Hysteria or pithiatism, and reflex nervous disorders in the neurology of war / by J. Babinski ... and J. Froment ... with a proscript by the authors; translated by J.D. Rolleston ... ed., with a preface, by E. Farquhar Buzzard ; with 37 figures and 8 plates.

Contributors

Babinski, J. 1857-1932.

Publication/Creation

London : University of London press ltd., 1918.

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MILITARY MEDICAL MANUALS

GENERAL EDITOR:
SURGEON-GEN. SIR ALFRED KEOGH
G.C.B., M.D., F.R.C.P.

HYSTERIA OR PITHIATISM

J. BABINSKI & J. FROMENT

EDITED BY
E. FARQUHAR BUZZARD

X75700

22102108054

H. K. LEWIS & CO. LTD.
136 GOWER STREET
LONDON, W.C.

Med
K35943

Geo. Riddoch.
Dec. 1917.

Dept. of Neurology & Psychiatry,
London Hospital.

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SIR ALFRED KEOGH, G.C.B., M.D., F.R.C.S.

HYSTERIA OR PITHIATISM

HYSTERIA OR PITHIATISM

AND REFLEX NERVOUS DISORDERS IN THE NEUROLGY OF WAR

BY

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Assistant Professor and Physician to the Hospitals of Lyons

WITH A POSTSCRIPT BY THE AUTHORS

TRANSLATED BY J. D. ROLLESTON, M.D.

EDITED, WITH A PREFACE, BY

E. FARQUHAR BUZZARD, M.D., F.R.C.P.

Captain, R.A.M.C.(T.)

With Thirty-seven Figures and Eight Plates

LONDON

UNIVERSITY OF LONDON PRESS, LTD.

18 WARWICK SQUARE, E.C. 4

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GENERAL INTRODUCTION

The infinite variety of injuries which any war presents to the surgeon gives to military surgery a special interest and importance. The special interest and importance, in a surgical sense, of the great European War lies not so much in the fact that examples of every form of gross lesion of organs and limbs have been seen, for if we read the older writers we find little in the moderns that is new in this respect, but is to be found in the enormous mass of clinical material which has been presented to us and in the production of evidence sufficient to eliminate sources of error in determining important conclusions. For the first time also in any campaign the labours of the surgeon and the physician have had the aid of the bacteriologist, the pathologist, the physiologist and indeed of every form of scientific assistance in the solution of their respective problems. The clinician entered upon the great war armed with all the resources which the advances of fifty years had made available. If the surgical problems of modern war can be said not to differ sensibly from the campaigns of the past, the form in which they have been presented is certainly as different as are the methods of their solution. The achievements in the field of discovery of the chemist, the physicist and the biologist have given the military surgeon an advantage in diagnosis and treatment which was denied to his predecessors, and we are able to measure the effects of these advantages when we come to appraise the results which have been attained.

But although we may admit the general truth of these statements it would be wrong to assume that modern scientific knowledge was, on the outbreak of the war, immediately useful to those to whom the

wounded were to be confided. Fixed principles existed in all the sciences auxiliary to the work of the surgeon, but our scientific resources were not immediately available at the outset of the great campaign; scientific work bearing on wound problems had not been arranged in a manner adapted to the requirements, indeed the requirements were not fully foreseen; the workers in the various fields were isolated, or isolated themselves, pursuing new researches rather than concentrating their powerful forces upon the one great quest.

However brilliant the triumphs of surgery may be, and that they have been of surpassing splendour no one will be found to deny, experiences of the war have already produced a mass of facts sufficient to suggest the complete remodelling of our methods of education and research.

The series of manuals, which it is my pleasant duty to introduce to English readers, consists of translations of the principal volumes of the "Horizon" Collection which has been appropriately named after the uniform of the French soldier.

The authors, who are all well-known specialists in the subjects which they represent, have given a concise but eminently readable account of the recent acquisitions to the medicine and surgery of war which had hitherto been disseminated in periodical literature.

No higher praise can be given to the Editors than to say that the clearness of exposition characteristic of the French original has not been lost in the rendering into English.

MEDICAL SERIES

The medical volumes which have been translated for this series may be divided into two main groups, the first dealing with certain epidemic diseases including syphilis, which are most liable to attack soldiers, and the second with various aspects of the neurology of war. The last word on *Typhoid Fever*, hitherto "the greatest scourge of armies in time of war," as it has been truly called, will be found in the mono-

graph by MM. Vincent and Muratet which contains a full account of recent progress in bacteriology and epidemiology as well as the clinical features of typhoid and paratyphoid fevers. The writers combat a belief in the comparatively harmless nature of paratyphoid and state that in the present war hæmorrhage and perforation have been as frequent in paratyphoid as in typhoid fever. In their chapter on diagnosis they show that the serum test is of no value in the case of those who have undergone anti-typhoid or anti-paratyphoid vaccination and that precise information can be gained by blood cultures only. The relative advantages of a restricted and liberal diet are discussed in the chapter on treatment, which also contains a description of serum-therapy and vaccine-therapy and the general management of the patient.

Considerable space is devoted to the important question of the carrier of infection. A special chapter is devoted to the prophylaxis of typhoid fever in the army. The work concludes with a chapter on preventive inoculation in which its value is conclusively proved by the statistics of all countries in which it has been employed.

MM. Vincent and Muratet have also contributed to the series a work on *Dysentery, Cholera and Typhus* which will be of special interest to those whose duties take them to the Eastern Mediterranean or Mesopotamia. The carrier problem in relation to dysentery and cholera is fully discussed, and special stress is laid on the epidemiological importance of mild or abortive cases of these two diseases.

In their monograph on *The Abnormal Forms of Tetanus*, MM. Courtois-Suffit and Giroux treat of those varieties of the disease in which the spasm is confined to a limited group of muscles, *e. g.* those of the head, or one or more limbs, or of the abdomino-thoracic muscles. The constitutional symptoms are less severe than in the generalised form of the disease, and the prognosis is more favourable.

The volume by Dr. G. Thibierge on *Syphilis in the*

Army is intended as a *vade-mecum* for medical officers in the army.

Turning now to the works of neurological interest, we have two volumes dealing with lesions of the peripheral nerves by Mme. Atanassio Benisty, who has been for several years assistant to Professor Pierre Marie at La Salpêtrière. The first volume contains an account of the anatomy and physiology of the peripheral nerves, together with the symptomatology of their lesions. The second volume is devoted to the prognosis and treatment of nerve lesions.

The monograph of MM. Babinski and Froment on *Hysteria or Pithiatism and Nervous Disorders of a Reflex Character* next claims attention. In the first part the old conception of hysteria, especially as it was built up by Charcot, is set forth, and is followed by a description of the modern conception of hysteria due to Babinski, who has suggested the substitution of the term "Pithiatism," *i. e.* a state curable by persuasion, for the old name hysteria. The second part deals with nervous disorders of a reflex character, consisting of contractures or paralysis following traumatism, which are frequently found in the neurology of war, and a variety of minor symptoms, such as muscular atrophy, exaggeration of the tendon reflexes, vasomotor, thermal and secretory changes, etc. An important section discusses the future of such men, especially as regards their disposal by medical boards.

An instructive companion volume to the above is to be found in the monograph of MM. Roussy and Lhermitte, which embodies a description of the psychoneuroses met with in war, starting with elementary motor disorders and concluding with the most complex represented by pure psychoses.

SURGICAL SERIES

When the present war began, surgeons, under the influence of the immortal work of Lister, had for more than a quarter of a century concerned themselves

almost exclusively with elaborations of technique designed to shorten the time occupied in or to improve the results obtained by the many complex operations that the genius of Lister had rendered possible. The good behaviour of the wound was taken for granted whenever it was made, as it nearly always was, through unbroken skin, and hence the study of the treatment of wounds had become largely restricted to the study of the aseptic variety. Septic wounds were rarely seen, and antiseptic surgery had been almost forgotten. Very few of those who were called upon to treat the wounded in the early autumn of 1914 were familiar with the treatment of grossly septic compound fractures and wounded joints, and none had any wide experience. To these men the conditions of the wounds came as a sinister and disheartening revelation. They were suddenly confronted with a state of affairs, as far as the physical conditions in the wounds were concerned, for which it was necessary to go back a hundred years or more to find a parallel.

