ON THE TREATMENT OF NEURALGIA.

SUMMARY.—Definition—Pathogeny and Causes of Neuralgia—Influence of the Nervous System—Influence of the Circulation—Influence of Diseases of the Blood—Treatment of the Neuralgias—Symptom Treatment—Nervous Medicaments—Morphia—Atropin—Chloral—Chloroform—Injections of Chloroform—Aconite and Aconitine—Gelsemium and Gelsemine—Electricity—Hydrotherapy—Surgical Treatment—Neurotomy—Neurectomy—Nerve Stretching—Revulsive Medication—Cutaneous frictions—Vesicatories—Cauterization—Injections for Local Effect—Acupuncture—*Reveilleur de la Vie*—Aquapuncture—Galvano-Puncture—Empirical Medication—Phosphorus—Guarana—Sulphate of Copper—Pathogenic Medication—Essential Neuralgias—Bromide of Potassium—Neurites—Revulsion—Congestive Neuralgias—Aconite—Neuralgias by Anæmia—Morphia—Dyscrasic Neuralgias—Chlorosis—Arsenic—Intermittent Neuralgia—Quinine—Syphilitic Neuralgia—Arthritic, Dartrous Neuralgia—Treatment of Certain Varieties of Neuralgia—Neuralgia of the Foot—Sciatica—Uterine and Vesical Neuralgia—Ileo-Lumbar Neuralgia—Intercostal Neuralgia—Trifacial Neuralgia—Odontalgia—Tic Douloureux—Migraine.

GENTLEMEN: I propose devoting this lecture to that very common affection which you will often have occasion to treat, and the therapeutics of which you ought well to understand—neuralgia.[1]

Despite the recent extensive researches into the functions of the nervous system, we have not yet precise and certain data concerning neuralgia, and we are compelled to define this affection by the principal characters[2] which it

[1] It is to Cotugno, in 1765, that we owe the first description of neuralgia. He describes sciatic neuralgia, and attributes it to an acrid liquid, which, issuing from the spinal canal, descends along the nerve.

Nevertheless long before the appearance of this work the ancients had certain notions concerning neuralgia; Hippocrates, Aretæus, Celsus described the symptoms; Aretæus in particular knew facial neuralgia; in 1756 André gave a good description of this neurosis.

We must come down to the commencement of this century before we obtain certain data respecting the neuralgias. In 1821 Chaussier published his work in which he gives an excellent account of neuralgia; then comes the important treatise of Valleix, who has rightly insisted on the *points douleureux*, which are in his estimation characteristic of this neurosis. Since then works have multiplied, and we may cite especially, in Germany, those of Nothnagel, Erb, Eulenburg, Rosenthal; in England, the treatise of Anstie; in Belgium, that of Vanlair; and in France, those of Vulpian, Charcot, Lasegue, Fernet and Landouzy, Rigal, Hallopeau and Martinet. (*a*)

[2] There have been several definitions given of neuralgia (*neuron*, a nerve; *algos*, pain) The best known are the following: "Neuralgia consists in a pain, more or less violent, having its seat on the tract of a nerve, and disseminated by circumscribed points, veritable

(*a*) Dominicus Cotugno, De ischiade de nervosa Commentarius, Naples, 1764; Chaussier, Tableau Synoptique des Nevralgies, Paris, 1822; Valleix, Traité des Nevralgies, Paris, 1842; Martinet, Essais sur les Nevralgies, (th. de Paris, 1878, No. 70;) Rosenthal, Beobacht, über Neuralgien, 1874; Erb, Galvano therap., Mittheilungen (Arch. f. Klin. Med., III, 1867); Northnagel, Storungen bei Neuralgien (Arch. für Psych., II, 1869;) Eulenberg, Functionelle Nervenkrankh., 1871; Anstie, Treatise on Neuralgia, London and New York, 1871; Lardouzy and Vulpian, Lecons sur l. Appareil Vaso-Moteur, second vol.; 1876; Hallopeau, Art, Neuralgia in Diction, de Med. Prac.; Rigal, Causes and Pathogeny of Neuralgia, 1870, Vanlair; Les Nevralgies, leurs formes et leur traitement, Bruxelles, 1882.

presents, and neuralgia is still a symptom rather than a pathological unity. Without entering here into a discussion respecting the relations of the structural diseases of nerves, and the neuralgias, which are veritable neuroses, I believe that the symptom known as pain is produced whenever there is molecular alteration or modification of sensory nerves. I do not believe in "essential" neuralgias, and I am persuaded that when we come to understand better the physiology and pathology of the nervous system, that word *essential*, which only conceals our ignorance and uncertainty, will disappear from the nosological category.

What is of importance for us to know from its bearing on the treatment of the neuralgias, is the pathogeny and etiology[3] of this affection; on this point

painful foci, from which stream forth at variable intervals lancinating pangs or other like sensations of distress, and on which points, a certain amount of pressure is more or less painful."—Valleix.

