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FAULTY INNERVATION AS A FACTOR IN SKIN DISEASES,

BY

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Delpech, as early as 1832, (*Revue Med. vol. i.*) called attention to the existence of nerve lesions due to compression from contracting cicatricial tissue. Hamilton (*Archives Gen. de Medecine*, 1838, t. ii.) states that with pain, redness and swelling may occur in parts at a distance from the original injury, though in the course of the nerve, resembling the effects of a sub-aponeurotic abscess, and increasing and diminishing abruptly and even periodically.

Thus, Obs. I. and III., where wounds of the hand were followed by periodical swellings, limited to the regions of the nerves affected, and accompanied by pain and greatly increased action of the sudoriparous glands, these swellings disappearing as suddenly as they came; and Obs. IV., in which there was in addition a morbid production of hair.

Professor J. Roux (*Gaz. des Hop.*, 1840, p. 101), reports a case where a nervous filament was injured as the result of venesection, the consequent swelling being strictly limited to the parts appertaining to the injured nerve, namely, the thumb, index and medius fingers, which became also very sensitive to heat and cold. The importance of these swellings, in a diagnostic point of view, is insisted on by Remak, (*Œsterr. Zeitschr. f. prakt. Heilkund*, 1860, No. 48.) Romberg (*Lehrbuch*, 1851, vol. i, p. 232) adds to these other results, such as diminution of calorification; inability of the part affected to withstand changes of temperature, cold water causing bullæ at the ends of the fingers, a fact observed also by Dieffenbach in regard to portions of skin transplanted in plastic operations; livid color due to stasis of capillary circulation. Similar observations have been made by Brown-Sequard, and especially by Charcot (*Journ. de Physiol.* 1859). So, also, by Samuel, (*die trophischen nerven*, Leipzig, 1860,) by Paget, (*Medical Times*, 1864,) and by Weir Mitchell, Morehouse and Keen, (*Gun-shot wounds and other injuries of the nerves;* Philadelphia, 1864.)

Of the cutaneous affections due to traumatic injuries of nerves, some may appear in the peripheral region of the nerve injured, others at a distance and upon parts supplied by nerves which have undergone no injury. The latter class must be attributed to reflex action. That an actual neuritis exists in such cases, is shown by the experiments upon animals of Descot, *These de Paris*, 1822, No. 233,) and

Dubreuilh, (*These de Montpellier*, 1845, No. 34,) by Vulpian and Tillaux, (*These d'agregation de chirurgie*, Paris, 1866,) and by Eulemburg and Landois, (*Gaz. Med. de. Paris*, 1865.) Mitchell, Morehouse, and Keen, in their work, based upon observations made during our recent civil war, divide the result of nerve leisons into four groups, the second being the alterations of the skin. Here there is generally at first œdema, the skin then becoming dry, thickened, yellowish or brown, and scaling off, while the nails become curved and thickened. The erythema, described by Paget, they have observed nineteen times out of fifty cases of partial lesion of the nerves, and Mougeot (*Recherches sur quelques troubles de' Nutrition consecutifs aux affections des nerfs*, Paris, 1867,) considers one of the essential conditions of its existence to be a merely partial separation of the nerve from the nervous centers. He adds, that when a single nerve is affected, as, for example, the median or the cubital, the erythema only exist in that part of the skin where its final ramifications are distributed. Vesicles or bullæ, followed by ulceration, may also occur, and ulcerations, consecutive to compression of the median nerve and its irritation, appear and disappear, cicatrize or remain stationary, according as the patient, by the position of the limb, maintains or removes the compression and consequent irritation. Such a case is reported by Charcot, (*loc. cit.*, vol. ii, p. 108.) Earl, in Romberg, (*loc. cit.*, p. 16,) reports a case where redness and pemphigoid bullæ appeared several times consecutively as a result of an injury of the external cutaneous nerve by the thrust of a fork. Mougeot (*loc. cit.*, p. 41) mentions a case, reported by Gosselin, of ulcerations upon the palmar aspect of the middle and upon the extremity of the index fingers, resulting from incomplete division of the median nerve. Also, one of Paget's cases, in which the radial and median nerves of a child, aged eleven years, were completely divided by a circular saw, and at the end of a year sensation had not returned to the last phalanges of the thumb and index finger, the parts chilling readily, and large bullæ forming upon the hand. In his *Surgical Pathology*, vol. i, p. 43, Paget reports a case of compression of the median nerve, followed by ulcerations, appearing or disappearing, according to the presence or absence of irritation due to this compression.

