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LECTURES

ON

THE DISEASES OF  
THE NERVOUS SYSTEM.

DELIVERED AT LA SALPÊTRIÈRE

BY

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### LECTURE III.

#### DISORDERS OF NUTRITION CONSECUTIVE ON LESIONS OF THE SPINAL CORD AND BRAIN.

SUMMARY.—*Cutaneous affections in sclerosis of the posterior columns: papular or lichenoid eruptions, urticaria, zona, pustular eruptions; their relations with the fulgurant pains; the former appear to arise from the same organic cause as the latter.*

*Eschars of rapid development (acute bed-sores) in diseases of the brain and spinal cord. Mode of evolution of this skin-affection: erythema, bullæ, mortification of the derma, accidents consecutive on the formation of eschars: a, putrid infection, purulent infection, gangrenous emboli; b, simple purulent ascending meningitis, ichorous ascending meningitis. Acute bed-sore in apoplexy symptomatic of circumscribed cerebral lesions. It appears principally in the gluteal region of paralysed extremities; its importance in prognosis. Acute bed-sore in diseases of the spinal cord; it generally occupies the sacral region.*

*Arthropathies depending on a lesion of the brain or spinal cord. A. Acute or subacute forms; they appear in cases of traumatic lesion of the spinal cord; in myelitis occasioned by compression (tumours, Pott's disease), in primary myelitis, in recent hemiplegia, connected with cerebral softening. These arthropathies occupy the joints of paralysed limbs. B. Chronic forms; they seem to depend, like amyotrophies of spinal origin, on a lesion of the anterior cornua of the grey axis; observed in posterior sclerosis (locomotor ataxia) and in certain cases of progressive muscular atrophy.*

GENTLEMEN,—In treating of the nutritive disorders determined by lesions of the peripheral nerves, I gave you to expect that these consecutive affections would, for the most part, be represented in

cases of lesions of the spinal axis. It is true, we shall not always find here a servile imitation; indeed, as a general rule, the trophic disorders of cerebral or spinal origin, as we shall often have occasion to note, bear with them the distinctive stamp of their cause. But there are circumstances in which the resemblance between affections of central origin and those which depend on a lesion of the peripheral nerves is so striking that discrimination may be a most difficult task. We will cite, as examples of this class, certain cutaneous eruptions which sometimes supervene in the course of ataxia.

## I.

The *cutaneous affections*, to which we have just alluded, may be classified as follows: *a*, *papular* or *lichenoid eruptions*; *b*, *urticaria*; *c*, *zona*; *d*, *pustular eruptions*, analogous to ecthyma.

The following, in a few words, are the results of my observations on this subject. It is not rare to see the skin of the legs and thighs become temporarily covered with a more or less confluent papular or lichenoid eruption, consequent on paroxysms of the fulgurant or shooting pains, characteristic of locomotor ataxy. In the case of a woman, at present under treatment at La Salpêtrière, enormous patches of urticaria are produced, at every paroxysm, over the parts where the keenest pains are felt. In another case, the skin of the right gluteal region becomes covered with an herpetic eruption, limited however to the course of the nervous filaments which convey the pain. Finally, a third patient presented, under analogous circumstances, still more remarkable phenomena. This woman, aged sixty-one years, was received into the hospital on account of blindness (sclerous atrophy of the optic nerves) about eight years ago; she is now suffering from well-marked locomotor ataxia. In her case, the evolution of the disease has been very rapid, for the first paroxysms of shooting pains date from the month of March, 1865, and in July, 1866, the incoördination was so far advanced as to render walking difficult. One of these fits, which happened in June, 1867, was of exceptional intensity. The pains which were really horrible, seemed fixed, during several days, along the course of the cutaneous branches of the right lesser ischiatic nerve, and of that supplying the levator ani.<sup>1</sup>

<sup>1</sup> The nerve called "releveur de l'anus" by French anatomists, is a branch of the fourth anterior sacral nerve, although the muscle, bearing the same name, receives twigs from the superficial perineal nerve (S.).

During this time, the corresponding parts of the skin became covered with a great number of pustules, analogous to ecthyma, some of which proved the starting points of deep ulcerations. Besides this, a rounded eschar of about two inches in diameter, which involved the derm nearly throughout its whole thickness, developed in the right sacral region, a few inches from the median line immediately under the extremity of the coccyx. The sore persisting after the elimination of the sphacelated parts, cicatrisation was not complete until two months had elapsed. In another paroxysm, the flashing pains followed the direction of the vertical portion of the left internal saphenous nerve, and a pustular eruption was soon thrown out on the skin of the regions to which this nerve is distributed.

There is one character common to all these eruptions, and it is of a kind to show that we have not here to deal with common disorders,—they all make their appearance concurrently with certain intense and persistent exacerbations of the specific pains, which are in some sort pathognomonic of fasciculated sclerosis of the posterior columns, which it is customary to call fulgurant or flashing pains.

Let me add, as another character, that the eruptions in question habitually show themselves along the course of the nerves invaded by the fulgurating pain.

From what precedes you will observe that the existence of those cutaneous eruptions seems closely connected with that of the fulgurant pains: hence it becomes at least very probable that one and the same organic cause presides over the development of both the former and the latter.

What, then, is the reason of the presence of fulgurant pains among the symptoms of sclerosis of the posterior columns? I do not desire to enter to-day upon a long discussion of this question which will meet us again; it will suffice, at present, to tell you that, in all probability, these pains depend upon the irritation set up, during their intra-spinal course, in those of the nerve-tubes emanating from the posterior roots which, under the name of internal radicular fasciculi, (*internal fibrous masses of the posterior roots* in the nomenclature of Kölliker),<sup>1</sup> pass, for a certain extent, through the area of the posterior columns before penetrating the posterior cornua of the grey matter.

It appears but little possible to connect the fulgurant pains with any one of the following lesions: 1°, atrophy of posterior roots, before

<sup>1</sup> Kölliker, 'Histologie Humaine,' P. i, pp. 345, 346.

entering the cord; 2°, posterior spinal meningitis; 3°, sclerosis of the posterior cornua of the grey matter; 4°, irritative lesions of the spinal ganglia or of the peripheral nerves,—for these pains have been met with in a certain number of ataxic cases in which post-mortem examinations have demonstrated the absence of all lesions of the kinds enumerated.

In support of this proposition allow me, gentlemen, to recall the results of the autopsy which Dr. Bouchard and I made, in the case of a woman who died in this hospital, during the first period of progressive locomotor ataxia.<sup>1</sup> This patient had experienced the special paroxysmal pains, in a high degree, lasting for some fifteen years, until the epoch of her death caused by an adventitious disease. No sign of motor incoördination had ever shown itself. The patient walked with ease, without throwing forward the leg, or stamping with the heel, nor did closing the eyes affect her certainty of movement. On post-mortem examination, we saw that the posterior roots had preserved their normal characters, and beyond some equivocal traces of meningitis, the only perceptible lesions met with occupied the posterior columns and consisted of a multiplication of neuroglia-nuclei with thickening of the meshes of the reticulum, but without concomitant alteration of the nerve-tubes. To complete the demonstration, I could cite many cases of the same kind where the fulgurant pains had been likewise very intense, and where, on a post-mortem examination, I was unable to discover the existence of any alteration whatever, either in the posterior grey cornua, or in the peripheral nerves, or in the spinal meninges.

From this it would appear necessary that we should seek, in the irritative alteration of the posterior columns of the spinal cord, the starting point of the fulgurant pains of ataxic patients. But it seems scarcely probable that all parts of these fasciculi ought to be indiscriminately arraigned on this count; everything, on the contrary, induces us to believe that the sensitive fibres, issuing from the posterior roots, which compose a portion of the *internal radicular fasciculi* should alone be incriminated. These fibres would participate, from time to time, periodically, in the irritation whose permanent seat is in the columns themselves; and thus would be produced those paroxysms of shooting or flashing pains which, in accordance with

<sup>1</sup> "Douleurs fulgurantes de l'ataxie, sans incoördination des mouvements, sclérose commençante des cordons postérieurs de la moëlle épinière," in 'Comtes Rendus des Séances et Mémoires de la Société de Biologie,' 1866.

a well-known physiological law are referred to the periphery, although in reality due to a central cause.