Hence the early period of the war was one of earnest search after the correct principles that should be applied to the removal of the unusual difficulties with which surgeons and physicians were faced. It was necessary to discover where and why the treatment that sufficed for affections among the civil population failed when it was applied to military casualties, and then to originate adequate measures for the relief of the latter. For many reasons this was a slow and laborious process, in spite of the multitude of workers and the wealth of scientific resources at their disposal. The ruthlessness of war must necessarily hamper the work of the medical scientist in almost every direction except in that of providing him with an abundance of material upon which to work. It limits the opportunity for deliberate critical observation and comparison that is so essential to the formation of an accurate estimation of values; it often compels work to be done under such high pressure and such unfavourable conditions that it becomes of little value for educative purposes.

In all the armies, and on all the fronts, the pressure caused by the unprecedented number of casualties has necessitated rapid evacuation from the front along lines of communication, often of enormous length, and this means the transfer of cases through many hands, with its consequent division of responsibility, loss of continuity of treatment, and absence of prolonged observation by any one individual.

In addition to all this, it must be remembered that in this war the early conditions at the front were so uncertain that it was impossible to establish there the completely equipped scientific institutions for the treatment of the wounded that are now available under more assured circumstances, and that progress was thereby much hampered until definitive treatment could be undertaken at the early stage that is now possible.

But order has been steadily evolved out of chaos, and many things are now being done at the front that would have been deemed impossible not many months ago. As general principles of treatment are established it is found practicable to give effect to them to their full logical extent, and though there are still many obscure points to be elucidated and many methods in use that still call for improvements, it is now safe to say that the position of the art of military medicine and surgery stands upon a sound foundation, and that its future may be regarded with confidence and sanguine expectation.

The views of great authorities who derive their knowledge from extensive first-hand practical experience gained in the field, cannot fail to serve as a most valuable asset to the less experienced, and must do much to enable them to derive the utmost value from the experience which will, in time, be theirs. The series covers the whole field of war surgery and medicine, and its predominating note is the exhaustive, practical and up-to-date manner in which it is handled. It is marked throughout not only by a wealth of detail, but by clearness of view and logical

sequence of thought. Its study will convince the reader that, great as have been the advances in all departments in the services during this war, the progress made in the medical branch may fairly challenge comparison with that in any other, and that not the least among the services rendered by our great Ally, France, to the common cause is this brilliant contribution to our professional knowledge.

A glance at the list of surgical works in the series will show how completely the ground has been covered. Appropriately enough, the series opens with the volume on *The Treatment of Infected Wounds*, by A. Carrel and G. Dehelly. This is a direct product of the war which, in the opinion of many, bids fair to become epoch-making in the treatment of septic wounds. It is peculiar to the war and derived directly from it, and the work upon which it is based is as fine an example of correlated work on the part of the chemist, the bacteriologist and the clinician as could well be wished for. This volume will show many for the first time what a precise and scientific method the "Carrel treatment" really is.

The two volumes by Prof. Leriche on *Fractures* contain the practical application of the views of the great Lyons school of surgeons with regard to the treatment of injuries of bones and joints. Supported as they are by an appeal to an abundant clinical experience, they cannot fail to interest English surgeons, and to prove of the greatest value. It is only necessary to say that *Wounds of the Abdomen* are dealt with by Dr. Abadie, *Wounds of the Vessels* by Prof. Sencert, *Wounds of the Skull and Brain* by MM. Chatelin and De Martel, and *Localisation and Extraction of Projectiles* by Prof. Ombrédanne and R. Ledoux-Lebard, to prove that the subjects have been allotted to very able and experienced exponents.

ALFRED KEOGH.

PREFACE

No apology is necessary to justify the appearance of a volume which makes more accessible to the English-speaking race the observations and conclusions of its distinguished authors. The names of Babinski and Froment are sufficient introduction to those who are interested in Neurology, and their views on such important subjects as hysteria and reflex nervous disorders are certain to receive world-wide consideration even if they are not accepted universally without reserve.

Since the outbreak of war the study of hysteria has received a stimulus such as has been lacking since the days of Charcot, and there must be few neurologists who will not subscribe to the general conception of this psychical disorder as outlined in the following pages.

Whether the term "pithiatism" is destined for general adoption in place of hysteria is a question which can only be solved by the lapse of time, but its appearance under such distinguished patronage bodes well for its future.

There can be no doubt that there has been much confusion as to the meaning of hysteria in the mind of the public as well as in that of the medical profession, with the result that its use is often misunderstood. Perhaps a new name may be associated with a clearer understanding and may escape the obloquy attaching to its predecessor.

Some time must elapse before agreement can be arrived at as to the pathology of reflex nervous disorders, but the first step in that direction will be

reached when general recognition of their existence is obtained. This is one of the chief aims of this volume, which provides all the data necessary for an intelligent discrimination between cases of reflex nervous disorder, cases of hysteria and cases of peripheral nerve injury. The practical importance of these distinctions from a medico-legal as well as from a military and humane point of view need not be emphasised.

E. Farquhar Buzzard.

INTRODUCTION

THIS book has been written with a double purpose, its object being first to give some account of the contributions to neurology since the beginning of the war in relation to hysteria and the so-called reflex nervous disorders, and secondly to emphasise the bearings of these subjects on military medicine.

Among the various nervous phenomena observed in the neurology of war it is most important to distinguish hysterical or pithiatic disorders. (We shall see later why one of us has preferred the latter term.) The importance of such a distinction is due to the fact that these disorders may be cured rapidly or even instantaneously, or on the other hand persist indefinitely, according as the physician succeeds or fails in recognising their true nature and in adopting the appropriate psychotherapy or the reverse. The number of soldiers suffering from hysterical disorders is considerable, and many of them have been kept idle in hospitals for months. Thanks to the perspicacity and activity of some neurological centres and sanitary units at the front, a portion of these effectives which had been lost have now been recovered; but there are still far too many hysterical patients filling up military hospitals, owing to the lack of an exact diagnosis and the employment of an appropriate treatment. For this reason there is sufficient justification for any attempt to instruct medical men who have received no special training in methods not generally known which will help them to recognise more readily the manifestations of hysteria. Moreover, if it be taken into consideration that present events supply an exceptional opportunity for appre-

ciating the rôle played in the genesis of these troubles by the so-called provocative agents such as emotions, physical commotions and trauma of every kind, it is not surprising that a work on hysteria has been undertaken. But perhaps the reader will wonder why reflex nervous disorders have formed the object of a special study, or, at least, why so much room has been given them in this work. Although every medical man knows that a so-called reflex atrophy of the quadriceps may result from arthritis of the knee, this is perhaps the only survival of a doctrine to which in former times a much greater importance was attached. Judging by the size of the chapters devoted to nervous disorders of this kind in most modern neurological text-books, they have become to a certain extent unfashionable. We shall describe later on the reasons which in our opinion have caused them to fall into discredit.