The following is from Fleury and Monneret: "Neuralgia is a neurosis of sensibility, or, in other words, a painful neurosis; an apyretic disease, intermittent or remittent, irregular or periodical, fixed or readily shifting, having its seat in some point of the sensory nervous system, cerebro-spinal or tri-splanchnic; principally characterized by a very severe pain, which follows the course of the superficial nerve branches, or makes itself felt in the deep viscera; is accompanied by functional troubles which vary according to the organ affected, and cannot be explained by any appreciable lesion of the nervous tissue."

Spring thinks that in order that the word *neuralgia* should be applicable to any particular case, there should exist two conditions: (1) "the pain should be paroxysmal in character; (2) there should be no peripheral or central lesions present."

As Lereboullet has remarked, neuralgia can only be defined by its symptoms, and then we are forced to include under the same definition several distinct affections.

Axenfeld has given the following definition: "Neuralgia is an affection of the cerebro spinal nerves with this peculiarity, that generally the suffering is, or appears to be, limited to the tract of their trunks, branches or ramuscles."

Anstie thus defines neuralgia: "A disease of the nervous system, manifesting itself by pains which, in the majority of instances are unilateral, and which appear to follow the course of certain nerves, ramify sometimes into a few, sometimes into all the terminal branches of those nerves."

Vanlair has given a different definition, and which is as follows: "An affection whose essential symptom consists in a paroxysmal pain, recognizing for its cause a special and still undetermined alteration of the elements proper of the cerebro-spinal or ganglionic nervous tissue." (*a*)

[3] Monneret and Fleury have divided the causes of neuralgia into (1) predisposing, (2 determining.

Jaccoud classes them into three groups: 1. Intrinsic and primitive modification of the excitability of the nerve, from its nucleus of origin to its terminal expansions: 2. extrinsic lesions which act directly or reflexly: 3. Constitutional condition which modifies the nervous excitability, generally by the intermediation of the alteration of the blood.

Rigal classes the causes as follows: 1. General causes (age, sex, heredity). 2. Causes which act directly on the nerves (traumatism, compression): 3. Causes which act through

(*a*) Monneret et Fleury, Art Nevralgie du Compendium. Spring, Symptomatologie, t II, p. 80. Lereboullet, Dict. des Sc. Med. Art Nevralgie. Axenfeld, Des Nevroses, Paris, 1864, p. 156. Anstie, Neuralgia and Diseases that Resemble it, London, 1871. Vanlair, Op. cit., 1882, p. 5. Axenfeld et Henri Huchard. Traité des Nevroses, p. 34, Paris, 1883.

I must dwell briefly. I have told you before that in order that the functions of the nervous system may be regularly and normally performed, three conditions must be fulfilled; there must be: 1. Integrity of the nervous system itself, cells and fibres; 2. Integrity of the circulation; 3. Integrity of the nutrient blood. The sensory system of nerves is no exception to this law, and every circumstance, whether connected with the state of the blood or the blood-vessels, which modifies these nerves or their centres, may give rise to pain. Let us consider each of these conditions separately.

From the standpoint of the nervous system, all alterations, from the profound modifications of neuritis to simple molecular disturbances, may be the point of departure of the clinical syndrome described under the name of neuralgia; wounds of nerves, irritation, compression of nerves, inflammation of the neurilemma, neuritis properly so-called, are all so many causes of persistent neuralgias. It has even been claimed that rebellious neuralgia is always neuritis. In my opinion, if inflammation of a nerve sometimes gives rise to a stubborn neuralgia, we are not to conclude from this that every persistent neuralgia is of inflammatory origin, for some quite obstinate facial neuralgias have a different origin.

As for circulatory troubles, they have a manifest influence on the production of neuralgic phenomena, and in this regard two sorts of neuralgia may be distinguished; those which result from want of blood—anæmic neuralgias, and those which result from excess of blood—congestive neuralgias, to which Gubler first called attention.

It is to these disturbances of the circulation that neuralgias due to the impression of cold have been referred, and which are so frequent. Some explain them as the result of anæmia of the cutaneous extremities of sensory nerves, others as the result of congestion of the nervous centres. The question is more complex than one would suppose, and it is impossible at the present day to decide in one way or the other. Lastly, in certain cases neuralgias originate in alterations of the blood. Thus chlorosis, malarial and other blood-poisoning conditions, and diatheses, such as gout, may give rise to veritable dyscrasic neuralgias. Whether the cause may be changes in the blood, circulatory disturbances, or some alteration in the nervous system itself, these divers modifications may affect the sensory nerve in three points of its course; its periphery, some part of the main trunk, or its central termination.

At the periphery, every cause which, through traumatism or atmospheric changes, modifies the terminal sensory fibre, may determine a neuralgia which shall spread to all the ramifications of the nerve. As an example, I refer you

the medium of the blood (diathetic and infectious diseases): 4. Causes which act by sympathy or reflexly: 5. Associated causes: 6. Unknown causes.