How are we to understand the appearance of the cutaneous eruptions sometimes observed in ataxic patients, at the very time of the occurrence of fulgurant paroxysms of abnormal intensity? It is certain that the nerve fibres which form the internal radicular fasciculi are not all sensitive; there are, for instance, at least some amongst them which assist in the accomplishment of reflex actions; there are others also, no doubt, at least it is what these cutaneous eruptions tend to demonstrate, which belong to the system of centrifugal nerves and which possess a more or less direct influence over the exercise of the nutritive functions of the skin. The irritation of the latter class of fibres, an irritation more difficult to set up than that of the sensitive fibres, should be invoked to explain, in the cases I have above alluded to, the production of papular affections at one time, and, at another, of vesicular, pustular, or gangrenous disorder.

Are the posterior fasciculi the only departments of the spinal cord, the irritation of which is capable of determining such affections? This is a question which must remain unanswered for the present. All that can be said is that such eruptions have not yet been observed, except where there was some complication, in cases of irritative lesions confined to the antero-lateral columns, or to the anterior cornua of the grey matter; and as to the part which the posterior cornua may play, in this respect, we are in the most complete ignorance upon that subject.

On the other hand, some facts have been collected which tend to establish that zona is sometimes developed under the direct influence of partial lesions of the encephalon. Thus, in the case of an aged woman attacked with hemiplegia, whose history has been recorded by Dr. Duncan, an eruption of zona appeared on the thigh of the paralysed side; motor paralysis had supervened almost simultaneously with the eruption, and both passed away nearly at the same time.<sup>1</sup>

In the case of a child, recorded by Dr. Payne, the zona, which marked out the course of superficial branches of the anterior crural nerve, showed itself three days after the development of a hemiplegia occupying the same side of the body as the eruption.<sup>2</sup> These cases, which can be multiplied, are undoubtedly very interesting; unfortunately, they have been related in a very summary

<sup>1</sup> 'Journal of Cutaneous Medicine,' &c., 69. Erasmus Wilson, October, 1868.

<sup>2</sup> 'British Medical Journal,' August, 1871.

manner only, and caution is needed, I think, in drawing conclusions from them, which may prove premature. I can, in fact, cite a case in many respects analogous to the preceding, which I recently observed at La Salpêtrière, and where the cause of the zona was most probably the irritation of a peripheral nerve. Here again, the seat of the vesicular eruption was in the inferior extremity of the paralysed side, where it followed the distribution of the superficial twigs of the cutaneous perineal nerve. It showed itself also, simultaneously with the hemiplegia which, making an abrupt appearance, was correlated to the formation in one of the cerebral hemispheres of a focus of ramollissement, itself being determined by the embolic obliteration of a posterior cerebral artery. As to the zona, it was produced, I believe, after the following mechanism; a spinal arterial branch,<sup>1</sup> arising, no doubt, from one of the lateral sacral arteries was, on a post-mortem examination, found to be obstructed by a blood-clot, and to form a comparatively voluminous cord, adhering to one of the posterior spinal roots of the cauda equina. It is probable that, on its passage through the sacral foramen, this arteriole, exceedingly distended by the thrombus had compressed either the spinal ganglion, or an initial branch of the ischiatic nerve, so as to set up irritation in it. A vegetating ulceration, which was noticed on one of the sigmoid valves of the aorta appears to have been the starting point of all the accidents which we have just described.<sup>2</sup>

You will observe that, in this case, the coexistence of the hemiplegia and of the vesicular eruption resulted to a certain extent from a fortuitous coincidence. However it be, in default of zona, there are other trophic disorders of the skin, the existence of which

<sup>1</sup> One of the *rami medullæ spinalis*, see N. Rudinger, "Arterienverzweigung, in dem Wirbelcanal, &c.," in 'Verbreitung des Sympathicus,' p. 2, München, 1863.

<sup>2</sup> The following are the principal details of this case which presents a fine example of ulcerous endocarditis, with multiple emboli and a typhoid condition.

The patient Lacq, . . . aged 22 years, a soldier, was admitted on the 28th December, 1870, to the Salpêtrière ambulance (fever ward). He had been suffering, it seems, from an intense fever for two or three days. On the day of admission the following symptoms were noted: severe cephalalgia, pains in the loins, diarrhœa. The patient cannot swallow the smallest quantity of liquid without being taken with nausea and vomiting. Skin hot, pulse very frequent. It was regarded as a case of typhoid fever. Noisy delirium during the night. Next day, 29th December, was noticed the existence of an almost complete hemiplegia of the left side. The paralysed members were not rigid;

may sometimes be attributed to the influence of an encephalic lesion. This is a fact which, I hope at least, will soon be placed beyond doubt.

## II.

*Eschars of rapid development. Decubitus acutus : acute bed-sore.*<sup>1</sup>—

incomplete facial paralysis, on the left side, likewise existed. The eyes are constantly directed to the right side, and there is nystagmus. Pulse 120; rectal temperature 40·5° Cent. On the breast, fore-arms, and thighs, the skin shows a great number of little ecchymoses, somewhat resembling flea-bites,—frequent respirations, sibilant râles.—Tympanitis. On the antero-external surface of the left paralysed leg, there exists an eruption of zona which answers exactly to the distribution of the superficial twigs of the cutaneous perineal branch of the musculo-cutaneous nerve. The first group of vesicles is seen above and below the patella; a larger group is disposed in a vertical straight line which descends to the middle third of the leg; the third group occupies the neck of the foot before and inside of the external malleolus. The eruption is tolerably developed. It is remarked that some traces of it existed the day before,—that is to say, previous to the hemiplegia. On the 30th, the eruption is in full vigour. The patient succumbs at 4 o'clock in the afternoon.

*Autopsy.*—One of the sigmoid valves of the aorta is ulcerated and covered with vegetations, fibrinous, soft and reddish in appearance. The mesenteric glands are somewhat red and swollen, but there exists no trace of dothien-enterical eruptions or ulcerations in the small or large intestines. Numerous ecchymoses are observed on the visceral and parietal pleuræ, in the pericardium, and in the peritoneum. The spleen and kidneys present infarcti in different stages of development. Right cerebral hemisphere; on many points of the occipital lobe the pia mater, which is much injected, presents large patches of sanguine suffusion. The lobe itself is softened throughout nearly its whole extent; the cerebral matter there assumes a greyish colour, and at one point in the midst of the softened parts we note an effusion of blood, as big as an almond. The posterior cerebral artery of the same side is completely obliterated by a thrombus. The spinal cord, prepared with chromic acid, and examined in thin sections, presents no perceptible alterations. At the cauda equina, on the left side, we found adhering to one of the posterior spinal roots which give origin to the sacral plexus, an arteriole (spinal branch, arising from the lateral sacral artery) distended by a blood-clot. The obliterated artery, equal in size to a crow-quill, may be followed from the point where the root has been cut not far from the corresponding sacral foramen, to the spinal cord; upon this it can still further be followed the whole length of the lumbar enlargement, where it ascends along the posterior median fissure, contrary to the usual arrangement of the posterior spinal arterial plexus.

<sup>1</sup> *Decubitus* (when qualified by the adjectives *acutus*, *chronicus*, *ominosus*) signifies, not the position of the patient in bed, but the bed-sores supposed to result from such position. This term, though etymologically objectionable, is generally employed in foreign hospitals. As its adoption in this translation might confuse, and appears to be unnecessary, the term "bed-sore" has been substituted (S.).

I hasten to leave the question of eruptions occurring in locomotor ataxia, which, on the whole, have but a secondary importance, in order to draw your attention, in a very special manner, to another affection of the skin which holds a most important position in the clinical history of a considerable number of the diseases of the brain and spinal cord.

The cutaneous affection, which I am about to discuss, shows itself at first under the form of an erythematous patch, on which vesiculae and bullae are rapidly developed; it terminates very often in mortification of the skin and subjacent tissues.

Usually it occupies the sacro-gluteal regions; but it may also appear almost indifferently on all parts of the trunk or members subjected, in the decubitus, to a somewhat continuous pressure. Even a very slight and very short pressure suffices to make it appear in certain cases. Finally, there are other cases still, though these indeed are very exceptional, in which it seems to be produced without the intervention of the least pressure or of any other occasional cause of the same kind.<sup>1</sup>

This is a very different affection from all those various eruptions which are so commonly remarked over the sacrum in patients condemned by different disorders to long maintain a recumbent position in bed. These eruptions which are sometimes erythematous and lichenoid, sometimes pustular and ulcerous, sometimes papular, having a deceptive resemblance to syphilitic sores (*plaques muqueuses*), are generally occasioned by repeated and prolonged contact with irritating substances, such as urine or faecal matters. They, as well as acute bed-sore, may become the starting points of genuine eschars; but the acute bed-sore is distinguished from the former by important characters, namely: firstly, by appearing shortly after the commencement of the primary disease, or following on a sudden exacerbation; and, secondly, by a very rapid evolution.