There is no doubt that until the end of last year these disorders were dealt with only incidentally, and no one had any idea of the rank which they occupy in the neurology of war. However, attention was gradually called to cases of amyotrophic paralysis and reflex contracture which had been described many years ago; some observers also were impressed by the new disorders which they were constantly meeting with, and which bore a certain resemblance to previous cases. Whatever opinion may be held as to the mechanism of these various disorders, some of which have been known for a long time, and others have only recently been described, whether they can be completely explained by reflex action, or whether their pathogeny is more complex and requires further study, they constitute a special group which is as distinct from organic affections of the nervous and vascular systems as it is from hysterical disorders. Far from being exceptional, they are very common, and it is most important for every medical man to learn to diagnose them. Enough has now been said to justify our detailed description of these disorders. We have next to explain why we thought it advisable to deal with two distinct subjects in the

same work. The reason is that in spite of the differences between them hysterical manifestations and reflex disorders produce identical sequelæ, have points of contact, have been and still are frequently confused and are often associated, with the result that a profound knowledge of the one is necessary in order to understand the other. In this respect one may compare reflex disorders with organic affections of the nervous system which were very often confounded with hysteria in the days when the objective signs, now well recognised, were not at our disposal.

The progress of semeiology has also supplied methods for distinguishing reflex nervous disorders. In our description, therefore, we shall endeavour to indicate precisely the special characters which help to distinguish them from hysterical manifestations.

The foregoing remarks will enable the reader to understand the plan which we have adopted. After having studied separately each of these two classes of phenomena in the first two parts of the book, in the third part, devoted to diagnosis and treatment, we shall deal with them together so as to illustrate more clearly their distinguishing features.

The various chapters may perhaps seem to be lacking in proportion, and some of them may appear of an extravagant length in relation to others. Such criticism would be merited, if this work were a simple study of a well-known and uncontroversial subject. But this is not the case, since one of its objects is to describe new facts, as to whose significance all neurologists are not agreed. We thought it necessary to give a detailed description of all such observations, so as to enable the reader to estimate the value of the views which we submit and to draw his own conclusions. On the other hand, doctrines which are already generally accepted do not require such extensive development and can be dealt with briefly.

It is unnecessary to state that we make no claim to having exhausted the two subjects which we have discussed. As regards the reflex nervous disorders in

particular, the moment has not yet arrived to formulate an exact prognosis.

It is quite conceivable that wounds and their resultant infections may produce changes in the nerves and muscles different from those with which we are familiar to-day, and that new investigations will perhaps enable us to determine their nature.

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HYSTERIA OR PITHIATISM

PART I

HYSTERIA: PITHIATISM

CHAPTER I

HISTORICAL NOTE

It seems unnecessary for our purpose to give a complete history of hysteria and to repeat what can be found on this subject in most text-books of medicine.

We will limit ourselves to relating the views which were current twenty-five or thirty years ago and those which were adopted later by the great majority of neurologists, especially after the discussions "on the revision of hysteria" which took place in 1908 at the Paris Neurological Society (47).[1]

Has "the modern conception of hysteria" been confirmed by observations made since the beginning of the war? Or should these observations, as some think, lead us back to some extent to the "old conception"?

To enable the reader to form an opinion on this question he must know the essential points of these two conceptions of hysteria. We will describe them briefly, but without omitting any details which are needed to illustrate their different characteristics.

[1] We have given in the bibliography the list of the principal publications dealing with the questions discussed in this book. All are numbered, to correspond with the figures inserted in the text.

The Old Conception of Hysteria

According to this doctrine hysteria is manifested by two varieties of disorders. The first, which are permanent, are known as "stigmata"; while the second, though they may persist for a long time, are usually transient, being liable to be provoked or suppressed by external influences or purely psychical causes.

Some of the manifestations may be associated with or substituted for others and appear in the most varied guises. Neither of these two varieties causes any grave disturbances in the general nutrition or the mental state.

Some hysterical disorders have a characteristic appearance which enables the observer to recognise them without paying any attention to the accompanying symptoms or the circumstances in which they arise. The following are examples: *Hysteria major* with its four periods, epileptoid period, period of contortions and generalised movements, period of attitude expressing various passions, and period of delirium, is absolutely characteristic, whatever views may be held as to its mechanism; no other affection but hysteria can give rise to such disturbances. Much more common than hysteria major is *Hysteria minor*, which is an incomplete form of the preceding, and includes almost countless varieties. Though generally easy to recognise at first sight it may be mistaken for epilepsy, if the character of the movements be taken into consideration alone; sometimes the attacks succeed each other uninterruptedly and constitute a sort of *status hystericus* comparable to the *status epilepticus*. Nevertheless, whatever its form, duration and intensity may have been, the attack has no serious results. In spite of the convulsions and contortions which astonish and alarm the laity, there is hardly any risk of severe wounds or contusions, as in the case of an epileptic fit. It has never been seen to occur in sleep or to cause an involuntary emission of urine, subconjunctival ecchymoses or subcutaneous hæmorrhages. It is not

followed by a long period of prostration or torpor; on recovery from the attack the patient has only a slight feeling of discomfort, and almost at once recovers his lucidity. Even when prolonged the status hystericus does not produce the rise of temperature which is so common in the status epilepticus.

In *hysterical hemiplegia* the gait, as described by Todd, has a peculiar character which enables it to be recognised at first sight.

"The patient," says this eminent English clinician, "drags the palsied limb after her as if it were a piece of inanimate matter, and uses no act of circumduction nor effort of any kind to raise it from the ground: the foot sweeps the ground as she walks. This, I believe," he adds, "is characteristic of the hysterical form of paralysis."

Hysterical hemiplegia like all other hysterical paralyses may remain without any change in its appearance for months and even years—an occurrence unknown in organic paralysis, which never remains the same from the beginning to the end, but follows a definite course.

Hystero-traumatic brachial monoplegia, which was first observed by Charcot in a man, and described by him in his celebrated lectures, is identical with that which he was able to reproduce by hypnotic suggestion. One of its attributes is the association of an anæsthesia of the upper limb "resembling a shoulder of mutton in its distribution," with slight involvement of the thorax in front and behind.

In *glosso-labial hemispasm*, described by Charcot, Brissaud and P. Marie, the spasm, as its name indicates, may be limited to the tongue and lips but sometimes affects simultaneously the orbicularis palpebrarum, platysma and neck muscles. The hook-like appearance of the tongue and the intermittent spasms of the contracted muscles give it an almost pathognomonic appearance.

Astasia-abasia, which has been specially studied by Charcot, Richer and Blocq, who gave its name to the

condition, consists in a peculiar dissociation of the motor functions of the lower limbs. In a lying or sitting position the patient can move his limbs freely without a sign of anything being wrong. He is even able to walk on all fours, to jump and climb. But he is incapable of standing or walking normally; sometimes these two functions are abolished or weakened (paralytic or paretic forms), sometimes they are disturbed by abnormal movements (ataxic, choreiform or tremulous forms).

This dissociation of the motor functions of the lower limbs is peculiar to hysteria. When showing a woman suffering from *hysterical mutism* at one of his Tuesday lectures Charcot expressed himself as follows—

"Not only has it become impossible for her to articulate a single word in a loud or a low voice, but she is even incapable, in spite of all her efforts, of emitting any laryngeal sound or noise whatever. It is true that she will still have a means of communicating with us by an intelligent pantomime or what is still better by writing, for although there is an absolute motor aphasia, the faculty of expressing herself by writing has, in striking contrast, remained perfectly unaffected, as you will see in a moment. Gentlemen, even from the rapid description I have just given, those of you who have attended these lectures for the last three years will have at once grasped that we are dealing with a case of hysterical mutism. In no other condition, in fact, will you find this combination of characteristic symptoms."

We will also quote the following passage from Charcot's Tuesday lectures—

"Rhythm and cadence are characteristic of a number of hysterical phenomena, as I have several times had occasion to remark. In *rhythmic chorea* especially this feature is so pronounced that a dancing-master could follow and record the peculiar and often very complicated movements carried out by the patients during these attacks. As Hamlet says,

there is ' method in their madness.' The same applies to hysterical coughing, lowing and barking. I believe that it may be asserted that all yawning recurring at regular intervals as in the present case, is an hysterical phenomenon."

Although hysteria is often manifested by symptoms which it alone is capable of producing, it can also assume the appearance of various other affections and even of organic disease. It is able to produce motor disturbances which in themselves are indistinguishable from those caused by cerebral or spinal changes.