Hallopeau studies the causes under two heads, *predisposing* and *occasional*. The last are divided into three groups: 1. By direct lesions of the nerves or their roots: 2. By lesions more or less remote: 3. By general diseases. (*a*)

(*a*) Monneret et Fleury, Compendium de Med. pratique. Jaccoud, Traité de Pathologié Interne, t I, p. 451. Rigál, Causes et Pathogenie de la Neuralgie, p. 12, 1872. Hallopeau, Art, Nevralgie in Nouveau Dictionaire de med, et de chir.

to dental neuralgia. A carious tooth produces some alteration of the dental pulp, and an irritation spreads along the dental nerve, causing pain in all the branches of the trifacial. The annals of medicine are full of similar facts, where we see neuralgias persist for years, in consequence of the presence in the tissues of foreign bodies which irritate the peripheral extremities of sensory nerves, But in order that there may be a painful sensation, a sentient cell must be touched; and this is a point on which Vulpian, Anstie, and especially Vanlair,[1] have insisted. It is then well understood that if theoretically there exist peripheral neuralgias, yet in order that there may be phenomena of pain the neuralgia must be central.

These preliminaries being settled, we will now enter on the treatment of the neuralgias; but in order to pass in review the numerous therapeutic measures recommended in these cases, I shall be obliged to establish a certain number of divisions. Therapeutic agencies applicable to neuralgia may be classed in two distinct groups—the one is addressed to the symptom pain which characterizes the neuralgia, this is symptom treatment; the other is directed to the cause of the pain, this is pathogenic treatment.

Symptom treatment is subdivided into three groups. In the first are placed all medicaments which act by modifying more or less profoundly the functions of the nervous system, and which are described under the name of hypnotics, anæsthetics, analgesics, anti-neuralgics, etc., such as opium, chloral, chloroform, and aconite. The second group contains medicaments which act by substituting for the pain, another pain, and constitutes revulsive or substitutive medication; we place here vesicatories, cauterizations, etc. The third group contains substances which experience has shown to have powerful anti-neuralgic properties, but the mechanism of whose action is not known, such as turpentine, guarana, and sulphate of copper.

I shall first briefly examine the medicaments of the three divisions of the

[1] Vanlair has given a good physiological and clinical analysis of pain. It depends on alteration of the normal sensibility but is not itself this alteration. The latter is called *algesia* and pain is but the conscious expression of it. We must, he says, distinguish hyperesthesia from algesia; the one is exaltation of sensibility, the other is objective pain. In order that there may be pain, according to Vanlair, there must be molecular modification in the central ganglia. Neuralgia depends on a change in the state of the sensory cell. These aphorisms sum up his views concerning pain:

I. Notwithstanding the variety of its expressions, pain is one in its essence.

II. It takes place without the intervention of the terminal apparatus of the nerves.

III. Painful sensations have not special fibres subservient to their transmission.

IV. But there exist nerve cells exclusively charged with the exercise of algesic sensibility.

V. Moreover these cells, destined primitively for another function may become in certain conditions centers of pain.

According to Jewell neuralgia has always a central cause while its seat is in the sensorial tract. The nerve cells of the sensorial tract are modified in their nutrition, and this modification is the efficient cause of neuralgia. (*a*)

(*a*) Vanlair, Les Nevralgies, leurs Formes et leur Traitement, 1882, 2d ed.. p. 48. Jewell, Pathology of uralgia (Journal of Nervous and Mental Diseases, April, 1877.)

first group, then the bases of the pathogenic medication, and finally shall take up, in order, certain forms of neuralgia and their treatment.

In the first group stand prominently forth, opium and its derivatives, chloral, chloroform, aconitine and gelsemium, electricity and hydrotherapy.

Opium is undoubtedly one of the means the most employed in the treatment of pain in neuralgia, and since the introduction into medicine, by Wood, of hypodermic injections, it may be truly said, that it is on subcutaneous injections of morphia that we rely most to subdue pain, or at least to obtain temporary alleviation.

Is it necessary to make the subcutaneous injection *in loco dolenti?* Some, and Chouppe in particular, have answered this question affirmatively. I do not think so. If morphine relieves neuralgia, it is not by any local action on a nerve or nerves in a painful region, but by modifying the sensory nerve-centre; the anodyne must first enter the circulation and be carried to the heart, then sent to the cerebro-spinal axis, before it can have the effect sought. The injection then may be made with equal advantage on the thighs, hips, or the fleshy part of the arm, wherever it can be made the most easily.

You may use Magendie's solution made with cherry-laurel water, or any other good menstruum that will not ferment; the average dose being one or two centigrammes. Constantine Paul recommends water that has been boiled. If you use common water, mucedines will be sure to form in your solution after a few days. Bardet has shown that these aid in the transformation of morphia into apomorphia.