On account of the peculiar interest belonging to it, the affection, in question, certainly deserves to be designated by an appellation proper to itself. One of the few authors who have made it a special study, Herr Samuel, has proposed to characterise it by the name of *decubitus acutus* or eschar of rapid formation. He desires thus to distinguish it from *decubitus chronicus*, that is, from the dermal necrosis which

<sup>1</sup> Brown-Séquard, 'Lectures on the Central Nervous System,' Philadelphia, 1868, p. 248. Couyba, 'Des Troubles Trophiques,' &c., Thèse de Paris, 1871 p. 43.

appears long after the invasion of the disease which occasions its existence. We propose to accept this appellation, whilst reminding you, however, that the mortification of the skin is not everything in *decubitus acutus*.<sup>1</sup> It answers, on the whole, to the most advanced phases of the morbid process. It may happen, indeed, that the vesiculæ or bullæ will dry up and disappear without that portion of the derm, on which they were seated, presenting the least trace of necrosis. This is principally observed when they are produced on parts where the pressure has only been of short duration, of little intensity, and, so to speak, accidental, as over the ankles, on the inner surface of the knees, the legs, or the thighs. Now, it behoves you to be able to recognise the significance of these vesiculæ and bullæ, from their first appearance on the scene; for, even at that period, they enable us under certain circumstances to formulate a prognosis, with certainty.

The opportunity has been given me, many times, of following as it were day by day, hour by hour, the evolution of the *acute bed-sore*, in cases of apoplexy consecutive on hæmorrhage, or on softening of the brain which we so often meet with in this hospital.<sup>2</sup>

I can refer to the observations I made in regard to this, in the general description which follows, for I have been able to establish, from another stand-point, that the acute bed-sore connected with brain-diseases does not essentially differ from that which arises under the influence of spinal lesions.

Some days or even some hours only after the manifestation of the cerebral or spinal affection, or again, following on a sudden exacerbation of these affections, there appear on certain points of the skin one or many erythematous patches, variable in extent and irregular in shape.<sup>3</sup> The skin there has a rosy hue, sometimes it is dark red, and even violet, but the colour disappears momentarily on pressure with the finger. Under somewhat rare conditions, which hitherto I have met with almost entirely in cases of spinal lesions, there appears besides, involving the derm and subjacent tissues, an *apparently phlegmonous tumefaction*, which may be accompanied some-

<sup>1</sup> See note <sup>1</sup>, p. 69.

<sup>2</sup> Charcot, "Note sur la formation rapide d'une eschare à la fesse du côté paralysé dans l'hémiplégie récente de cause cérébrale," 'Archives de Physiol. normale et pathol.,' t. i, 1868, p. 308.

<sup>3</sup> I have ascertained, anatomically, that in such cases the derm is infiltrated with leucocytes, as happens in erysipelas.

times by acute pain, if the region has not been previously smitten with anæsthesia.

On the morrow, or after-morrow, vesiculæ or bullæ make their appearance towards the central part of the erythematous patch; they contain a liquid, sometimes colourless and perfectly transparent, sometimes more or less opaque, reddish, or brown-coloured.

Matters may remain so, as we have already mentioned, and then the vesicles and blebs soon wither, dry up, and disappear. At other times, however, the elevated epidermis becomes torn, drops off in pieces, and lays bare a bright red surface strewn with bluish and violet points or patches, corresponding with a sanguine infiltration of the derm. In such cases the subcutaneous connective tissue, and sometimes even the subjacent muscles are themselves already invaded by sanguine infiltration. This fact I have repeatedly verified by post-mortem examination.

The violet patches extend rapidly in width and their edges soon run together and unite. A short time after, there supervenes in the affected part, a mortification of the derm which, at first superficial, soon grows profound. From that time, the eschar is constituted. Later on comes the development of the work of reaction and elimination, followed, in favourable cases, by a period of reparation which is too often impeded in its course. It is unnecessary for me, I think, to expatiate on this point.

I have been occupying your attention with minute details, but I trust I shall induce you to acknowledge that they have their own peculiar interest. R. Bright thought them sufficiently worthy of notice and novel enough to believe he should insist upon them in his "Reports of Medical Cases," and should get wax models made of the bullæ of *acute bed-sore*, observed in a case of traumatic paraplegia.<sup>1</sup> These models still figure, no doubt, in the museum of Guy's Hospital.

<sup>1</sup> It will not be deemed inappropriate to quote here the remarks which R. Bright has appended to his cases of affections of the spinal cord, with rapid formation of bullæ and eschars, which he has consigned to his "Reports of Medical Cases," (t. ii, 'Diseases of the Brain and Nervous System,' London, 1831). First comes a case where softening of the spinal cord supervened, without any known external cause, in a young woman aged 21; the lesion occupied the lumbar enlargement immediately above the cauda equina. The case suggested the following reflections:

"Another curious circumstance connected with paralysis of the lower extremities is illustrated by this case:—the tendency which is observed in such

Since then, as far as I know, this subject has but slightly arrested the attention of observers, with a few rare exceptions.<sup>1</sup> It would be unjust, however, not to acknowledge that, in cases of typhus and typhoid fevers, a cutaneous affection, which offers the closest analogies with this disorder and which, perhaps, partly depends on analogous conditions, has been minutely described in France by Piorry,<sup>2</sup> and in Germany, by Pfeüfer.<sup>3</sup>

Let us return, gentlemen, to the *bed-sore* provoked by diseases of the nervous centres. You know too well the accidents which eschars, from whatever cause arising, are capable of engendering for me to indulge in a detailed description. Allow me, however, to sketch out in a few words the principal amongst them, for you must expect to see them often figuring in the last period of a great number of affections of the brain, and especially of the spinal cord.

The eschars, if they but attain a certain extent, constitute, as you are aware, dangerous foci of infection; and, in fact, putrid intoxications to the formation of vesications or bullæ, which frequently make their appearance in a night, on some part, as the knee, the ankle, or the instep, where accidental pressure or irritation has taken place; they contain a limpid fluid which after a few days becomes opaque. It has sometimes struck me that this connexion between interrupted nervous action and the formation of bullæ, might hereafter be found to throw light on that most singular disease herpes zoster which, from the peculiar pain with which it is accompanied, as well as from its strict confinement to one side of the body, seems to be connected with some peculiar condition, perhaps the distension of the sentient nerves." (p. 383.)

Three other cases relating to traumatic lesions of the spinal cord (caused by a fall from a height, the passage of a wagon, &c.) are commented on as follows:

"The two most remarkable points to be incidentally noticed in the foregoing cases are, first, the diseased state of the bladder, resulting from its diminished power to resist injury, and from the changes taking place in the condition of the urine, detained in its most depending part, which becomes one of the most frequent causes of fatal irritation in paraplegia;—and secondly, we observe the occurrence of bullæ on the paralysed limbs, to which circumstance I have already alluded in some remarks made at p. 383; the general inability to resist injury is likewise marked by extensive sloughing of all the paralysed parts on which pressure is made." (p. 423.)

<sup>1</sup> After R. Bright, we must specially refer to Sir Benjamin Brodie ("Injuries of the Spinal Cord," 'Med.-Chir. Transactions,' t. xx, 1837,) and Brown-Séquard (*loc cit.*).

<sup>2</sup> A. Touzé, "Des dermopathies et des dermonécroses sacro-coccygiennes," Thèses de Paris, 1853.

<sup>3</sup> Kerchensteiner's "Bericht," in 'Henle und Pfeüfer's Zeitschrift für rationelle Medicin,' Bd. v. See also Wunderlich, 'Pathologie,' t. ii, p. 285.

tion, denoted by a more or less intense remittent fever, is one of the complications they most commonly provoke.

Next comes *purulent infection*, with production of metastatic abscesses in the viscera.<sup>1</sup> This species appears to be seldom met with.