Weir Mitchell, (*Injuries of the Nerves and their consequences*, Philadelphia,) after alluding to Hutchinson's series (*Clin. Lectures and Reports*, London Hospital, 1866,) of injuries from cutting, mostly by glass, where loss of sensation and motion were serious and lasting, and with marked nutritive changes, quotes such a case, where division of the ulnar nerve and vessels, and of the median nerve, was followed by anæsthesia of the parts supplied, inflammation of the tips of three fingers unattended by sensation, and diminution of animal heat in all the parts paralyzed. At the extremity of the middle finger, was formed a subcutaneous bulla, the cuticle being elevated by effused serum, (subcuticular whitlow,) with a red areola.

He states, also, that there is no absolute physiological proof of the existence of trophic nerves; but, in the phenomena of nerve wounds, there are certain arguments in favor of the possibility of disorders of nutrition being capable of production by the irritation of ordinary nerves of sensation, and, indeed, of motion.

Létiévant, (*Traite des Sections Nerveuses*, Paris, 1873,) considers trophic changes as most prone to follow wounds of nerves which are distributed to the hands and feet, and is more rare after injuries to nerves supplying the upper portions of a limb.

Peripheral changes might, therefore, be anticipated after injury of the median nerve of the arm, which supplies tactile sensibility to the palmar surface of the hand, as in the following case :

M. O'B., of New Brunswick, an unmarried seamstress, aged forty-three years, applied to the Boston Dispensary for Skin Diseases, October 2d, 1874. About two years previously, she had injured the tissues over the second joint of the right thumb by falling with her whole weight upon the joint, while her hand was tightly clasped, thus cutting a deep gash upon its radial aspect, which now shows a ragged cicatrice.

On January 1st, 1874, the tissues of the last phalanx became tender, the skin grew hard, "like a corn," and peeled off. Tincture iodine was applied, causing great pain. Rubber cots were used to no purpose. In September the ball and end of the thumb festered. For this she desired treatment, as she was unable to pursue her trade of sewing coats.

October 2d, 1874, the whole last phalanx of the thumb is red and swollen, hot and tender to the touch, smooth and dry. Voluntary motion somewhat interfered with, but no spasms nor contraction. The joint proper does not appear to participate in the process. At the upper portion of the palmar aspect of the thumb are two small pustules, hardly raised above the level of the surrounding skin, and covered by a thick cuticle. These, when opened and poulticed, would scale off. Under diachylon ointment things would apparently improve. Then, with pains extending up the arm to the top of the shoulder, the whole process would repeat itself. Fearing that the median nerve had been, perhaps, crushed at the time of the injury to the thumb, and seeing that the lesion hardly fell within the domain of dermatology proper, I requested Dr. J. J. Putnam to see the case, October 28th. He galvanized the thumb at intervals until April 14th, 1875, the patient continuing iron internally, and belladonna plaster externally. She derived so much benefit that she ceased attendance at that time. March 4, 1877. She again asked relief. Pustules like the others were again present, the ball of the thumb was painful and quite sensitive to pressure. There were also tender spots upon the palmar sides of the joints of the first and second phalanges.

The skin of the ball of the thumb was thickened, except where the festering process had just been completed ; there it was thin and of a glossy red color. Drs. D. F. Lincoln and S. G. Webber saw her at this time, the latter gentleman being also kind enough to administer a six weeks' course of electricity. The patient then again disappeared.

November 9th, 1877. Patient has returned. The condition much as in March. Whole thumb enlarged and reddened, painful pustules all along, and under the free end of the nail, and the nail itself being hard and dead, thickened, and of a yellowish brown color. The pustules make their appearance within twenty-four hours, then, in from twenty-four to forty-eight hours, they dry and scale off. The interval between this scaling and a new formation of pustules was formerly one of weeks; but now, practically, does not exist, the crops being continuous.

Under Dr. Putnam, treatment by electricity was recommenced, the woman's thumb being placed in a basin of water alongside of the negative pole of a galvanic battery, the positive pole having been put either at the back of the neck or on the arm, and as strong a current used as could be borne; this at intervals of a few days.

Early in January, 1878, a pustule formed, for the first time, at the root of the nail, underneath it, accompanied by sharp pain and softening of the nail, which, after the absorption of the pustule, began to grow very fast; probably a good effect of the galvanic treatment.

January 23d, 1878. During the last fortnight the ball of the thumb has been six times superficially cauterized with the gas cautery, the skin having previously been frozen with ether spray. No special improvement was, however, noticed from this stimulation. Galvanism has now been employed since November, and under this the pains passing from the thumb along the front of the arm to the top of the shoulder have diminished, and occur only at night. So, also, the pain in the end of the thumb is present only at night, and then only during an access of the festering process. Internally the patient takes Fowler's solution, three drops ter die; and is "of the decided opinion that the thumb has done better during this treatment" by galvanism. She is able, already, to do a certain amount of sewing, and, although the ball of the thumb has become flabby, this appears to be due rather to absorption of subcutaneous tissue, than to actual atrophy of the muscles.