" Convulsive hysteria," said Brissaud (1), " is an affection in which the functional disorders of the pyramidal tracts play an important part, and we could have shown cases of permanent hysterical contracture which entirely resemble those of hemiplegic or paraplegic contracture."

" The tendon reflexes," said Richer, " are usually exaggerated, and the paralysis assumes all the characters of spastic paralysis, the most important of which are exaggeration of the tendon reflexes and ankle clonus. Thus by insensible degrees paralysis may be transformed into contracture, and we have had an opportunity of seeing in hysteria cases of spastic paraplegia which gradually assumed all the characters of permanent contracture of the lower extremities with the closest resemblance to ataxic paraplegia due to an organic lesion. Circumstances of this kind may cause considerable difficulty in diagnosis."

Hysteria has been considered capable of producing superficial or deep lesions and disturbances of all kinds : such as erythemata, vesicles, bullæ, hæmorrhages, ulcerations, and even gangrene of the skin, and subcutaneous œdema, laryngeal paralyses, spasm of the glottis, œdema of the glottis, pulmonary congestion and hæmoptysis ; gastric ulcer, hæmatemesis and melæna ; anuria, hæmaturia, albuminuria ; angina pectoris, tachycardia or bradycardia ; and fever which sometimes may be very high.

Hysteria would thus occupy a very extensive domain, the limits of which could not be fixed. "Hysteria," as Sydenham said long ago, "imitates almost every disease which befalls mankind. Whatever part of the body it attacks, it will create the proper symptom of that part. Hence without skill and sagacity the physician will be deceived, so as to refer the symptoms to some essential disease of the part in question and not to the effects of hysteria."

Hysteria is a kind of Proteus, and has been called "the champion imitator."

How is it possible to find the true cause of nervous symptoms when their appearance is the same whether their origin is organic or hysterical?

It used to be said that the answer to this question was to be found by looking for the *stigmata*. Although, according to Charcot and Pitres, these stigmata are not constantly present, they constitute clear evidence of hysteria. In addition to being permanent they develop without the patient's knowledge. They are as follows: Anæsthesia of the pharynx, hemianæsthesia, consisting, in a well-developed form, of abolition of the various kinds of common sensation and unilateral diminution of the acuity of special senses, especially vision, with concentric narrowing of the visual field, diplopia or monocular polyopia and a dyschromatopsia in which, unlike that seen in tabes and alcoholism, the blue and violet field is affected while the perception of red remains normal.

The various painful areas such as the clavus hystericus in the head may also be reckoned among the stigmata. As regards the etiology, *neuropathic heredity* constitutes the essential and constant factor in hysteria, but its manifestations may be due to a variety of *provocative agents*, such as various intoxications and infections, trauma and psychical influence. Imagination, suggestion (Charcot, Bernheim, Janet, Strümpell) and "mental representations" (Moebius) play an important part in the genesis of hysterical symptoms, which in Russell Reynolds' words are

"dependent on idea." The following, according to Charcot, is the ordinary mechanism of hystero-traumatism. An individual with a predisposition to hysteria receives, it may be, a blow on the shoulder which is insufficient to cause an appreciable lesion. However, although he continues to make use of his arm, the idea of motor impotence occurs to him; it gradually increases during a period of varying duration (phase of meditation), and finally manifests itself in the form of brachial monoplegia.

But, although suggestion in the form of auto- or hetero-suggestion is of considerable importance, the principal factor is usually emotion; it prepares the ground and is even supposed to have the power to create hysterical disorders without consciousness being aware of their development or the will interfering to oppose them.

Permanent stigmata especially were supposed in some cases at least to be independent of suggestion, and some hysterical symptoms were regarded as explicable by a physiological mechanism.

Such was the general conception of hysteria a quarter of a century ago, though this does not mean, of course, that agreement was complete on all points. We need only allude to the discussions which took place between the Salpêtrière School and the Nancy School, though these were principally connected with hypnotism. As regards hysteria, properly so called, the pathogeny of hysteria major with its four periods was specially the object of controversy; some regarded it as a spontaneous expression of the neurosis, occurring without the intervention of any suggestion; while others, on the contrary, such as Bernheim, considered that it represented an artificial creation of which the physician himself was the chief author. Pitres was guarded as to the psychical mechanism which Charcot invoked to explain the genesis of traumatic brachial monoplegia.

"The hypothesis," he wrote, "is an attractive one. It explains in a fairly satisfactory manner the late

appearance of most of the hystero-traumatic paralyses, but it is difficult to apply to every case." Limits of space prevent us from discussing this subject in greater detail.

Modern Conception of Hysteria: Pithiatism

Complete agreement on all questions relating to hysteria has not even yet been reached. But on certain points of primary importance the old views have been abandoned by all neurologists, and the new ideas have been generally adopted, as may be seen from the discussions which took place at the Paris Neurological Society in 1908.

It is therefore justifiable to say that there is a "modern conception of hysteria." But before describing it, we must warn the reader of certain errors of interpretation which have been too frequently committed. Those who have adopted the new conception have been credited by a number of badly informed medical men with the opinion that nothing remains of the old hysteria, that hysteria is indistinguishable from simulation, and has no longer any real existence, so that the dismemberment of hysteria has been a destruction of this protean affection. This is a gross misrepresentation. The most enthusiastic adherents of the modern school are the first to recognise the value of a part of the work of their predecessors. The clinical picture of the various syndromes which we have dealt with in the previous section, such as certain forms of hemiplegia, astasia-abasia, mutism, and rhythmic chorea, has been drawn, as no one will deny, in a masterly manner, and in this respect there is nothing to suppress. We gladly admit that the experimental investigations of Charcot on hystero-traumatic brachial monoplegia have been particularly illuminating, and have helped to establish the psychical nature of hysterical manifestations. After making this correction, we must try to show what has been the development of ideas. As one of us

has been their chief promoter, we may quote from one of his writings on the subject (61) certain passages which will enable the reader to understand how he was guided to form this new conception of hysteria.

"I had at first concentrated my attention on the comparative study of hysterical and organic paralyses, and, as I have already had occasion to remark, I was struck by the inadequacy of the means at our disposal for distinguishing them. I well remember that these two kinds of paralyses were supposed to exhibit the same intrinsic characters; it was only in the concomitant circumstances that the distinctive feature was to be found which they did not possess in themselves. A hemiplegia, for instance, occurring in a young subject who had neither cardiac disease nor syphilis, and accompanied by 'stigmata' of the 'neurosis' (hemianæsthesia, anæsthesia of the pharynx, narrowing of the visual field, etc.), was usually regarded as hysterical, and it was in the reverse circumstances attributed to a lesion of the nerve centres.

"Such reasoning showed a lack of precision and defective logic. It had indeed long been known that in the first place the various manifestations of hysteria were not invariably associated with the so-called stigmata, and secondly that the latter might occur in organic paralysis. The presence or absence of anæsthesia of common or special sensation cannot therefore authorise us to affirm or deny the hysterical nature of a paralysis; just as the presence or absence of signs of a cardio-vascular affection or of syphilis does not warrant us in admitting or rejecting the idea of an organic paralysis. As the result of these considerations I became convinced of the necessity for subjecting paralytic disorders to a more rigorous examination and for endeavouring to find the differential characters inherent in the paralyses themselves.

"Methodical investigations, the first decisive results of which were published in 1893, led me to the con-

clusion that there is no change in the tendon reflexes in purely hysterical paralyses and contractures (22).

"This statement, simple as it appears to-day when it meets with hardly any opposition, was for a long time disputed and periodically, for years, gave rise to hostile criticism. The objections, however, were always due to inaccurate observation or false interpretation of facts, as I was able to show whenever I had an opportunity of testing them.