We shall also notice *gangrenous emboli*. In this variety, thrombi impregnated with gangrenous ichor are transported to a distance and give rise to gangrenous metastases, which are principally observed in the lungs. This is a point upon which Dr. Ball and myself have insisted in a work published in 1857.<sup>2</sup> But long before us, and even long before the theory of embolism had been Germanised, M. Foville had expressed his opinion that a considerable number of cases of pulmonary gangrene, observed in the insane, and in different diseases of the nervous centres, are caused by "the transport into the lungs of a part of the fluid which bathes the eschars of the breech."<sup>3</sup>

The process of mortification tends gradually to invade the deeper tissues. The ruin that results is sometimes carried to the highest degree; thus the trochanteric serous bursæ may be laid open, the trochanter denuded of its periosteum, the muscles, the nerve-trunks, and arterial branches of a certain calibre laid bare. But the most dangerous accidents are those determined by the denudation and loss of substance of the sacrum and coccyx, the destruction of the sacro-coccygean ligament, and the consecutive opening of the sacral canal or arachnoid cavity. In consequence of these disorders, the pus and the gangrenous ichor may proceed to infiltrate the fatty cellular tissue which envelops the dura mater, or even, if this membrane be destroyed in any point, it may penetrate into the cavity of the arachnoid.<sup>4</sup>

Under such circumstances, grave cerebro-spinal complications

<sup>1</sup> Billroth und Wäckerling, in 'Langenbeck's Archiv für Klin. Chir.,' Bd. i, 1861, § 470. Fracture of the sixth dorsal vertebra, rapid formation of eschar on sacrum. Manifest symptoms of pyæmia: six or eight abscesses on the surface of the kidneys. Midderdorf, 'Knochenbrüch,' § 62. Fracture of the eighth dorsal vertebra. Rapid formation of eschar; pyæmia; metastatic abscesses in the lungs.

<sup>2</sup> "De la coïncidence des gangrènes viscérales et des affections gangréneuses extérieures, in 'Union Médicale,' 26 et 28 Janvier, 1860.

<sup>3</sup> 'Dictionnaire de Méd. et de Chir. Prat.,' t. i, p. 556.

<sup>4</sup> B. Brodie, *loc. cit.*, p. 153. Velpeau, 'Anatom. Chirurgicale.' Ollivier (d'Angers) 'Traité des maladies de la moëlle épinière,' t. i, pp. 314, 324, 3rd edition, 1837. Moynier, "De l'eschare du sacrum et des accidents qui peuvent en resulter" ('Moniteur des Sciences Médicales et Pharmaceutiques,' Paris, 1859). Lisfranc, 'Archives Générales de Médecine,' 4e année, t. xiv, p. 291.

supervene; they may be collected into two principal classes. At one time we see a *simple purulent ascending meningitis*; at another, a sort of *ichorous ascending meningitis*, of which Lisfranc and Baillarger have reported many remarkable examples. In such a case, it is found that a puriform, greyish, acrid, and fœtid liquid steepes the meninges and the cord itself, sometimes the lower part only is bathed in it, sometimes the whole cord. This liquid is occasionally found at the base of the encephalon, in the fourth ventricle, in the aqueduct of Sylvius, and even in the lateral ventricles. In all these points the cerebral matter is discoloured at its surface and to a certain depth, taking a slaty bluish tint which has several times been considered, but very wrongly, as constituting one of the characters of gangrene of the brain.<sup>1</sup> M. Baillarger was the first, I believe, to recognise the real nature of this alteration. What we have to note there is, above all, a phenomenon of imbibition, maceration, and *dyeing*. Remark that always, when ichorous cerebral meningitis has a sacral eschar as its starting point, the slaty tint is found throughout the whole extent of the spinal cord, it is constantly better marked there than in the encephalon, and more manifest the nearer you keep to the eschar. On the contrary, in the case where a sanious ulcer of the face, a canceroid for instance, after having destroyed the bone, has denuded the dura mater, the slaty coloration induced by ichorous maceration may, as I have many times observed, remain limited to the anterior lobes of the brain, in the regions corresponding to the bottom of the ulcer.

To these complications which I have been only able to indicate in a very summary manner, we must with Ollivier (d'Angers) connect the grave cerebral or cerebro-spinal symptoms, as yet but ill-defined, which rapidly terminate life in a great number of cases of disease of the spinal cord.

We have now to enter upon details and to show you the principal circumstances under which acute bed-sore is produced, under the influence of lesions of the brain and of the spinal cord, as well as the varieties of position and of evolution which it presents, according to the variety or seat of the lesion which has provoked its appearance. We shall also have to inquire whether the mode of production of this trophic lesion of the skin comes under the general theory which we have hitherto had to accept. With this

<sup>1</sup> Dubois (d'Amiens), 'Mémoires de l'Académie de Médecine,' t. xxvii, p. 50, 1865, 1866.

aim, we shall successively review the different affections of the brain and of the cord which may give rise to acute bed-sore.

A. *Of acute bed-sore in apoplexy symptomatic of cerebral lesions in focal centres.* It is especially observed in the apoplexy consecutive on intra-encephalic hæmorrhage, or on partial softening of the brain. But it may also be produced in meningeal hæmorrhage, in pachymeningitis, and finally in cases when intra-cranial tumours give rise to apoplectiform attacks. The latter have often given me opportunities for observing it in patients attacked with partial encephalitis caused by wounds received in battle.<sup>1</sup>

<sup>1</sup> The courtesy of my colleague, M. Cruveilhier, surgeon to La Salpêtrière, enables me to record the following fact, which I give as an example of the last-mentioned class.

The patient, Louis Ernst, a Saxon soldier, was picked up, at Villiers, on the field of battle, Nov. 30, 1870, and brought to the ambulance of La Salpêtrière, the same evening about nine o'clock. A bullet had traversed his skull, piercing it through and through; one of the orifices was situated on the upper part of the forehead, a little to the left of the median line; the other, on the right side, about the middle of the parietal bone. The cerebral substance protruded, like a mushroom, through the last-named orifice. The temporal region and the upper eyelid of the right side were ecchymosed and tumefied; profound coma. December 3rd, somnolence; the patient, when interrogated sharply, mutters some inarticulate sounds; he puts out the tongue perfectly, when told; deglutition proceeds with ease. Almost complete hemiplegia is found to exist, with flaccidity of the muscles of the members of the right side. From time to time, without provocation, a sort of spasmodic contraction occurs in the superior member of this side, causing momentary pronation of the arm. The diaphragm seems to be also, from time to time, the seat of analogous contractions. The respiration, irregular at times, is calm, without stertor. There is no deviation of head, or eyes. The labial commissures are not drawn to one side. Sensibility appears much blunted over all parts of the body. No vomiting. Pulse very frequent, 140. December 4th (fifth day), same state as the previous day, but the somnolence is more intense than yesterday; contractions of the facial muscles are induced with difficulty, on forcibly pinching the skin. Involuntary passage of urine and fæces. Skin warm, covered with perspiration; axillary temperature 41° C. *The commencement of an eschar is observed on the right gluteal eminence (the paralysed side); nothing of the kind exists on the left. On the inner surface of the right thigh, a little above the knee, on a point where the flexed left knee seems to have exercised a rather prolonged pressure during the night, a bulla is found, about the size of an almond, full of a lemon-coloured liquor and surrounded by an erythematous zone, of little extent. The left knee, in the part where the pressure must have been, shows no trace of erythema or of epidermic elevation. The patient succumbed on the 5th December.*

*Autopsy.*—The two cerebral hemispheres, at their middle and superior parts,

The erythema, in all cases of this kind, usually shows itself from the second to the fourth day after the attack, rarely sooner, sometimes later. It affects a peculiar position. It is not in the sacral region, so commonly invaded in cases of spinal affection, that it develops, nor on any point of the median parts, but towards the centre of the gluteal region, and, most usually, if there be unilateral lesion of the brain, exclusively on the side corresponding with the hemiplegia. (Fig. 3.)

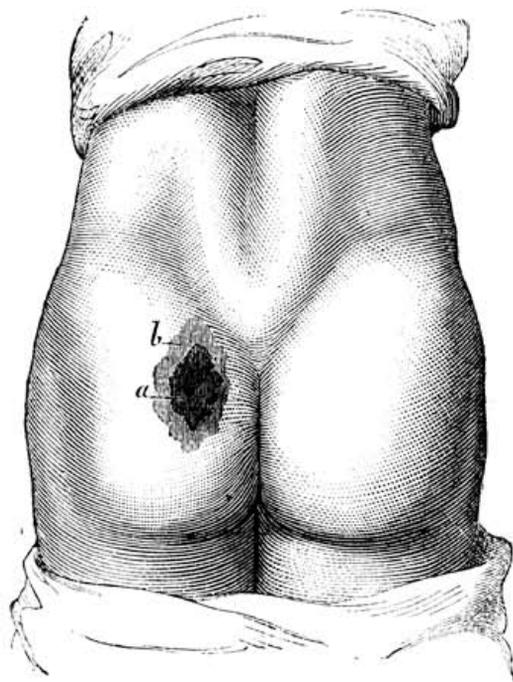


FIG. 3.—Gluteal eschar of the paralysed side in a case of apoplexy, consecutive on hæmorrhage: *a*, mortified portion; *b*, erythematous zone.