February 4. Nearly well.

In the case reported, (*Berliner Klin. Wochenschr*, 10 Sept., 1877,) by Dr. W. Sander, of Berlin, of "Trophic-disturbance following injury to the left median nerve," this nerve was injured by a cut four centimetres in length across the lower arm, a little above the styloid processes of the radius and ulna. Six flat, whitish, oval vesicles soon appeared, two being upon the thumb, two upon the index, and two upon the middle finger. They were from pea to bean size, and their contents, at first clear, soon became turbid, after which the vesicles dried to a scab and fell off, leaving cicatrices, which seem to form regardless of the absence of innervation. There were present in the fingers weariness, stiffness, immobility, numbness with pricking, and loss of tactile sensibility; the skin was flabby, red and smooth, and did not perspire. No change occurred in the nails while the patient was under observation. In this case the vesicles appeared in succession, the first being noticed as early as ten days after the wound, and the neuritis must be regarded as an acute process.

We may also regard this case as one of complete section of the nerve, whereas in my own the section was probably partial; for, according to Létiévant, (*loc. cit.*,) complete section of the median nerve causes immediate anæsthesia and paralysis, and eventually muscular atrophy and deformity; and Mitchell (*loc. cit.*) shows that, while, when nerves are wholly divided, blows or pressure may cause readily-healing ulcers; where nerves are partially divided, bullæ and superficial ulcers may appear, apparently without cause, assuming the form of the "sub-cutaneous whitlows" of Hutchinson, and painful or not, according as they occur in anæsthetic or hyperæsthetic regions. So, also, excessive, and even bad-smelling perspiration, especially where neuritis is present; though later, where there is loss of function from atrophic changes, both oleaginous and sudoriparous glands may cease to act.

Assuming, then, that the local manifestations in my case arose from partial section of a branch of the median nerve, are we to regard them as due to direct or reflex irritation?

Mitchell (*loc. cit*) quotes Daniellsen and Bœck as stating (*Recueil d' observations sur les Maladies de la Peau*, Christiania, 1860,) that in the anæsthetic form of leprosy the nerves undergo certain changes, propagated finally from periphery to centre, causing at first neuralgia, tingling and hyperæthesia, which become intense, followed by anæsthesia and loss of motion as from gradual compression, the earlier symptoms being related to simple congestion of the neurilemma, the latest to a hyperplasia of the connective tissues within and without the nerve sheath, causing compression of the nerve fibres, and extinction of their functional life. He adds, that nerve-wounds may attack the cutaneous nutrition directly by irritation of fibres leading to that part, or reflectively, through the centres and by uninjured filaments upon the skin. He has seen a sudden accession of inflammation in a healing wound over the injured median nerve determine an immediate outbreak of neuralgia, ulcerated matrices of nails, and vesicular eruption. Now, as we can hardly hold that the injured nerve was suppurating and exuding through the skin at its peripheral termination, like the dead nerve of a tooth through the gingival tissues, it seems fair to conclude that certain cells of the posterior cornua of the spinal cord were affected by transmission of irritation from the periphery, and that these cells again caused the actual tissue-changes in the tissues at the distal terminations of the nerves connected with these cells. In this connection, the following case is of interest:

J. M., aged forty years, shoemaker, applied to me, December 22d, 1873. In 1846, a knife was plunged into his left arm, along the inner aspect of the biceps muscle. It was seventeen weeks "before he could lift a teacup." Scar now present. In 1853, while holding a one-and-a-quarter-inch drill, a piece, an inch long, was split off and driven through his hand, between the metacarpal bones of the thumb and forefinger. Scar plain to-day. September 1st, 1872, a horny patch was noticed upon the ball of the thumb, as if this "had been burned by a hot iron." The thumb swelled, and after four days, deep fissures had formed across the ball, which was so sensitive as to prevent him entirely from working. He received the very best treatment for eczema without effect, and subsequently passed through the hands of various physicians, and, finally, of vacuum-pumpers, mesmerizers, and quacks of every description. Recently there appeared upon the ball of the thumb a blister of the size of a large bean. This he punctured, and its contents oozed out "as thick as molasses, and nearly half an inch high, and coagulated, as transparent as glass." This being washed off, the cut healed in four days; but in less than a week another smaller blister appeared, and when punctured, exhibited the same results, but took two weeks to heal, with a little watery running during this period.