These sub-cutaneous injections, which have supplanted all other modes of administration of opiates in the treatment of neuralgias, have one great disadvantage, and only one—the patient easily becomes habituated to them, and resorts to the hypodermic syringe, not to obtain relief from pain, but an excitation which henceforth becomes a necessity. That will be a curious chapter of pathology, which shall describe the progress of morphomania in our times; it will show that it has almost always been the case that inveterate and deplorable habits of morphia-taking have had their origin in the use of hypodermic injections of that anodyne in the treatment of neuralgia.

When the hypodermic method was first introduced, Wood, in Great Britain, and Behier, in France, employed atropine, but this medicament was soon abandoned on account of the dangers which it presented, and the delirium which frequently followed its use. At the same time you may derive benefit from the association of the two medicaments, and I recall to your remembrance the formula which I habitually use:

℞.—Sulphate of atropine..... 0.01 (gr. $\frac{1}{6}$).
Hydrochlorate of morphia..... 0.10 (gr. iss),
Cherry-laurel water..... 20.00 (ʒ vss).
M.—

A cubic centimetre (15 m.) or about a syringeful of this solution contains half a milligramme ($\frac{1}{120}$ gr.) of atropine, and a half a centigramme ($\frac{1}{12}$ gr.) of morphia.

It has been asserted that injections of plain water would relieve pain as effectually as injections of morphia, and Dieulafoy has given his support to this statement. I showed in 1872 that only injections of morphia can be relied upon to calm the pain, and that an occasional anodyne effect produced by injections of water, is due to distension or rupture of certain muscular fibrillæ.[1]

Chloral is one of the best anodynes we possess; it has only one inconvenience, that it cannot be administered a great while to the same individual without determining by its caustic and irritant action a chronic inflammation of the digestive tube. Therefore, I have recommended, in order to obviate this inconvenience, to give the chloral preferably by enema; the following combination administered *per rectum* will do good service. Take the yolk of one egg, beat it up in a gill of milk, and dissolve one or two grammes of chloral. Administered in this way, the chloral, however, in a few days irritates the rectal mucous membrane, and must be suspended.

Certain derivatives of chloral have been proposed as a substitute, and croton-chloral has been especially vaunted by Liebreich, Benson Baker, and others in Germany and France. Croton-chloral and butyl-chloral are given in the dose of thirty centigrammes to one gramme every three hours, till the paroxysm disappears; despite the advantages which this remedy possesses intic douleureux, it is little used in the treatment of neuralgia.[2]

[1] The fact that intense pain is sometimes relieved by a hypodermic injection of water, has been attested by a great many observers. Gubler, who has many times witnessed the phenomenon, explains it as the result of local infiltration, not only of the cellular tissue, but of the histological elements as well. There are degrees of hydration of the tissues, and there is a marked relation between this hydration and divers modes of sensibility; witness cases of anasarca, in which the infiltrated tissues are relatively insensible, as you will see by testing the sensibility over the œdematous parts, and over the surrounding region not invaded by the anasarca. The aqueous injections succeed the best, according to Gubler, in those neuralgias which are called congestive.—*Vide Cours de Therapeutique*, p. 238, Paris, 1880.

The whole subject is far from being clear.—TRANS.

[2] Croton-chloral is obtained by the action of chlorine on aldehyde. By constitution it is a chlorated aldehyde of crotonic acid. Liebreich has studied its physiological action; its hypnotic effects are due to decomposition in presence of alkalies into bichlorallyline, which acts on the brain and spinal cord.

Croton-chloral is little soluble; it has been employed in the treatment of neuralgias by Benson Baker and Skerrit. The latter administered it in the form of pills, in the dose of 30 centigrams (about 5 grs.) every three hours, and he has thus given five and even six grammes a day (75 to 90 grains). Croton-chloral often causes vomiting. Gray combines croton-chloral with bromide of potassium in the following formula:

M. Signa. A teaspoonful every two hours till the pain is relieved.

℞. Croton-chlor... 1 gr. (gr. xv).
Bromide pot... 4 " (ʒ j).
Water..... 250 " (℥ viij & gr. xv).
M.

Worms employes the following formula:

M. Signa. A tablespoonful every two hours.

℞. Croton-chloral.. 1 gr. (gr. xv).
Glycerine..... 60 " (℥ ij).
Water..... 60 " (℥ ij).
Essence menth.
Pip. q. s. to fla.
Syr. simp..... 25 " (ʒ vi & gr. xv).
M.

Chloroform is also in current use in the treatment of neuralgia; it is employed almost exclusively locally, occasionally, however, by inhalation in the case of neuralgias that are horribly painful. Locally it is used in the form of liniment, or injected subcutaneously. Aran, Dupuy, De Frenel, and others, advised a long time ago to treat neuralgias locally by compresses wet with chloroform, and recently Brown-Séquard has experimentally demonstrated the analgesic action of these local applications. But it is especially in hypodermic injections that this medicament gives good results.[3]

Introduced into therapeutics by Roberts Bartholow, of Philadelphia, then by Doe, of Boston, the usage of subcutaneous injections of chloroform did not become general in France till Ernest Besnier made his favorable report.