On the morrow or after-morrow, the bullous eruption and then in the points corresponding to the internal extremities of the anterior and posterior marginal convolutions, are transformed into a confused mess, partly reddish, where little disseminated clots are found here and there; partly bluish (slate-coloured). On a transverse section it is found that the softening extends to the centrum ovale (majus) of Vieussens, to the vicinity of the lateral ventricles, which however it does not attain, even on the left side, where the focus of the encephalitis is much more extensive, in all directions, than on the right. The optic thalami and corpora striata are perfectly normal. In the vicinity of the softened parts of the brain, the dura mater is covered with a neo-membrane, of fibrinous character, and purulent in parts. The cranium is found to be fractured in several parts, in the neighbourhood of the orifices which gave passage to the projectile.

the ecchymotic blotch make their appearance on the central part of the erythematous patch, that is, about two inches from the intergluteal fissure, and about an inch and a half beneath a supposititious line, drawn from its upper extremity, perpendicularly to its direction. Next, mortification of the derm supervenes in this same point, and it rapidly spreads, if the patient survive; but it is rather rare, on the whole, for the acute bed-sore of apoplectic sufferers to reach the stage of confirmed eschar.

It is likewise uncommon to observe, in addition to the gluteal eruption, bulke or vesicles developed on the heel, the internal surface of the knee, and, in short, on the several points of the paralysed lower extremity which may be subjected to a slight pressure.

I should not omit to point out to you that, according to my observations, this skin-affection appears but very exceptionally in cases which are to have a favourable termination; its appearance therefore constitutes a most inauspicious sign. We might, in fact, call it *decubitus ominosus*, or *ominous bed-sore*, by way of distinction. This symptom, I repeat, is rarely deceptive, and as its existence may be discerned from the first days, it consequently acquires, as you will understand, a great value in doubtful cases. The very marked lowering of the central temperature, beneath the normal rate, observable at the outset of an attack, is to my knowledge the only sign that can rival the preceding, in cases of sudden hemiplegia.

The circumstances in which acute bed-sore of apoplectic patients develops, evidently do not permit us to refer to the intervention of pressure on the parts where it appears, as the only element in its production. The pressure is the same on both nates, but the eruption is exclusively produced, or at least always predominates in that of the paralysed side. Many a time I was careful to make the patient repose upon the non-paralysed side, during the greater part of the day, and this precaution has not in any way modified the production of the eschar. Besides, what, in such a case, could be the influence of a pressure which is only in operation for two or three days? Nor can the irritating contact of urine be given as the cause. In several cases, I have had this liquid drawn off hour by hour, day and night, during the whole time of the disease, in order to avoid as much as possible the irritation of the skin of the seat, and in spite of every care, the eschar was produced in accordance with the rules I have indicated.

What may be the organic cause of this singular trophic lesion?

I was long under the impression that this lesion should be considered as one of the effects of neuro-paralytic hyperæmia, which betrays itself always, in a more or less prominent manner, you are aware, in members struck with hemiplegia of cerebral origin, by a comparative elevation of temperature. But this hypothesis is, as we shall see, open to a number of objections. The facts which will be set forth, as we proceed, render it probable that we must here recognise the irritation of certain regions of the encephalon, which, in the normal state, are believed to exercise a more or less direct influence over the nutrition of different parts of the external tegument.

B. *Of acute bed-sore of spinal origin.* When acute bed-sore appears under the influence of a lesion of the spinal cord, it shows itself in the very great majority of cases in the sacral region—and consequently above and internal to the chosen seat of eschars of cerebral origin. Here it occupies the median line and extends symmetrically, on either side, towards the adjacent parts. (Fig. 4.) It

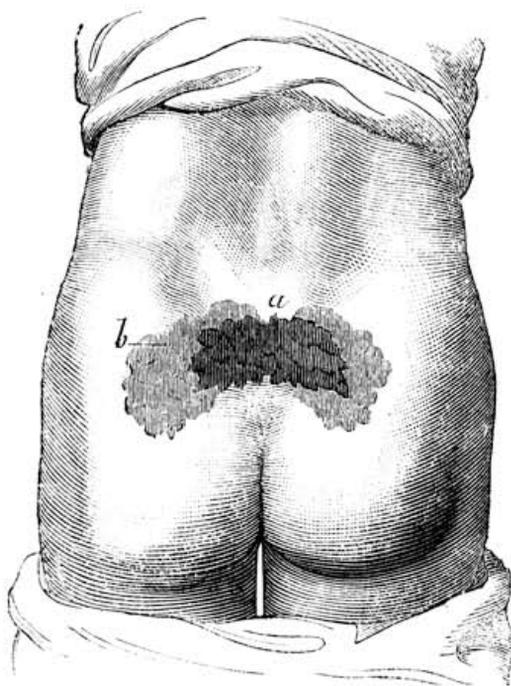


FIG. 4.—Eschar of the sacral region in a case of partial myelitis occupying the dorsal region of the spinal cord: *a*, mortified portion; *b*, erythematous zone.

may, indeed, happen that only one side will be affected—in the case,

for instance, where a lateral half of the cord is alone engaged, and then the cutaneous lesion frequently shows itself on the opposite side of the body from the spinal lesion.

The influence of attitudes here plays an important part. Thus it is customary when the patients are so placed as to repose on the side, during part of the day, to find, besides the sacral eschar, vast necrosive ulcerations developing on the trochanteric regions. It is also common enough to see, contrary to what happens in cerebral cases, that the different parts of the paralysed limbs which are exposed to even slight and brief pressure, as the ankles, heels and inner surface of knees, present lesions characteristic of acute bed-sore. Eschars may also show themselves, but indeed very rarely, on a level with the apex of the scapula, or over the olecranon process.<sup>1</sup>

Speaking generally, we may say that the spinal lesions which produce acute bed-sore are also those which give rise to rapid muscular atrophy and to other disorders of the same class. The almost simultaneous development of these different consecutive affections makes it seem probable, already, that they have a common origin.

It behoves us to remark, however, that this rule is far from being absolute. As a matter of fact, it is a characteristic of certain spinal affections that rapid muscular atrophy is developed without being accompanied by eschars; whilst there are others, on the contrary, where the eschars may be produced without the nutrition of the muscles in the paralysed limb being affected. This is, in truth, a fact of great interest from the stand-point of pathological physiology, and one which we shall take care to bring into prominence. (Fig. 4).

(a) We will mention, in the first place, the traumatic lesions of the spinal cord, those in particular which result from fractures or luxations of the vertebral column. Numerous cases of this kind, recorded by Bright,<sup>2</sup> Brodie,<sup>3</sup> Jeffreys,<sup>4</sup> Ollivier (d'Angers),<sup>5</sup>

<sup>1</sup> W. Clapp, 'Provenc. Med. and Surg. Journal,' 1851, p. 322, and Gurit, *loc. cit.*, p. 110, No. 76.

<sup>2</sup> R. Bright, 'Report of Medical Cases,' t. ii, pp. 380, 432, London, 1821.

<sup>3</sup> B. Brodie, 'Medic.-Chirurg. Transactions,' p. 148, t. ii, 1836.

<sup>4</sup> Jeffreys, "Cases of fractured spine," in 'London Med. and Surg. Journ.,' July, 1826.

<sup>5</sup> Ollivier (d'Angers), *loc. cit.*, t. i.

Laugier,<sup>1</sup> Gurlt,<sup>2</sup> and some others,<sup>3</sup> show with what rapidity sacral eschars may be produced in such cases. In order to enable you to form distinct ideas, in relation to this, I shall request permission to relate briefly some of these cases.

In one case, reported by Dr. Wood, of New York,<sup>4</sup> there was fracture of the seventh cervical vertebra, resulting from a fall down stairs; death took place four days after the accident. From the second day, redness of the sacral region was noticed, and a bulla formed at the coccyx. Hæmaturia supervened on the third day.