At present there are horny patches, resembling those of old eczema, upon the ball of the thumb and upon the radial aspect of the tissues covering the metacarpal bone and the first phalanx of the fore-finger. On the thumb, the old skin was cracking off and new skin appearing. Pain on deep pressure. Whole thumb atrophied. The nail of this thumb was smaller and more rounded than that of its fellow. Cold is more readily and sharply felt in this thumb than in any other part of the body. Light superficial cautery was used, followed by diachylon ointment, until February 8th, when Dr. J. J. Putnam was kind enough to employ galvanism, the positive pole being placed over the palmar surface of the thumb, the negative over the median nerve at the wrist, and later over other portions, and over the vertebral column. Improvement very marked for several weeks, the nail growing also quite rapidly.

February 26. Dr. Putnam tells me that for the last two days there has been less improvement. The soft parts of the thumb are much swollen, the skin dry and shining, great itching, and last night tingling sensations up the arm on the inner side and in the elbow-joint. The nail continues to grow well. The patient describes this as the usual course of an attack, but that after twenty-four to thirty-six hours, the swelling begins to diminish, leaving the skin loose, hard and devitalized, and this then cracks and is thrown off. Gradually the end of the thumb shrinks to half its natural size. So it proved here; after which improvement was again manifested, though the fleshy parts of the thumb remained unnaturally soft; and within a fortnight the patient reported himself as "cured." A relapse, however, occurred, when he was given arsenic internally; and, externally, superficial cautery with a caustic potassa solution every second day, and was again treated by Dr. Putnam with electricity twice a week, until July, when he ceased attendance.

In August, 1877, I met him in Maine. Part of the intervening time, he stated, had been spent in the hospital for the insane. He considered that "electricity had cured" him. In January, 1878, he made the same statement upon calling upon me, with his thanks, and upon Dr. Putnam with (most justly) a new patient.

In the cases under the care of Dr. Putnam and myself we are dealing with old injuries of nerves, consequent diminished powers of resistance on the part of the tissues supplied by these nerves, and continuous irritation of these tissues by external agencies of a mechanical nature arising from the occupation of the patients. On the other hand, Prof. J. S. Jewell reports, (*Archives of Dermatol.*, July, 1877,) cases which he regards as descending neuritis, which occurred immediately after impure vaccination by subcutaneous injection of old human virus, where the lesions, more peripherally situated than the point of innoculation, were upon tissues unirritated by external agencies.

In other cases, a morbid process, not traumatic, will cause reflex or sympathetic irritation at, apparently, as great a distance as possible from itself. Thus I have seen herpes labialis followed in a day or two, by herpes of the anus, no other part of the body being affected. The reflex irritation of worms in the rectum upon the nasal mucous membrane has been observed by every one. There is at present a most interesting case under my charge, the explanation of the nature of which I owe to Dr. J. C. White. He has seen but few such cases. I never saw one before to my knowledge. In this, as in all of Dr. White's similar cases, vulvar irritation, in this case that of an old eczema, has preceded or been accompanied by a deep-seated and persistent dermatitis of the chin, the expression of a neurosis of reflex or sympathetic origin.

Or, again, the sympathy may be between the interior and the surface of the body. Thus a rosacea may be due to the frequent flushing of the face following heavy meals. An acute gastric catarrh will often be accompanied, or immediately followed, by an acne composed of miliary pustules, which dry up and scale off as the gastritis passes away. Inversely, a cold, wet cloth applied to the forehead often causes, almost at once, the vomiting necessary to relieve the sick headache of indigestion. Urticaria resulting from indigestion is only too common, and cases of alternating asthma and eczema are not very rare.

But the nerves, or their ganglia, may not merely transmit a morbid influence; this may originate with them, as has been thoroughly shown in many cases of zoster, and especially in Kaposi's well-known case of zona recurrens. So, also, general pruritus, (*Kaposi-Ueber Sensibilitats-Neurosen der Haut. Viertelj f. Derm. u. Syph.*, 1876, *III Heft.*,) hyper-and-an-æsthesia, analgesia, (*Fournier on Syph.*,) and dermatalgia represent systemic revolts where the battle-field is, very truly, the skin; but the real enemy is the nervous system.

The multifarious conditions of increased, diminished, or perverted growth due to or influenced by vaso-motor, or other nerve agencies, are too numerous to be here considered. They are well summed up up by Gamberini, (*Giorn. Ital. d. Mal. Ven. ed. Pelle.*, Aprile, 1877.) Among these may be found the nerve-nævi of T. Simon, alopecia areata, cell or pigment hypertrophies and atrophies, Hebra's erythema multiforme, Wilson's Nervous Excoriations, (*Lectures*, Lond., 1875, p. 192,) and others. Nor is it necessary to more than allude to the action of the mind upon the body through the nerves, as shown by cutis anserina, or pigment changes of the hair or skin due to mental emotion.