Weill counsels the use of the following preparations, potions and pills:

℞. Croton-chloral..... 2 grammes (ʒ ss).
Glycerine..... 6 " (ʒ jss).
Ext. licorice..... 4 " (ʒ i).
Syrup } ää..... 45 " (ʒ iss).
Aquæ }

M. Sig. A tablespoonful as often as required.

℞. Croton-chloral, } ää..... 1 gram (15 grains).
Licorice powder, }
Conserve of roses. }

M. F. S. A. pill, No. xx.

Leoni's potion is as follows:

℞. Croton-chloral..... 1 gr. (15 grains).
Glycerine..... 16 "
Aquæ lauro-cerasi..... 16 " (a a ʒ ss).

M. Each teaspoonful contains ten centigrammes of croton-chloral. (*a*)

[3] Roberts Bartholow first employed in 1874 these subcutaneous injections of chloroform in neuralgia. Stedmann, in 1877, cites eight cases cured by this means. The same year Doe, of Boston, treated by this method a case of neuralgia consecutive to zona, but these injections did not become general in France till Ernest Besnier made his favorable report to the Societé de Therapeutique, November 14th, 1877.

Dujardin-Beaumetz has experimented with this method, and shown the advantages which may be derived from it, and has especially insisted on the general symptoms which follow injections of notable quantities of chloroform (from 4 to 10 grammes). Henry Fournier, his pupil, has embodied in his thesis a great number of observations relative to this subject. (*b*)

(*a*) Liébreich, On the Action and Use of Hydrate of Croton-Chloral (Brit. Med. Jour., Dec. 20th, 1873). Benson Baker, On the Employ of Croton Chloral in Neuralgia (Brit. Med. Jour., 1874). George Grey, On the Effect of Croton-Chloral as an Anæsthetic and Analgesic (Brit. Med. Jour., March 24th, 1874). Worms, Note on the Action of Croton Chloral (Bull. de Ther. 1874 t 86 p. 447). Martin Skerrit (Lancet, Dec. 2d and 9th, 1874). Bruennich, Croton Chloral and Prosopalgia, 1874. Weill on Croton Chloral Hydrate (Thése de Paris, Dec. 30, 1874). Leoni, Sur le Croton Chloral (Marseille Medicalé, April and May, 1877, page 129 and 259).

(*b*) Roberts Bartholow, On the Deep Injection of Chloroform, in the Practitioner for 1874. Ernest Besnier, On Subcutaneous Injections of Chloroform, in Bull. de Therap., t. xcii., p. 433. Stedmann, Eight Cases of Neuralgia Treated by Deep Injections of Chloroform (Boston Med. and Surg. Jour., May 24, 1877.) Dujardin-Beaumetz, Des injections hypodermique de chloroforme (Bull. et mem. de le Soc. de Therap., t. v. pp. 39, 40, 1878). H. Fournier (Thése de Paris, 1878). Duran, Des injections hypodermiques de chloroforme Thése de Paris, 1878).

I have myself made trial of this method in my hospital practice, and my pupil, Henry Fournier, has given the results in his thesis. In order that these injections of chloroform may do good, they must be made in the painful region, and they must be introduced deeply in the cellular tissue, or muscular interstices; neglect to follow this rule has resulted in accidents, and in failure. Plunge your needle, then, perpendicularly into the tissues, and carry it as far as the guard at the proximal extremity. This mode of treatment is hardly applicable to any form of neuralgia except sciatica.

By these subcutaneous injections of chloroform you may obtain two different results—either disappearance of local pain after small doses, or general effects, characterized by sleep, when you inject two, three, four, and even ten grammes of chloroform, without, however, at any time obtaining surgical anæsthesia. Why do you not obtain complete anæsthesia? It is because chloroform, when introduced beneath the skin, is absorbed by the veins and lymphatics, and carried to the lungs before entering the arterial system to be distributed to the brain and other nerve-centres, and in the lungs it is in large part eliminated. What remains uneliminated, and such portion of the vapor of the chloroform as, after being expired, returns to the lungs in the air of inspiration, passes into the blood of the aortic system, and is carried to the brain, where it has a more or less sedative effect, according to the quantity which has escaped the eliminating action of the lungs. In producing surgical anæsthesia by inhalations of chloroform, you practically suppress the principal source of elimination, and charge the arterial blood with the toxic agent.