"On reference to the Proceedings of the Paris Neurological Society cases of this kind are to be found, such as a so-called hysterical hemiplegia accompanied by unilateral exaggeration of the tendon reflexes, or a paraplegia with exaggeration of the reflexes in the lower limbs and ankle clonus also attributed to hysteria. But in none of these cases was the diagnosis of hysteria verified; as a rule those who had shown cases of the kind afterwards admitted that the course of the disease compelled them to abandon their original hypothesis and to recognise, in conformity with my opinion, that it was some organic affection. In other cases a different error was committed: a patient who was really suffering from hysterical paralysis was wrongly supposed to have very exaggerated tendon reflexes and ankle clonus.

"The prevalence of the belief that hysteria like lesions of the pyramidal system might cause exaggeration of the reflexes was principally due to the fact that the study of reflexes in the normal condition had been neglected and that the scale of their individual differences had not been properly determined. It was by establishing an exact scale (179) and by distinguishing 'complete' ankle clonus which is pathological, from 'incomplete' ankle clonus which is physiological, and may of course be observed in an individual with hysterical paralysis as well as in a normal subject, that I supplied the means of avoiding what had so frequently been a stumbling-block to others.

"Hysteria has no appreciable action on the tendon

reflexes; it has no more power to exaggerate them than it has to weaken or abolish them. The same applies to the pupillary reflexes and pharyngeal reflex. These conclusions which result from my investigations and which are to be found in every text-book nowadays, in addition to other new facts, have sapped the foundation of the old hysteria.

"I have described a number of signs which are peculiar to organic paralysis (25) (61).

"I have also been able to show, even since 1892, how an examination of the character of the motor disturbance exclusively is sufficient to distinguish hysterical from organic facial paralysis (18) (20).

"This series of studies, which have been unanimously confirmed, has brought about the first and very important change in the traditional doctrine of hysteria. We may therefore conclude (i) that hysteria is very far from being able 'to do everything' as was formerly stated (33); (ii) that it cannot reproduce certain characteristic phenomena of organic paralysis; (iii) that the diagnosis of these two kinds of paralyses instead of depending on extrinsic characters, and thus being arbitrary and being left to the perspicacity of the doctor, is subject to exact rules, and in most cases can be made with certainty now that it depends on the examination of intrinsic characters.

"But this was not the only consequence of these new discoveries. My conclusions, which I have just stated, were logically bound to lead me still further. I found it necessary to make a general revision of the circulatory, trophic and thermal disorders attributed to hysteria, for the notion that such disorders were caused by hysteria seemed partly to be due to cases of hemiplegia which had been improperly regarded as hysterical. It is not uncommon indeed to find vaso-motor phenomena and hypothermia on the paralysed side in organic hemiplegia; in such a case with an erroneous diagnosis of hysterical hemiplegia one was inevitably bound to conclude that hysteria has the faculty of producing circulatory disorders,

hence to the conclusion that it could give rise to hæmorrhages and other lesions in the skin there was only a step, so why should there not be visceral hæmorrhages also due to hysteria? Hysterical fever likewise appeared to some to be quite a natural occurrence, for if hysteria was able to exercise a disturbing influence on the centres of the tendon reflexes and the vaso-motor centres, there were grounds for supposing that it might also disturb the working of the centres which regulated the temperature. As all these deductions were logical and were apparently corroborated by actual cases, they were accepted by men of the keenest intelligence, but as they originated in error they were absolutely vain and worthless. I therefore thought that a clean sweep should be made, and that an unprejudiced enquiry should be started for new facts relating to this question.

"My personal observations made me doubt more than ever the authenticity of the disorders which I have just described: I did not have an opportunity of seeing a single conclusive example.

"For years I have constantly asked my colleagues to show me cases of the kind wherever they met with them. At first they thought that they had found some, but there was merely a repetition of what had happened in the case of 'hysterical exaggeration of the reflexes': events soon proved that they had made a mistake. Sometimes it was a case of œdema, described as hysterical, which was afterwards shown to be due to tuberculous synovitis; sometimes it was a case of formation of vesicles also attributed to hysteria, which, as was discovered later, were produced voluntarily by the patient by means of artificial irritation. None of these cases could resist a searching examination. Those who persisted in remaining faithful to the old doctrine cherished the hope that they would one day meet with what their predecessors declared they had seen, repeating that 'negative facts cannot prevail against positive facts.'

"For my part, I did not cease to maintain that the

old cases were liable to suspicion and that new ones were needed to settle the problem.

"In order to make my investigations as extensive as possible I recommended one of my pupils, Dr. Mendicini Bono, to address an enquiry on this matter to a large number of medical men on the staff of Paris hospitals. None of them was able to supply a single fact in confirmation of the hypothesis of circulatory or trophic disturbances due to hysteria. Nor, again, was any one found to guarantee their existence when their reality was discussed in 1908 at the Paris Neurological Society.

"There is no doubt that even in days gone by some of the cases described under this title were spurious. Thus, certain forms of 'hysterical fever' were found to be artificial. Charcot himself had issued a warning as to errors of interpretation or fraud. It is none the less true that this eminent neurologist believed in the existence of hysterical hæmorrhages and skin lesions, and that he gave the name of blue œdema to a circulatory disorder which he attributed to hysteria.

"A close examination of the facts has enabled me to establish that there is not a single case justifying such a point of view. Occasionally even now this statement is contradicted, but is not this the case with the most firmly established medical truths?

"To sum up, in former times hysteria was credited with the faculty of producing vesicles, ulceration, superficial gangrene, cutaneous or visceral hæmorrhages and fever; it was also supposed to be able to produce albuminuria and anuria. All this was to be found in the text-books, and there were numerous cases of the kind reported. Since 1901, when my first comprehensive study of the limitations of hysteria appeared, these publications have become increasingly rare, and one would search in vain for a single case in the Proceedings of the Medical Society of the Paris Hospitals or of the Neurological Society for the past

six years. The history of such cases is now nothing more than a legend.[1]

"The result of the work which I have just summarised was to restore what hysteria had unduly appropriated to conditions which to-day are well recognised as organic affections, and also to strip hysteria of the products of simulation. The work in question has a practical value which will be discussed later, and constitutes an acquisition whose importance, I would insist, in no way depends on the opinion that may be held as to the other questions which we will now examine.

"Although the ground had been partly cleared, a large amount of material still remained. This residue was composed of disorders whose common character was the absence of an anatomical substratum, at least in so far as the methods of investigation at our disposal allowed us to ascertain. But this point of resemblance was not enough to justify their complete assimilation.

"Did these different parts form a homogeneous whole to which the term 'hysterical' could be applied? Was it not rather an artificial assemblage composed of heterogeneous elements? Such was the new problem which I set myself.

"I will allude only to those observations and comparative experiments of mine which appeared to me to be conclusive and have allowed me to attain my aim. As I mentioned above, the rôle of suggestion in the production of hysterical disorders, and that of psychotherapy in their treatment, had long been known. Nevertheless, in spite of the importance attributed to these agents, it was generally agreed that their influence did not extend to all the manifestations of hysteria. Was it possible to have any other opinion at a time when organic affections were included in this neurosis?

[1] I exclude for the moment the vaso-motor troubles of a superficial and transitory character (erythema, dermographia), which will be discussed later (*v.* p. 16).

"Failure was obviously inevitable when, for instance, a persistent attempt was made to treat hemiplegia due to cerebral hæmorrhage by psychical methods under the impression that it was hysterical. But as the progress of semeiology had supplied the means of avoiding such errors, and the intrusion of organic affections into hysteria was no longer to be feared, I thought it advisable to resume the study of suggestion and counter-suggestion in their relations to the various disorders under discussion. Subsequent investigations enabled me to divide these phenomena into two distinct groups: suggestion produces the first but has no action on the second. To avoid a misunderstanding, however, I must give some complementary explanations.