A fall from a height determined complete diastasis of the sixth and seventh cervical vertebræ; death supervened sixty hours after the accident, and, at that period, a well-marked bed-sore was already visible. This fact is recorded by Dr. Büchner, of Darmstadt.<sup>5</sup>

One of Jeffrey's cases relates to the fracture of the fourth dorsal vertebra; a confirmed eschar occupied the sacral region, from the fourth day. The eschar supervened three days after the accident, in a patient whose history has been narrated by Ollivier (d'Angers), on the authority of Guersant, and who had received a bullet in the body of the eighth dorsal vertebra.

Another case, given by Jeffreys, is particularly worthy of interest. The patient had fallen, from a ladder, a height of twenty-five feet. On post-mortem examination it was found that the bodies of the seventh and eighth dorsal vertebræ were broken in several pieces, and had been much displaced. On the day of the fall, the skin was cold, and the pulse barely perceptible. All the parts below the fracture were deprived of sensibility and motion. Next day, there were continual erections; "then supervened phlyctænæ in the region of the sacrum," and, on the same day, "the patient recovered his sensibility." I point out this last feature to your attention, because many authors have endeavoured, very erroneously, as you see, to make anæsthesia play an important part in the pathogeny of acute bed-sore of spinal origin. The persistence of sensibility, in the parts situated below the lesion, is also marked out, in a more

<sup>1</sup> Laugier, "Des lésions traumatiques de la moëlle épinière," 'Thèse de concours,' Paris, 1848.

<sup>2</sup> E. Gurlt, 'Handbuch der Lehre von den Knochenbrüchen,' 2 Th. i. Liefer Hamm. 1864.

<sup>3</sup> See an interesting chapter on this subject in Herr Samuel's work, *loc. cit.*, p. 239.

<sup>4</sup> Gurlt, *loc. cit.*, Tableau No. 97.

<sup>5</sup> Gurlt, *loc. cit.*, No. 86.

or less explicit manner, in a case recorded by Colliny,<sup>1</sup> relating to a fracture of the seventh cervical vertebra, where the eschar appeared on the fourth day, as well as in a case mentioned by Ollivier (d'Angers),<sup>2</sup> where there was fracture of the twelfth dorsal vertebra. The eschar, in the latter case, made its appearance on the thirteenth day.

It is useless to multiply these examples, for all surgeons agree in acknowledging that the rapid formation of eschars is one of the most common of the phenomena consecutive on spinal lesions resulting from fracture with displacement of vertebræ. According to Gurlt, whose opinion as regards this subject is based on the study of a very large number of observations,<sup>3</sup> it is from the fourth to the fifth day after the accident that the first symptoms of acute bed-sore most usually commence to appear; but they may, as we have just seen, set in much earlier, as on the second day, and even sooner. It seems, and the remark has been made by Brodie, that the production of eschars occurs early in proportion as the lesion affects a high point of the cord. On the other hand, it would result from the statistics drawn up by J. Ashhurst that nutritive troubles become frequent in proportion as the wound is lower down. Thus, according to this author, eschars were only observed in three cases, after lesions of the cervical region (being 1/41 per cent.); twelve times (or 9/23 per cent.) for the dorsal region, whilst as regards the lumbar region, the proportion rose to 12 per cent. (seven cases).<sup>4</sup>

Priapism, clonic convulsions of variable intensity, supervening in the paralysed members, either spontaneously or induced, tonic convulsions coming on in paroxysms—all those symptoms, which usually reveal a state of irritation of the cord and meninges, have been many times mentioned among the phenomena which, in fractures of the vertebral column, precede, accompany, or closely follow the precocious formation of eschars.

In such circumstances, as we have already seen, anæsthesia of the parts smitten with motor-paralysis, is not a constant fact. As to the remarkable elevation of temperature of which these parts some-

<sup>1</sup> Quoted by Ollivier (d'Angers), *loc. cit.*

<sup>2</sup> Sensibility was also preserved in Dr. Büchner's case, quoted above, where the eschar appeared before the close of the third day.

<sup>3</sup> See Gurlt, *loc. cit.*, p. 94, analysis of 270 cases.

<sup>4</sup> J. Ashhurst, "Injuries of the Spine, with analysis of nearly 400 cases," Philadelphia, 1867.

times become the seat in consequence of vaso-motor paralysis,<sup>1</sup> it cannot now be ascertained whether it was then present or not, the attention of the observers not having been drawn to this particular phenomenon. We shall note, on the contrary, as a symptom which shows itself frequently at the same time as the acute bed-sore, the emission of sanguinolent urine, alkaline in reaction, and sometimes purulent. This is a fact to which we shall have occasion to revert. Necroscopical examination, hitherto, has not, in general, revealed anything in connection with spinal lesions which can be considered peculiar to the cases where rapidly developing eschars are produced. We frequently, however, find mention made of alterations of the spinal cord, which place beyond doubt the existence of an inflammatory process; the presence of purulent infiltration, and even the formation of abscesses in the midst of the softened parts, have been observed in several instances.

6. The study of cases of hemiparaplegia, consecutive on wounds involving only a lateral half of the spinal cord, may furnish useful information concerning the pathogeny of acute bed-sore, and of some other trophic disorders of spinal origin. We learn, from the experiments of M. Brown-Séguard, that, after wounds of this kind, there supervenes in animals motor-paralysis of the lower extremity, on the same side with the lesion. The limb presents also a more or less marked degree of exaltation of tactile sensibility, and it likewise offers a notable elevation of temperature correlated with vaso-motor paralysis. The opposite limb preserves, on the contrary, its normal temperature and power of motion, whilst the tactile sensibility is much lessened, and may even be extinct. All these particulars are exactly reproduced in man under analogous circumstances. In his

<sup>1</sup> In a case of fracture of the vertebral column in the dorsal region, observed by J. Hutchinson, on the second day after the accident, the temperature of the feet, taken at the inner ankles, rose (to 101° F., or) above 38° Cent. In the normal state, according to observations made in London Hospital, by Dr. Woodman, the thermometer placed between the two first toes gave an average of 27·5° C. (81·5° F.), the maximum being 34·5° C. (94° F.), and the minimum 21·5° C. (70° F.). See J. Hutchinson, "On Fractures of the Spine," in 'London Hospital Reports,' t. iii, 1866, p. 363. See also H. Weber and Gull, in 'The Lancet,' Jan. 27, 1872, p. 117. Clinical Society of London. [See also Mr. J. W. Teale, "Case of Remarkable Elevation of Temperature" after injury of the spine, in a young lady, where 122° F. (50° C.) is stated to have been observed, 'Lancet,' 1875, p. 340; and J. Hutchinson, "On the Temperature and Circulation after Crushing of the Cervical Spinal Cord," 'Lancet,' 1875, pp. 714, 747.] (S.)

case, as in that of animals, we may also find different trophic derangements supervening, which appear almost simultaneously, and which are all manifestly due to spinal lesion. Among the nutritive lesions of this kind observed in man, we would especially point out the rapid diminution of the (faradaic) electrical contractility of the muscles, soon followed by atrophy,—a particular form of arthropathy to which I shall refer in a few moments—and finally, acute bed-sore. It is a remarkable thing that, whilst the arthropathy and muscular atrophy are to be found in the limb on the same side with the lesion, the eschar seems to prefer, as we have already remarked, to show itself on the member of the opposite side, where it occupies the sacral region, and the gluteal, in the immediate neighbourhood of the former. This peculiar disposition of the eschar in relation to the seat of the spinal lesion is, according to what M. Brown-Séguard has told me, a constant fact in the case of animals; in man, it has already been several times observed.

As an example of the class, I shall briefly cite the following facts:

A man, aged twenty years, whose history has been related by M. Viguès,<sup>1</sup> received on the back of the thorax, between the ninth and tenth dorsal vertebræ, a sword cut which, to judge from the symptoms, injured the left lateral half of the spinal cord chiefly. Motor paralysis immediately ensued, which, at first affecting both the lower extremities, appeared from the next day to be almost entirely confined to the left leg. Hyperæsthesia is very manifest in the latter member; the right limb presents, on the contrary, a well-marked obnubilation of sensibility, whilst the power of motion has nearly quite returned. The symptoms showed rapid improvement up to the twelfth day after the accident; on that day it was remarked that, without perceptible cause, the *left leg*, still more sensitive than in the normal state, had increased in volume, and also that in the left knee-joint there had accumulated a quantity of fluid sufficient to keep the patella raised half an inch above the condyles. Two days later an eschar was observed occupying the *right lateral* part of the sacrum and right gluteal region.