By the side of these medicaments, and even at their head, we must place aconite and aconitia, which give marvelous results in certain varieties of neuralgia, and especially in facial neuralgia of the congestive form. Experiments have shown that aconitia has an action quite special on sensory innervation, and in particular on that of the trifacial, and it is this action which Oulmont, Séguin, Franceschini, and Laborde have utilized in the treatment of neuralgia. You can then make use of the crystallized nitrate of aconitia, and as there exist impure aconitais in commerce, you would do well to order the preparation of Duquesnel. The granules of Duquesnel contain each one-quarter of a milligramme of aconitia; you may give one of these granules every three hours till eight are taken in the course of twenty-four hours.[1]

[1] I have previously described these medicaments (see vol. II of this series), and shall here only treat of the physiological properties of aconitia.

According to Franceschini and Laborde, aconitine acts especially on the bulbous portion of the myelencephelon, then consecutively on the great sympathetic, and by their medium it exerts an influence, more or less profound, on the principal functions of the economy.

Gubler has dwelt on the phenomena that follows aconitia in moderate doses: A half-hour after the injection, there are formications over the whole body, a general numbness, with tingling, pricking, and smarting in the nose, and end of the tongue, and disorders of taste. The tactile sensibility is blunted, torpor supervenes, and the patients feel a sensation of a rubber band which tightly constricts their skin. This sensation of general anæsthesia is especially felt in the parts innervated by the trigeminal nerve. To sum up, the phenomena observed after the administration of the aconitia are as follows: 1. A

Crystallized aconitia is one of the most energetic poisons; and you ought rarely to exceed the dose of two milligrammes a day; there are some patients even, in whom, owing to their susceptibility to the drug, this dose cannot with safety be reached. You ought then to suspend the medicine when the patient complains of an uncomfortable sensation of constriction of the mouth and eyes, and tingling in the tongue, which are the first toxic manifestations. When you cannot obtain aconitia, you can employ the tincture of the root (the tincture of the leaves is not to be relied on). Of the common tincture of aconite root, you may give ten drops every three hours. [Fleming's tincture is much stronger, and should not be given in a larger dose than five drops, at least as a commencing dose.] The tincture is much inferior to aconitia, at least in the treatment of facial neuralgia. I cannot too highly commend the alkaloid in prosopalgia; since I have been in the habit of using it, I have obtained cures in a great many cases, and always an amelioration.

In my judgment gelsemium sempervirens[2] and gelsemium merit a place far below aconite and aconitia. In the rich, moist soils of Virginia and the Carolinas grows a climbing plant with yellow flowers, called the yellow or Carolina jasmine; it is the gelsemium sempervirens. From the root and stalk is obtained an alkaloid called gelsemin, discovered by Fredigke. A tincture is

special modification of sensory innervation, appreciable more particularly in the sphere of the fifth nerve. 2. Paralysis of the peripheral extremities of the motor nerves, by an action similar to that of curare. 3. Paralysis of the muscles of respiration, then depression of the vascular system, and arrest of the heart by a special action on the sympathetic system. (*a*)

[2] The gelsemium sempervirens, "eclectic febrifuge," botanic family still undecided (referred by some to apocynaceæ; by others to the scrofulariaceæ), has long been a popular medicine in America. The roots and stalks contain gelsemic acid, discovered by Wormby, and gelsemine discovered by Fredigke. The latter is crystallizable. Ringer and Murrell have studied the physiological action of the plant. It acts on the muscular system and on the heart; produces phenomena of paralysis like curare, and antagonizes strychnia. The tincture is powerfully toxic. Dujardin Beaumetz and Eymery have caused the death of hares in two hours, by injecting two cubic centimetres of the tincture. Death has followed its use in man. Freeman cites the case of three children poisoned by two grammes (3 ss) of tincture of Gelsemium. Drs. Marin and Courtright have noticed similar cases. In a patient of the author two cubic centimetres (about forty drops), administered by mouth, caused paralytic symptoms of extreme gravity:

Almost all authorities who have employed this tincture medicinally, have given it in quantities equivalent to twenty drops a day. Massini, however, has employed it in doses amounting to 60 drops in the 24 hours.(*b*)

(*a*) Franceschini, Sur l. aconitine (Thése de Paris, 1875). Laborde et Duquesnel, Physiological, Chemicál, Clinicál, and Toxicologicál Study of Aconitia (Tribune Med., 1881). Gubler, New Researches on the Therapeutic Action of Aconitia (Bull. de Ther. 1864, p. 348 t. 66, and Commentaires du Codex). Dujardin Beaumetz, Art. Aconitine, in Diction. de Therapeutique, 1882. Séguin, Report on Aconitia in Trigeminal Neuralgia (New York Med. Jour. Dec. 1877. Mary, Du nitrate de aconitine dans les Nevralgies faciales (Thése de Paris, 1880.)

