated in conditions similar to those in which the wave-current is employed. This, in fact, has been my experience with this modality. I have of late had several patients whose conditions were apparently aggravated by the wave-current, that improved with marvelous rapidity when subjected to positive insulation. These cases were mostly neurasthenics who presented no localized manifestations, but who suffered from general malaise, nervous and physical exhaustion. In every instance there was a subnormal blood pressure, and usually cold hands and feet with mental apathy. In the cerebral type of this disease I have found the crown breeze a valuable adjuvant in connection with positive insulation. In most of these cases, however, a local condition will be found indicating the employment of the wave-current with a metallic electrode over the affected area. It is only in exceptional cases that I have found simple insulation to be of greater efficiency.

Negative insulation is also a modality worthy of consideration. If I may be again permitted I will quote our experimental results with this method. "The next group received daily séances by means of negative insulation of fifteen minutes' duration. In nineteen of the twenty tests there was a fall of arterial tension averaging 3 mm. I also made observations on several neurasthenic patients accompanied with vascular excitement and temporary exaggeration of blood pressure. In every instance there was a relaxation of the blood pressure following the application."

It has been my fortune since the above was written to have treated a very interesting case of neurasthenia by means of this modality.

Mrs. V. F., æt. forty-five. Came to me March 6, 1905. From what I was enabled to learn of her family history, her mother was an neurasthenic, as is also her sister. She is a neuropath always prone to worry over trifles and exaggerate slight abnormal sensations. She has never suffered from an acute disease, is the mother of four children, each birth having been normal. About a year ago she began to experience menstrual irregularity with its accompanying vasomotor disturbances, manifested by hot flashes, throbbing in the head, and various other abnormal sensations that were exaggerated to the extent that she thought herself to be suffering from a

serious organic disease. She became very despondent and could be made to think or talk of nothing except her manifold abnormal sensations. When I first saw her she seemed to be rapidly drifting into a state of acute melancholia. A very careful physical examination revealed nothing except an increased arterial tension that I felt sure was functional, as the heart and kidneys were normal. The average blood pressure after several tests was 190 mm. Other measures failing, I advised static electricity. I began with the Morton wave-current. The result was far from satisfactory. Every abnormal sensation that she had heretofore experienced was aroused to vie with one another for demoniacal supremacy. The arterial tension was increased 15 mm. at the termination of a séance of fifteen minutes' duration. She was unable to sleep for several nights, and it was with no little difficulty that I persuaded her to return for further treatment. At the next séance I resorted to negative insulation, basing my selection of this modality upon the increased arterial tension. The result was almost magical. When she stepped upon the platform she was a fit subject for a madhouse, when she left it after a treatment of twenty minutes' duration she was absolutely free from abnormal sensations. The blood pressure had fallen 27 mm. She slept that night, and has since continued to improve until at the present time she is apparently well.

This is but one of several observations of a like character. While the sphygmomanometer may not be a specific guide in the selection of electro-static modalities, I am convinced that the above referred to experiments with these quiet electrical discharges are of great value in the selection of the method to be employed in a given case. It at least aids us to base our selection of modalities upon a physiological foundation that may be demonstrated rather than presumed.

Our experimental work with the Morton wave-current with negative insulation has been very unsatisfactory. I have made a large number of observations with this modality with results most perplexing and contradictory. It will at one time cause a distinct rise of blood pressure and at another séance a distinct fall of the arterial tension. Clinically, I have also experienced the same contradictory results. It certainly is a distinct modality and differs in its physiological effects from the wave-current as ordinarily employed with positive insulation.

In the therapeutic application of this modality I know of no other guide than empiricism.

It was found that both the disruptive and convective static discharge produce a marked rise of the arterial tension, and, apparently, without regard to the polarity employed.

The spark and spray are the oldest and perhaps the best understood electro-static modalities. While we at present know but little of the exact physiological action of either, we have learned by the empirical use of the spark that it in some subtle manner profoundly affects nutrition and metabolism. While the Morton wave-current relieves stasis and imparts a normal vasomotor tone to the affected region over which it is applied, the action of the spark is still more profound in its effects upon nutrition and the metabolic changes of the tissues. It not only relieves stasis, but by its use exudates are absorbed and a renewed vasomotor tone is imparted to the affected structures. It increases cellular activity in dormant organs and awakens segmental spinal centers to send and receive with increased alertness their manifold stimuli. My own experience with this modality has led me to believe that the only polar difference there is in the spark is intensity. The indirect positive spark with negative insulation is certainly by far less painful than the indirect negative with positive insulation, although the latter may, perhaps, be more penetrating in its effects.

With the spray, however, there certainly is a decided difference in the therapeutic effects of the indirect negative and positive discharge. While both cause a rise of blood pressure, I have many times observed that the indirect positive spray with negative insulation is by far more soothing, producing a sedative effect, while the indirect negative is more irritating and efficient where a distinct counter-irritant is desired.

In a communication presented before the Syracuse Academy of Medicine, May 5, 1903, I described a method of employing the static spray direct from the machine without the use of the platform. The method consists in attaching one end of a flexible rheophore to a metallic ring that may be readily slipped over one of the discharging rods, while the other end is connected with the spray electrode. In using this modality the plates are caused to revolve at the speed desired, the metallic ring is attached to the discharging rod of one side of

the machine, while the opposite side is grounded. The patient sits upon an ordinary stool or chair placed upon the floor and receives the effleuve direct from the machine without the platform. I have used this modality very often during the past three years and have come to look upon it as a very valuable method where the employment of the spray is demanded. By its use a hot and powerful effleuve may be applied directly from the side of the machine desired. There is less danger of sparks and it may be directed with greater facility to the affected area. The polar effects of this modality are distinct and clearly defined. From the negative side of the machine a soothing sedative spray may be obtained that relieves hyperesthesia and nervous irritability, while that from the positive side is distinctly stimulating, being a powerful counter-irritant awakening dormant cutaneous reflexes that carry their increased stimuli to their respective segmental centers in the spinal cord and thereby enhance the nutrition and innervation of the distant organs over which they preside.

While the physiological effects of quiet electrical discharges are perhaps largely due to their action upon the vasomotor nervous system, we are not justified in basing the clinical application of these modalities wholly upon the experimental findings of the sphygmanometer. Empiricism and clinical experience are, after all, the most important factors in our present system of therapy, and it is only with the hope that these observations may aid in the clinical application of these valuable electro-static currents that they are submitted.