"The first of these groups includes convulsive attacks, paralyses, various kinds of contractures, tremors, choreic movements, which are sometimes irregular but usually rhythmical, and disturbances of phonation, respiration, common sensations (anæsthesia, hyperæsthesia), and special senses, all possessing the common characteristic of being liable to be reproduced by experimental suggestion which—and this is a most important point—is *capable of determining their form intensity and duration.* These phenomena, it may be said in passing, may be imitated by a clever and well-educated simulator, which constitutes a source of difficulty in medico-legal enquiries relating to what is called 'hystero-traumatism.'

"These disorders are liable to disappear sometimes instantaneously, under the sole influence of persuasion or counter-suggestion. It may even be said that psychotherapy cures them almost infallibly unless it is counterbalanced by an opposing influence, such as the counter-psychotherapeutic action exercised involuntarily by the patient's entourage or in cases of hystero-organic association, by auto-suggestion which is maintained by the disorder due to the lesion. I will add parenthetically that these manifestations may resist treatment in a subject suffering from a

mental affection such as hebephrenia. The second group comprises on the one hand dermographism, which indicates an exaggeration of the cutaneous vaso-motor reflexes, and on the other abnormally intense and prolonged emotional reactions such as tachycardia, erythemata, and over-activity of the sweat or intestinal glands.

"Suggestion has no power to reproduce them and counter-suggestion has no action upon them. I have been met with the retort that it is possible to provoke in some persons, almost at the word of command, an acceleration of the heart-beats and vaso-motor reactions which might be regarded as the effects of suggestion.

"The influence of suggestion, however, in this case is more apparent than real. In reality such an influence is very indirect on disorders of this kind; when suggestion does give rise to them, it is only by the agency of the emotion which it may produce. Suggestion cannot control them : as soon as the disorders appear they escape its influence; it is unable to determine *their form intensity and duration.*

"Thus a fundamental characteristic separates these two groups of disorders. That is a new point which is definitely established.

"However, in spite of their differences it might be possible for them to be connected by some bond of union, and it would be right to maintain this if there was a sort of attraction between them; but as a matter of fact there is nothing of the kind. As I have shown by a comparative study, dermographism and excessive emotionalism are as frequently seen in individuals who are otherwise normal as in those who present symptoms characteristic of the first group, such as fits, contractures, etc.

"There is, therefore, no reason to unite these two groups of phenomena and to give them a common title. They should be completely dissociated and each receive a different name. This conclusion which I have reached is by no means arbitrary, but is logically inevitable.

"It would obviously be unreasonable to continue to give the name hysterical to the disorders ranged in the second group; besides, are not the terms 'dermographia,' 'vaso-motor disorders,' or 'disorders of the vaso-motor reflexes' and 'emotional disorders' sufficient to express the ideas attached to them?

"There might even be some advantage in abandoning the use of the term hysteria, which in its etymological sense is in no way suitable for any of the phenomena under consideration. If, however, it is to be retained, it should be reserved for the first group, comprising those impressive disorders which this word calls to our memory almost automatically (fits, epidemic chorea of the middle ages, and paralysis miraculously cured). I have proposed the substitution of the term 'pithiatism,' from *πείθω*, 'I persuade,' and *ἰατός*, 'curable,' which expresses one of the fundamental characteristics of these symptoms, viz. the possibility of being cured by the influence of persuasion.

"The dismemberment of the traditional hysteria is therefore an accomplished fact: the heterogeneous elements of which it was comprised as the result of an artificial grouping have been separated and each has been put in its natural place. 'Hysteria,' said Lasègue, 'has never been defined and never will be.' Indeed, as it is impossible to give a definition which is applicable to a number of different objects it was impossible in former times to define the conditions comprised under this title. Nowadays, it is different. The isolation of the group of phenomena which may be called indifferently hysterical or pithiatic is an accomplished fact. They possess characteristics which belong only to themselves, which are absent in all other morbid states, and which therefore constitute the elements of the definition of hysteria (26) which I have set forth as follows: '*Hysteria is a pathological state manifested by disorders which it is possible to reproduce exactly by suggestion in certain subjects and can be made to disappear by the influence of persuasion* (*counter-suggestion*) *alone*' (59). Some authors have

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criticised this definition, on the ground that persuasion or counter-suggestion is capable of curing neuropathic disorders which are not hysterical, especially neurasthenic symptoms. Such a criticism is obviously due to a confusion between hysteria and neurasthenia. It is agreed that the phenomena of exhaustion which constitute the essential characters of neurasthenia cannot be cured by counter-suggestion alone : the symptoms which are caused to disappear by this method are merely hysterical or pithiatic symptoms which have been grafted on to neurasthenia. In 1892, or twenty-one years ago, I insisted on the frequency of associations of this kind.

" I think then that I can say that this definition is adequate ; it suits the whole of the object defined, and is applicable to it alone.

" The fact that suggestion has the power of giving an exact reproduction of every hysterical disorder undoubtedly does not prove a priori that such disorders are actually due to suggestion. However, as I have previously said, the possibility of its participation in the production of apparently spontaneous hysterical phenomena has never been denied ; clinical observation has so clearly proved this that such a truth could not have escaped notice. But to what extent does suggestion intervene ? In former times one was very far from realising its various modes of action. There was one in particular which for a long time was overlooked, viz. medical suggestion, to which Bernheim attracted attention and of which I have shown the great importance.

" Its influence can be seen in the study of the so-called hysterical stigmata which were said to develop without the patient being aware of them, like an organic disease, and without any previous mental representation. Bernheim himself admitted the possibility of an hysterical hemianæsthesia and amblyopia which were not caused by suggestion. Until recently most hysterical patients showed the so-called ' permanent ' stigmata which, according to the old

belief, gave the transitory symptoms a genuine character. This was an error and was due to the fact that the unconscious influence exerted by the doctor's questions and attitude on the genesis of these disorders was not taken into account. I convinced myself of this by the systematic study of a series of patients with hysterical symptoms who had hitherto not undergone any medical examination : I investigated the conditions of their sensation and vision, always avoiding any untimely reflections or gestures during my enquiry which might interfere with the spontaneity of their replies. Now, in none of these patients, who numbered more than a hundred, did I find any hemianæsthesia, narrowing of the visual field, or dyschromatopsia. Comment is needless.

" Suggestion as manifested by a love for imitation offers an explanation of the contagious character of hysterical phenomena, especially nervous attacks, which formerly, when their mechanism was not understood, used to spread like an epidemic through the wards. Suggestion may intervene in a different form in hystero-organic associations : auto-suggestion replacing or accompanying hetero-suggestion. It is easy to understand that in a disease with any tendency to persist the symptoms on which the patient concentrates his attention and apprehension will cause disorders to develop which belong to the domain of suggestion. Sometimes this organic factor may be minimal, but a transient disturbance, a slight pain, a trivial injury, or a mere bruise, in a susceptible individual may be the starting-point of a complex process of auto-suggestion in which psychological analysis might have much difficulty in unravelling the part played by various factors, such as the patient's own reflections, his previous experience and beliefs, the misguided solicitude of his friends, and, lastly, medical examination with its impressive paraphernalia, admirably suited for rousing the patient's attention and directing his thoughts into unexpected channels. All these factors become inextricably mixed, and their

combined action gives rise to the hysterical phenomenon which henceforth persists by itself, whereas the preliminary process of auto- and hetero-suggestion is very likely to pass unnoticed.

"There is no need to insist further on the importance of suggestion in the genesis of hysterical phenomena.

"But I have not yet proved that it is a *sine qua non*. Have not other agents, especially emotion, the power to produce them, as was unanimously believed until quite recently?

"Before attacking this problem it is important that it should be stated in precise terms. No doubt there are grounds for supposing *a priori* that physical commotion and, still more, moral shocks may diminish the personality, weaken the critical sense, and increase the suggestibility, and so play an indirect part in the development of pithiatic disorders; but these agents in such cases would be merely preparing the ground for suggestion. Are they capable by themselves of producing hysterical phenomena apart from any suggestion, as has been maintained? In other words, can an hysterical paraplegia or monoplegia, for example, appear automatically under the influence of an emotion [1] without any preliminary mental repre-

[1] In a work written in collaboration with J. Dagnan-Bouveret, entitled *Emotion and Hysteria*, we insisted on the distinction that should be made between emotion in the sense of a shock and a gradual emotion. We reserved the name emotion for the former, and the latter we called an affective state.