(*b*) Isaac Ott, in Philadelphia Med. Times, March 31st, 1877. Cordes, of Geneva, in Jour. de Ther , No. 5, 1877. Hill in Philad. Med. and Surg. Reporter, Jan. 30th, 1875. Ringer and Murrell in Lancet, 1875, 1876. Spencer Thompson, Lancet, 1875. Eymery, Thése de Paris, No. 362, 1875. Suraszc, Centralb. July, 1875. Massini, On the Root of Gelsemium as an Anti-Neuralgic, 1878. Putreyse and Romée, Action physiologique de la Gelsemine.

made from the root, which is given in the dose of ten drops every two hours. This tincture has been made the subject of experimentation by Wickham Legg, Cordes, of Geneva, Hill of the United States, Spencer Thompson, Sidney Ringer and William Murrell, Massini, Suraszc, Roberts Bartholow, and others, who have obtained remarkable results in the treatment of facial neuralgia, and neuralgias especially of the paroxysmal or intermittent form.

I was the first in France to experiment with this tincture, and my pupil, Dr. Eymery-Heroguelle has reported the results in his thesis of graduation (August 1877). I obtained certain favorable results from the tincture, but I found it an uncertain medicament. Moreover the tinctures were of no definite and uniform strength, a fact due probably to the circumstance that in making the fluid preparations, all parts of the plant, as well as the roots, were used, or possibly because pains were not always taken to obtain the fresh, green root; as a consequence the same doses sometimes gave toxic effects, sometimes no effect at all. In one of our patients, symptoms of poisoning, of the utmost gravity, from the medicinal use of the tincture were noted. Such toxic phenomena have already been often reported as the result of the free use of this tincture, and Hanna, Freeman, and Courtwright have even known death to follow. I have, therefor, abandoned, in the treatment of neuralgias, the use of this drug, as being uncertain and dangerous. These inconveniences may be avoided by the use of gelsemin; but this alkaloid is little known, having been as yet little studied, and seems much inferior as an anodyne to aconitia.[1]

In the same group of medicaments, we must place electricity and hydrotherapy, which modify more or less directly the nervous system.

Electricity is one of the most active agents in the treatment of rebellious neuralgias. In my lecture on "Medical Electricity," I have told you that electricity modifies the molecular state of nerves during its application, and sets up polar currents in the nerves which prolongs its effect; you need not be surprised, then, at its beneficial effect in neuralgia.

You may make use of faradic or galvanic currents; the latter are much to be preferred. The negative pole is applied near the nerve-centre, the positive pole (which is the truly sedative pole) may be moved over the different painful points of the affected nerve. When you are treating tic douleureux,

[1] Numerous fatal cases are on record in American journals of poisoning by gelsemium. Thus, Pinkham's case in the *Boston Med. and Surg. Journ.*, for 1876; that of Boutelle, of Boston, in the same journal; that of Wormley, in the *Amer. Journ. of Pharmacy*, for 1870; also that of Seymour, in the *Therapeutic Gazette*, for 1882. Freeman's three cases (referred to in the text) occurred in 1860; death occurred from taking one or more (in one instance, less than one) teaspoonful doses of the tincture. I myself came near dying four years ago from the effect of a drachm dose (given through mistake) of Wyeth's fluid extract of gelsemium; there were dimness of vision and double vision, irregular breathing, the most alarming prostration, and general muscular paralysis; the use of electricity and stimulants (capsicum, quinine, and strong coffee) brought me out of danger in a few hours. The toxicological history of this drug is well summed up by Ringer, in the *Lancet*, for 1878.

Despite the danger attending the use of gelsemium in large doses, I have found moderate doses (five to ten drops of the tincture every two hours) a charming remedy in facial and especially dental neuralgias.—TRANS.

your currents should be very mild, and should not exceed three or four milliampères. In fact, too intense galvanic currents applied in the region of the encephalon, determine two effects which we ought to avoid—syncope on the one hand, and certain photopsias on the other; it is well, then, to use very light currents.

In the case of sciatica, your current should be much stronger; twenty milliampères, and even more. When treating of electricity in medicine I gave you a definition of this term (milliampère), and told you that it was the basis on which are graduated all our modern galvanic machines and the only scientific means at our command of comparing observations relative to the medical application of electricity. In the treatment of neuralgia it is necessary to be precise as to the quantity, if we would employ electro-therapeutics to advantage.

As for the duration of the current, authorities are far from being agreed, some recommending prolonged, others very short sittings. I think, with Apostoli, that the duration of the *sèance* cannot be fixed in advance, and that the passage of the current should be continued till the pain disappears, or at least till some mitigation is obtained.[1]

[1] In the treatment of neuralgia, faradic, galvanic, or static electricity may be employed.

Induced currents.—Becquerel was one of the first to recommend the use of very strong and rapid currents. He advised the extra current and a wet sponge for electrode, and directed to apply the positive pole over the part of the nerve nearest the nerve-centre, and the negative pole over the divisions of the nerve; to be passed to and fro. *Seances* of five minutes' duration.

Duchenne preferred the revulsion method—the painful region to be electrified by the metallic brush; a very strong current with rapid interruptions. This is the method of "electric fustigation," employed by Tripier.