The case recorded by MM. Joffroy and Salomon,<sup>2</sup> of one of Dr. Cusco's patients, which was recently communicated to the *Société de Biologie*, reproduces, as it were, the foregoing case, even in its smallest details. In the former, as in the latter, after a traumatic

<sup>1</sup> Brown-Séguard, 'Journal de la Physiologie,' &c., t. iii, p. 130, 1863.

<sup>2</sup> 'Gazette Médicale de Paris,' Nos. 6, 7, 8, 1872.

lesion affecting one lateral half of the cord in the dorsal region, we find motor paralysis supervening in the inferior extremity that corresponds to the injured side; this limb presents a notable augmentation of temperature—a fact not mentioned by Viguès, though probably present—and manifest hyperæsthesia; whilst the opposite limb, unharmed in its motor functions, offers a remarkable diminution of all kinds of sensibility whilst preserving the normal temperature. In addition—and this is the point which we desire to put especially forward—shortly after the accident, and without any appreciable cause, there supervened an arthropathy in the knee of the paralysed limb, whilst, in the vicinity of the sacral region, the nates of the member deprived of sensibility but not paralysed in motion, became the seat of an eschar.<sup>1</sup>

<sup>1</sup> On account of the interest connected with it, we shall mention the principal details of this case.

The patient, Martin, aged about 40 years, was stabbed with a poignard, in the night of the 15-16th February, 1871. The weapon entered at the third dorsal vertebra. The direction of the wound is downward, backward, and to the right. Having been brought to hospital immediately after the wound, it was observed that, even then, the left inferior extremity was completely stricken with motor-paralysis, whilst the corresponding member on the other side showed nothing of the kind. February 16th, in the morning, the following note was made:—Left lower extremity, complete motor-paralysis. The limb is perfectly flaccid; no trace of contraction, or rigidity, no spasmodic movements, nor subsultus. On the contrary, sensibility appears in the same limb to be exaggerated in all its modes; the least touch of the skin, especially near the foot, causes pain. Pressure has the same effect. A slight pinch or a tickle is followed by very painful sensations. Finally, the contact of a cold surface also produces painful sensations which the patient compares to those producible by a series of prickings. Right lower extremity: all the voluntary movements are perfectly normal, but *per contra*, the sensibility is almost completely destroyed. Complete analgesia; sensitiveness to touch almost null. The contact of a cold body is marked by an obscure dull prickling sensation. The insensibility is not limited, on the right, to the lower limb; it ascends to a level with the nipple. The urine and fæces passed involuntarily.

February 24th (eighth day).—The same phenomena are observed; in addition it is noted that the left (motor-paralysed) limb is warmer than the right. The patient complains of a sensation of constriction or rather of compression at the base of the thorax.

March 5th (seventeenth day).—The patient complains of troubled sight: the left pupil is more contracted than the right, and the vessels of the left eye are more voluminous and more numerous than those of the right eye. The evacuations have again become voluntary, for two days past. The state of the lower extremities is still unchanged.

March 13th (twenty-fifth day).—The right nates, since yesterday, has been

I take the following case from an interesting work by Herr W. Müller:<sup>1</sup> in this instance the arthropathy is not mentioned; on the other hand, we find mention of rapid wasting of the muscles of the paralysed limb, preceded for several days by a well-marked diminution of faradaic contractility. In all other matters, Müller's observation is in conformity with those of MM. Viguès and Joffroy. The case is that of a woman, aged 21, who received a stab with a knife in the back, at the fourth dorsal vertebra; the weapon, as the autopsy demonstrated afterwards, had completely divided the left lateral half of the spinal cord, two millimètres above the third dorsal pair. On the very day of the accident complete paralysis and hyperæsthesia of the left lower extremity was observed; the opposite limb was anæsthetic, but not paralysed. On the second day it was found that the muscles of the paralysed member and those of the lower part of the abdomen gave no reaction under the influence of faradaic stimulation, whilst, in the homologous parts of the opposite side, the electrical contractility remained normal. On the eleventh day an eschar was formed, occupying the sacral region and extending to the right gluteal eminence. On the same day, it was remarked that the paralysed limb had notably wasted away, measuring about two inches less in circumference than the anæsthetic member. Death occurred on the thirteenth day. On a post-mortem examination, the borders of the spinal wound appeared tumefied, and of a reddish-brown colour; a thin purulent layer covered it. Below the wound the left lateral column, throughout its whole length, offered the anatomical characteristics of descending myelitis.

The simultaneous appearance of different trophic disorders noted in these cases, and in some others of the same kind, seem to indicate a common cause. This cause, to all appearance, is nothing the seat of vivid redness, and the epidermis has already fallen off from a part of the erythematous patch.

March 14th.—The derm is denuded to the size of a crown-piece on the right nates, near the sacrum: it is also ecchymosed (*acute bed-sore*). On Feb. 24th, it had been already remarked that some pain was felt when the left knee (motor-paralysed limb) was moved; to-day, it is noted that this joint is swollen and red, and that it is, besides, the seat of spontaneous pains, exaggerated on movement (spinal arthropathy).

March 24th.—An ulceration, this day covered with granulations, has formed on the right nates, on a level with the ecchymosed patch. The swelling, redness, and pains have almost completely disappeared from the left knee.

<sup>1</sup> W. Müller, "Beiträge zur pathologisch Anatomie und Physiologie des menschlichen Rückenmarkes," Leipzig, 1871. Obs. i.

other than the extension to certain regions of the inferior segment of the cord, of the inflammatory action originally set up in the immediate vicinity of the wound.<sup>1</sup>

That being admitted, it would seem legitimate, relying on the facts stated in the preceding lecture, to assign the rapid and general atrophy of the paralysed muscles, noted in Herr Müller's case, to the invasion of the anterior cornu of the grey substance throughout the whole extent of the cord, whence nerves are given forth to the paralysed muscles; the invasion in question taking place either progressively by direct downward propagation; or indirectly by the lateral columns. This lesion of the anterior cornu we shall mention, in a moment, to explain the development of the arthropathy described in the observations of Viguès and Joffroy. Now, with respect to the eschars, their appearance on the side opposite the spinal lesion tends to establish that the nerve-fibres (whose alteration, under such circumstances, provokes the mortification of the external tegument) do not follow the same course as those which influence the nutrition of joints and muscles, and that they, on the contrary, decussate in the cord in the same manner as the nerve-fibres subserving the transmission of tactile impressions.

Another item of information which we get from cases of hemiparaplegia consecutive on a unilateral lesion of the spinal cord, is this, namely: acute bed-sore may show itself independently of all neuroparalytic hyperæmia, since we observe it forming upon that side of the body where the vaso-motor nerves are not affected.

c. I shall now mention the case where myelitis results, not, as in the preceding instance, from a wound or attrition of the spinal cord, but from indirect traumatic influence, such for example as an effort made in raising a weight. Acute bed-sore may, in cases of this kind, be produced as rapidly as though there had been fracture of the vertebral column, as the following fact recorded by Dr. Gull demonstrates:

A man, aged 25, by trade a labourer in the London Docks, felt, after lifting a load, a sudden pain in his back. He was

<sup>1</sup> In a work, recently published, I have endeavoured to establish that, after wounds of the spinal cord, irritative lesions such as hypertrophy of the axis-cylinders, proliferation of myelocytes, &c., may be observed at some distance from the spinal wound, above and below it, scarcely twenty-four hours after the accident. Charcot, "Sur la tumefaction des cellules nerveuses, motrices, et des cylindres d'axe des tubes nerveux dans certains cas de myélite," in 'Archives de Physiologie,' No. 1, 1872, p. 95. Obs. i.

able to walk to his home, about a mile off. On the morning of the second day after, his lower limbs were completely paralysed; two days later, or four days after the accident, an eschar had begun to form on the sacral region, and the urine which flowed from the bladder was ammoniacal. The patient succumbed ten days after paralysis had set in. At the post-mortem examination, it was noted, after careful scrutiny, that the bones and ligaments of the vertebral column presented no lesion; in the neighbourhood of the fifth and sixth dorsal vertebræ the spinal cord was transformed throughout its whole breadth into a thick liquid, muco-purulent in appearance and in colour both brown and greenish.<sup>1</sup>

Following the example of traumatic myelites, spontaneous acute myelitis also very frequently determines the precocious formation of sacral eschars, principally when it sets in suddenly, and when the evolution is rapid. In order not to enter on lengthy details, in connection with this matter, I shall confine myself to indicating some examples illustrative of this class of cases. The sore has been noticed on the fifth day in a case reported by Mr. Duckworth,<sup>2</sup> on the sixth day in the case of a patient under the care of M. Woilliez, which M. Joffroy has communicated to me; on the ninth day in an observation of M. Engelken, on the twelfth day in another case related by the same author;<sup>3</sup> finally, in a case of cervico-dorsal meningo-myelitis, published by MM. Voisin and Cornil, the eschar formed on the sixth day.<sup>4</sup> These examples might be easily increased.