We defined emotion as follows—

"A violent modification of affectivity occurring under the influence of a sudden representation which upsets the physiological or psychical equilibrium during a period which is usually of short duration." We have shown that in the affective life diffuse phenomena must be distinguished from those which are systematised. The first group comprises all the emotions properly so called and certain affective states like vague and unreasonable melancholy. The second group contains the organised affective states whose principal types are sentiments of hope and fear, these states possessing the power of entering into representative complexes and giving them life.

sentation, like a secretion of sweat, an intestinal flux or an erythema? Such is the all-important problem which requires to be investigated afresh by one who wishes to penetrate the nature and mechanism of hysteria, for the method hitherto employed to solve it is defective.

"The method is as follows—

"Given a patient with hysterical symptoms, an attempt is made to determine the circumstances in which they developed by examination of the patient and his friends; if there is a history of an emotion, it is regarded as being the cause of the symptoms in question. Observations of this kind have led to the classical opinion as to the rôle of emotion in hysteria.

"I have shown that by following such a path it is impossible to attain the truth; in a matter of this kind one must view with suspicion the information given by patients who are inclined, even when suffering from an organic affection, to attribute their disorder to an old or recent emotion; with the best faith in the world they may lead one into error. Besides, in the problem before us it was not enough to establish that the development of one of these accidents had been preceded by a psychical shock; it was also necessary to prove that suggestion had nothing to do with its development. Now suggestion implies the idea of a perturbation of consciousness, and any one submitting to its influence cannot have a clear idea of it.

"The method hitherto adopted by which the examination was made by means of *retrospection* cannot lead to the end in view. I have adopted another method which proceeds in an entirely opposite manner; given the presence or absence of certain conditions which are or seem to be suitable for the development of nervous symptoms, an examination is made for any hysterical disorders. This may be called an examination by *prospection*. The patients are not asked to furnish a history or supply explanations of their case. By means of this method, if a

number of observations are made, it is possible to detect the supposed causes of hysteria, to dissociate them and to judge of the value of each. I have already used it in the criticism of 'stigmata,' comparing, as we have seen, two groups of hysterical subjects, one of whom had been subjected to and the other removed from the influence of medical suggestion. The comparison showed that without its intervention these stigmata did not develop : suggestion, therefore, appears to be an indispensable condition for their production.

"This method is also applicable in a comparative study of hospital conditions in the past and present; formerly it was by no means exceptional to see several patients at once in a ward in convulsions with attacks of opisthotonus, a sight never seen nowadays. And yet the human heart is no more secure against moral shocks to-day than it was in former times. Why, then, has this change taken place? The reason is that formerly the doctor unconsciously 'cultivated' hysteria, or at least, as he did not understand its mechanism, he did not take, as he does at present, the proper measures for causing the manifestations to disappear as soon as they develop and to preserve the patient's neighbours from infection.

"Are we not justified in concluding that emotion, or at least emotion by itself, cannot produce hysterical attacks? Similar remarks might be made with regard to epidemics of hysterical rhythmic chorea which have not been seen for a long time.

"The method of prospection finds a direct application, and gives more conclusive results as regards the point at issue in questioning those who by chance or by reason of their profession have been in contact with a large number of persons under circumstances in which emotion was inevitable, and have had an opportunity of observing them at the moment of the shock before the phase of 'meditation,' during which suggestion so frequently comes into play.

"The following is a brief summary of the results of

various enquiries of the kind, the first of which relate to catastrophes in which a large number of persons were simultaneously affected. Several medical men who have been present at serious railway accidents and given immediate attention to the wounded have informed me of their observations, which all agreed with one another; none of them had observed any hysterical disorders.

"Neri's account of the earthquake of Messina is also very instructive. Although he examined more than 2000 persons immediately after the catastrophe he did not see a single case of paralysis, contracture or convulsive attacks. The studies which he carried out later, in the weeks following the disaster, at a time when suggestion might have entered into play and accentuated the phenomena caused by the psychical shock, gave the same results. It is to be noted especially that Neri carefully examined the state of sensation and measured with the perimeter the visual field of more than 600 survivors, some of whom were suffering from various nervous disorders constituting a real morbid condition or 'emotional neurosis'; he did not find a single case of hemianæsthesia or narrowing of the visual field. One is justified, however, in supposing that under the circumstances emotion must have reached its utmost intensity and would be expressed outwardly in a startling degree.

"Personally, I have made enquiries of mortuary attendants in the various Paris hospitals. There can, indeed, be no doubt that when persons see the dead bodies of their relations they are likely to feel a deep emotion, which is increased by the environment in which the scene takes place. Among these enquiries, all of which led to the same result, I will specially mention that which I made in company with my colleague Richardière at the Hospital for Sick Children. During a period of eighteen years, in which more than 20,000 deaths had been entered in the register, the mortuary attendant had seen about 10,000 women come to identify their child's body and be present

when it was put in a coffin; there can be no doubt that he witnessed sincere emotions. Now this man, in his very full replies to our questions, declared that he had never observed a single manifestation of undoubtedly hysterical character; he remembers that only five or six times in his long experience women had a sort of faint and remained unconscious for a few moments, but he had never seen a convulsive attack, and he declares that he had never witnessed a single case of paralysis or contracture. Enquiries of the same kind were made of medical men, sisters and nurses who had several times had occasion to observe the effects of the most violent moral shocks, and all had the same result.

"Investigations by prospection thus present us with an entirely new aspect of the relation of hysteria to emotion: they show that emotion alone, however intense it may be, does not produce hysterical disorders. It may even be said that if emotions, by weakening the critical sense, may prepare the mind to submit to suggestion, they nevertheless exclude suggestion for the time being, and when they are intense they prevent the development of pithiatic disorders, or even cause them to disappear. *When the human soul is shaken by a profound and sincere emotion, there is no room left in it for hysteria* (50).

"The foregoing description will enable the reader to understand how hysterical manifestations may vary in form and frequency according to circumstances, in marked contrast with the permanence and invariability of other mental diseases. This changeableness is explained by hysterical phenomena being a product of suggestion. If emotion, as was once supposed, is able to produce them, they ought to be almost as common nowadays as they were in the past, for life's tragedies have not ceased to cause moral upheavals.

"A new question arises. Do the affective states which we distinguished from emotion resemble emotion or differ from it in their relations with hysteria? Like emotion, they are incapable by themselves of

creating pithiatic phenomena, but unlike emotion which is incompatible with such symptoms they play an accessory part in their pathogeny, as we shall endeavour to prove.

" In this connection I must say that my interpretation of hysterical manifestations has been met by the following argument: Mere ideas cannot have sufficiently great influence on conduct or moral health to produce such disturbances.

" This objection which is of a speculative character cannot hold good against the facts which I have advanced, but even theoretically it does not appear to be justified, and I have endeavoured to refute it in a work written in collaboration with Dagnan-Bouveret entitled *Emotion and Hysteria* (59).