Galvanic currents.—Magendie employed electro-puncture with the galvanic current; this process is now abandoned.

Remak, Ramios, Rosenthal, and Meyer make use of a centrifugal or descending current; positive pole in the vicinity of the nerve-centre, negative pole at the periphery.

Onimus also uses the descending current; placing the positive pole over the point of emergence of the nerve, the negative pole over the terminal branches, and passing for fifteen minutes a current of thirty elements of Remak. He advises weak currents, but of long duration.

Niemeyer, Tripier, Apostoli, and Bardet, on the contrary, recommend to apply the positive pole over the *point douleureux*, and this is the practice of most electro-therapeutists at the present day.

Static currents.—Arthuis has treated with great success a large number of neuralgias by Franklinic electricity. He employs the electric bath, and the electric brush, which is moved over the branches of the painful nerve.

As for the treatment of certain forms of neuralgia—facial neuralgia and gastralgia—this is the procedure of Bouchaud, Craddock, Apostoli, and Beard.

Apostoli employs, in the case of gastralgia—positive polar electrization of the pneumogastric: positive electrode over the pneumogastric, negative pole in the hand of the patient.

Bouchaud treats odontalgia by a constant current of ten elements; positive pole on the face as near as possible to the painful nerve, negative pole on the antero-lateral region of the neck. In a few minutes' time marked relief is generally obtained.

Craddock has used the constant current with success in neuralgia of the face. Beard has long insisted on the treatment of neuralgias by electricity. In facial neuralgia, galvanization and faradization rapidly cure, but care and prudence in the use of these means are necessary. In gastralgia, galvanization gives complete success; in sciatica, ameliorates or effects a cure. In the latter malady, Beard recommends to apply one of the poles to the vertebral column at the point of emergence of the nerve; the other pole to be moved up and down the sciatic nerve, and the current to be especially directed to the *points douloureux.*(*a*)

It is in proceeding in this way that Remak, Onimus, Bouchaud, Craddock, Ouspenski, etc., have obtained results that are truly marvelous in the treatment of obstinate neuralgias, and especially in neuritis. I, myself, employed as far back as 1872 these constant currents in the treatment, more especially, of sciatica, and one of my pupils, Dr. Cado, has given the results (often most gratifying) in his thesis.[2]

But if electricity, methodically employed, may mitigate and cure neuralgic pains, you should repudiate altogether those "electric" (?) chains, belts, and pads, which you see advertised for pain, and especially for the cure of migraine. These contrivances are so badly constructed that they are incapable of generating any current, and can have no effect at all, unless a moral effect by acting on the imagination of the patient.

Hydrotherapy, like electricity, is one of the most active agencies in the treatment of neuralgia. Cold water acts, not only by modifying directly the neurility of sensory nerves, but also in promoting healthy circulation and nutrition, and I know of no better means of arresting a paroxysm of neuralgia, or even of preventing a return of an attack than the douche.

Next in order come the surgical measures, which have a direct action on the painful nerve. These are: 1. Neurotomy;[3] 2. Neurectomy; 3. Nerve-stretching.

The section of nerves for the relief of neuralgias is quite an old opera-

[2] L. Cado, "On the Treatment of Sciatica by Galvanic Currents" *Th. de Paris*, 1872.

[3] It was about the middle of the last century that Marechal first proposed the division of painful nerves for the cure of neuralgia. Andrè has cited cases where Marechal practiced neurotomy, but alarmed by the frequent relapses which followed these sections, Andrè advised to destroy the nerve by means of caustic.

In neuralgia simple section has now been abandoned to give place to resection, which gives much more lasting success, and rules have been laid down for the operation applicable to the different resections. Everybody seems now agreed in regarding neurectomy as indicated in all cases of neuralgia rebellious to all other modes of treatment. It is generally recommended to pursue successively the following course, in these desperate cases: 1. Simple stretching of the nerve; if this does not succeed, then: 2. Resection of a portion of the nerve.(*b*)

(*a*) Beard on the Treatment of Neuralgia by Electricity, in the Practitioner, 1873: and in Beard and Rockwell's Medical Electricity. Remark on Galvano-therapy, 1860. Onimus and Legros, Medical Electricity, Paris, 1872. Bouchaud on "Constant Currents in Odontalgia," (Bull. de Therap., tome lxxxv. p. 1.) Craddock, Trigeminal Neuralgia Treated by the Constant Current, (Practitioner, 1873). Tripier on Electric Revulsion, (Courrier Medical, 1870). Apostoli, Treatment of Gastralgia, (Bull. de Therap., 1882, etc.

(*b*) Boyer, Traité des Maladies Chirurgicáles, t. vi., p. 334 and 335, Paris, 1822. Otto Weber, Art, Nevrotumie, in Handbuch der Allgemeinen und Speciellen Chirurgie. Tripier, Art, Nevrotomié in Dict. encyclopediqué. See also Comptes Rendus de la Societé de Chir. 1882.