Acute bed-sore frequently accompanies hæmatomyelia (which indeed appears to be, at least in a certain number of cases, only an accident of central myelitis); thus we found it in the case of Duriau, already quoted, where mortification showed itself in the sacral region only four days after the appearance of the first symptoms.<sup>5</sup>

We may also observe rapid mortification of the skin of the sacral region supervening, even in spinal diseases of slow evolution, when a new course of active irritation intervenes on a sudden, or when acute inflammatory action is suddenly superadded to the initial lesion.

<sup>1</sup> W. Gull, "Cases of Paraplegia," in 'Guy's Hospital Reports,' 1858, p. 189, Case xxii.

<sup>2</sup> 'The Lancet,' 6 Nov., 1869, p. 638.

<sup>3</sup> *Loc. cit.*, 'Pathologie der acuten Myelitis,' Zurich, 1867.

<sup>4</sup> 'Gazette des Hôpitaux,' 1865, No. 26.

<sup>5</sup> 'Union Médicale,' t. i, 1858, p. 308.

Not only the exacerbation of partial sclerosed myelitis, but the sudden irruption into the rachidian cavity of pus emanating from an abscess, in the case of a patient suffering from vertebral disease may, as I can attest, determine the rapid formation of eschars. The same result would be likewise produced in case a tumour occupying the central portions of the cord should, by its presence, provoke the development of acute myelitis. Several examples of this kind are on record.<sup>1</sup>

If the evidences which we have collected here do not yet allow us to construct a pathogenic theory of acute bed-sore of spinal origin, they at least suffice, if I mistake not, to exhibit the principal conditions of the phenomenon. Manifestly, we must relegate to a secondary position the influence of pressure; and also that of vasomotor paralysis which may be completely absent, as we have seen in relation to the hemiparaplegia resulting from the traumatic lesion of a lateral half of the cord. On the whole, the dominant and ever present fact is the active irritation of a more or less extensive region of the spinal cord—mostly showing itself, anatomically, by the characteristics of acute or superacute myelitis, and, clinically, by the assemblage of symptoms which are assignable to this kind of lesion. To explain the production of trophic disorders which issue in sacral mortification, here again it is not to absence of nerve-action that we should appeal, but to irritation of the spinal cord. This conclusion is in conformity with the experimental results which show that, in animals, the development of gangrenous ulcerations over the sacrum do not supervene on ordinary sections of the cord, but only in cases where inflammation has been set up in the neighbourhood of the spinal lesion.

It is scarcely probable that all the constituent parts of the cord are indiscriminately apt, under the influence of irritation, to provoke the development of acute bed-sore. The great frequency of this accident in cases of hæmatomyelia, and of acute central myelitis, where the lesion occupies chiefly the central regions of the spinal cord, seem to designate the grey substance as playing a predominant part in this respect. And this power is no doubt shared in by the posterior white fasciculi, for we know that the irritation of certain parts of these fasciculi has the effect of determining the production not only

<sup>1</sup> Amongst others see MacDowel's "Case of Paraplegia," in 'Dublin Quarterly Journal,' 1862.

of different cutaneous eruptions, but also, though rarely indeed, that of dermal necrosis.<sup>1</sup>

On the other hand, it is perfectly established that all portions of the grey matter should not be indifferently accused; some of them, in fact may, as we have already suggested, undergo the gravest lesions, without acute bed-sore ever supervening. Such are the anterior cornua, whose lesions, *per contra*, have, as you are aware, a most decided influence on the nutrition of muscles and, as we shall soon see, on that of joints also.

Hence it is that sacral eschar is often absent in infantile spinal paralysis, and in adult spinal paralysis—diseases which are characterised anatomically by acute inflammatory lesions, systematically limited to the area of the anterior cornua; whereas, those other diseases, which affect the skin, depend upon irritative lesions occupying, either the central and posterior portions of the grey matter, or the posterior white fasciculi. From this particular point of view there is reason to recognise, in the spinal cord, the existence of two regions endowed with very distinct properties. Now, since these regions may be affected either separately or simultaneously, it follows that, in clinical practice, acute bed-sore and acute muscular atrophy will sometimes appear separately, and that they will sometimes, on the contrary, coexist in the same individual.

From what precedes, the influence of irritative lesions of the spinal cord upon the development of acute bed-sore seems to us placed beyond doubt. Herr Samuel has, however, advanced a contrary opinion; he thinks that the spinal cord does not play any part herein, and that the spinal ganglia or peripheral nerves are alone implicated. We shall mention elsewhere the arguments on which this theory is based; but we are now able to point out that it is in formal contradiction with what has been noted in the numerous cases of traumatic myelitis affecting an elevated part of the cord—the cervical region, for instance, or the superior portion of the dorsal region—cases where acute bed-sore supervenes in the sacral region, and certainly without the direct participation of the spinal ganglia, or of the peripheral nerves. The cases of hæmatomyelia, or of spontaneous central myelitis, followed by precocious eschars, are likewise adverse to the views of Herr Samuel.

It is not alleged, however, that the irritative lesions of the peripheral nerves, and perhaps also those of the spinal ganglia, may not

<sup>1</sup> See *ante*, Lecture iii, § 1, p. 65.

sometimes have the effect of determining the rapid formation of eschars. No doubt, the examples published of dermal necrosis developed in consequence of a puncture, incomplete section, or compression of a nerve are rare enough; but many of them are thoroughly convincing.<sup>1</sup> In connection with this, I will relate the case of a female patient which I have been recently studying at La Salpêtrière. She had, on the left side, an enormous fibrous tumour which compressed, in the pelvis, the roots of the ischiatic and crural nerves of the corresponding lower extremity. There had resulted a paretic state of this member, accompanied by acute pains running along the track of the principal nerve-trunks. One morning, shortly after the appearance of the first symptoms of compression, it was remarked that an eschar had rapidly formed near and to the left of the sacral region. The inner surface of the left knee, likewise, in a spot which had been pressed upon by the right knee for a considerable time during the night, in consequence of the attitude of the patient when asleep, presented some pemphigoid bullæ, full of a brownish liquid, which soon gave place to an eschar. Nothing of the kind was developed on the right knee. This is perhaps the place to mention that spontaneous zona which, in certain cases at least, is very probably connected with the inflammation of some nerve, may, according to the remark of Rayer, occasionally issue in the more or less deep mortification of the skin. I have been often a witness to this fact, occurring among the aged persons in this hospital, and I have been many times able to satisfy myself that pressure on the spot occupied by the eruption did not here play an essential part. As to acute bed-sore of the breech, I am much inclined to believe that, in a certain number of cases, it should be attributed to an irritative lesion of the nerves of the cauda equina. A case recently published by M. Couyba, in his inaugural dissertation, may be cited as one of several examples of this class.<sup>3</sup>

<sup>1</sup> See, amongst recent published facts, a case reported by Dr. W. A. Lanson ('The Lancet,' 30 Dec., 1871, p. 913), and two cases of Dr. Vitrac ('Union Médicale de la Gironde,' t. ii, p. 127, and 'Revue Phot. des Hôpitaux,' 1871).

<sup>2</sup> Rayer, 'Maladies de la Peau,' t. i, p. 335.

<sup>3</sup> A young private in the Garde Mobile received a bullet-wound, at the outposts of Clamart. The projectile had entered near the anterior extremity of the tenth rib on the left side, and had emerged on the right side of the vertebral column, about three inches from the spine, on a level with the second lumbar vertebra. Paresis, with acute hyperæsthesia of the lower extremities, followed. On the right gluteal eminence a bulla (which quickly gave place to