" It might have some significance if by suggestion was meant the influence of a purely abstract idea, if indeed such ideas possess any psychological reality. Numerous studies including those of Ribot have shown that all ideas, even the most abstract, possess a certain affective element, however weak it may be. Moreover, in the cases under consideration there is no question of ideas of this kind; we are dealing with ideas with an extremely rich affective content whose influence can certainly not be disregarded. I have often insisted on the fact that the psychical process of suggestion has an element of simulation, the degree of which varies with the individual and with the circumstances in which the hysterical phenomena appear. The latter, it may be said, are due to an unconscious or subconscious simulation, or a sort of demi-simulation. All these terms, which clearly indicate the mechanism on which the pathogeny of the pithiatic disorder depends, enable us to approximate it, at least in one of its aspects, to a voluntary act. This comparison will allow me to explain my meaning. If a voluntary act be considered, it is seen to be the realisation of an idea, of a project formed in advance, and, in part at least, the result of an intellectual operation. But if the causes be investigated for adopting one idea in pre-

ference to another for carrying out this act, it will be found that the choice was determined by the sentiments to which it gave rise. In like manner the hysterical subject conceives the idea of a morbid condition, and realises it when this idea becomes implanted by its systematised affective elements, *i. e.* when it arouses in the patient the desire of certain advantages, or a continual uneasiness, or an abnormal desire to astonish or attract attention ; in short, creates the infinite variety of motives which act upon the easily influenced will of such patients. The rôle of the systematised affective elements is then clearly revealed ; they establish the idea and give it the power of a plastic realisation.

" To sum up, emotion (in the sense of a shock) cannot by itself cause the appearance of hysterical symptoms contrary to what was formerly admitted without dispute ; it is even opposed to their development and is not compatible with them. To enable them to appear the symptoms require the intervention of a suggested idea, which, it is true, is supported by systematised affective states."

Although the essential features of the conception which has just been described have been admitted by the majority of neurologists, some sides of the question have remained until recently the object of dispute, which has cropped up again in relation to the neurology of war. These are questions which we shall have to discuss in the following chapters.

CHAPTER II

HYSTERIA OR PITHIATISM IN THE NEUROLOGY OF WAR

Ever since the medical world became familiar with the influence of suggestion on the genesis of hysteria, whether the suggestion emanated from the family, the hospital or the doctor himself, and susceptible persons have been protected from its effects, the manifestations of hysteria have become much less frequent than formerly, especially in hospitals. Our observations, and those of Chauffard, Brissaud, Chaslin and many others bear witness to this. But as human nature has not changed, there was every reason for supposing that hysteria would increase under favourable conditions. Has the war produced such conditions, and are pithiatic phenomena frequently met with at present? Opinions on this question do not agree. Whereas Guillain (96), for instance, regards hysteria as very rare, Chavigny (99) considers it to be very common, but he thinks it is, as a rule, not recognised at the present time. "The exceptional circumstances of the war," he says, "have produced a real harvest of hystero-traumatic manifestations." Roussy (78), (79) estimates the proportion of hysterical manifestations to other nervous disorders from 10 to 15 per cent. Grasset's estimate is 42 per cent. (76). What are we to think in the presence of such divergences of opinion? It must undoubtedly be admitted that the diagnosis of hysteria has been improperly applied to entirely different nervous phenomena; it is none the less true that hysteria is often observed in the neurology of war. This is not a mere impression of ours; our opinion is

founded on the rapid disappearance of a large number of nervous symptoms which we obtained by various methods of counter-suggestion. This criterion is conclusive; as we have seen, it is an evidence of the pithiatic nature of the disorder in question.

In the cases with which we were concerned hysteria was either pure or associated with various organic disorders, and the latter form appeared to us to be much the commonest.

We will group the facts relating to the hysteria of war in two sections, entitled " Genesis " and " Symptomatology " respectively, and we will endeavour to draw suitable conclusions therefrom.

In our description of the various pithiatic phenomena which we have observed we shall have to insist on certain characteristics which enable them to be distinguished, but we shall not deal with the principal part of the diagnosis, especially that concerning paralysis, and contractures, until we have given a description of nervous troubles of a reflex character. We shall follow the same plan as regards treatment.

The Genesis of Hysterical Phenomena

What is the respective importance of emotion, traumatism and suggestion in the genesis of the hysterical phenomena observed in the neurology of war?

The present war which exceeds all others owing to the number of those engaged, the formidable character of the engines of destruction and its duration, presents a unique field of study for those desiring to determine the relative importance of the various provocative agents of hysteria. We may remark in passing that predisposition, personal or hereditary antecedents, the nature of the individual and the emotional constitution appear to be of secondary importance. The hysterical symptoms observed at the present time, as Grasset remarks, appear to develop chiefly as the result of moral and physical strain, and of commotions which diminish the psychical resistance of the individual and

predispose him to nervous disorders of this kind, however insusceptible he may appear.

We may mention that one of us as long ago as 1892 in a study of hysteria and hystero-organic associations wrote as follows (19): "It is undoubtedly one of the most widespread affections, and for my part I am inclined to believe that there are very few individuals who escape when placed in certain circumstances, and under the influence of more or less active occasional causes.

"This proposition, I hasten to say, applies to hysteria minor only; I believe, in fact, that hysteria major hardly ever develops except in individuals who are predisposed to it by heredity or nervous antecedents, and that it is the appanage of a neuropathic aristocracy; whereas hysteria minor is, so to speak, open to every one."

Rôle of Emotion

Some neurologists attached to sanitary units behind the lines thought that they could prove by their observations that emotion alone could cause hysterical manifestations to the exclusion of any factor of "suggestion." But to prove their point they appealed to the statements and explanations made by the wounded themselves. This examination by "retrospection" (*v.* p. 21) is not conclusive, as we have shown, being open to many sources of error. It is essential to depend entirely on examination by "prospection" (*v.* p. 21), as was done by our colleagues at the front who were able to judge of the effects of violent emotions on the spot. How do they enlighten us in this respect?

"I was able to follow a bombardment carefully," said M. Dide, chief medical officer to the 24th Battalion of "Chasseurs Alpins" (101). "My aid post was situated about five hundred yards from the first line on the day of an attack. The bombardment of the German counter-attack was chiefly directed against our second line, and the

communication trench from my aid post to the trench suffered especially. The two companies who were collected there to support the attack, if required, were kept standing still, and were subjected to an accurate fire by heavy artillery. The losses were high, since we had to remove thirty-two dead bodies which had been almost blown to pieces as well as the wounded. After two hours of this experience some movement took place. It was thought that the order had been given to retire, and I saw half a company making their way to my aid post in a bewildered condition just as if they had been surprised in their sleep. I gave them a few words of encouragement, and, new orders having meanwhile arrived, they returned to the firing-line in the most perfect order. I have referred to this episode not as something exceptional, but as one which happened to come under my personal observation. It appeared to combine all the circumstances likely to cause nervous disturbances, viz. the extreme violence of the bombardment (several explosions a second), the heavy losses in killed, the appalling spectacle of the mutilated bodies and the absence of anything to distract attention, occurring as it did to troops standing still and waiting to fight.

" Neither on the day of this sanguinary affair, nor in the following weeks, was there a single case of nervous disorder as the result of the explosions.

" During a whole year I observed only a single case of delirium, oneiric in character, following the explosion of a trench mortar.

" I attribute the extreme rarity of the nervous disorders following explosions to the excellent *moral* of the troops. In any case, it must be admitted that, though I had a better opportunity of detecting such disorders than many medical officers, I looked for them in vain. . . . The extreme rarity of functional motor disorders in active units under energetic leaderships," adds Dide, " ought to be widely known. In the course of a year, in spite of the incessant aetivity of the unit to which I am attached, I saw only a single case of functional paralysis following a ' period of meditation ' for a week after a shell had exploded close at hand. I had the opportunity of observing thousands of

men; and we had to suffer everything that war can invent in the way of producing emotion and anguish. . . .

"Functional disorders, in my opinion, can occur only in individuals whose emotional tone has relaxed. In a glorious unit like my own the war proved to me that neither privation nor formidable and incessant emotions could cause these phenomena in the immense majority of men whose strength was derived from the belief that they could challenge any one in bravery."

Here is another important piece of evidence which gives us very definite information as to the effects of fear.

"After living," write du Roselle and Oberthur (101), "in a sector where bombardment by large shells, mines and trench engines of all kinds was particularly continuous and energetic, we had set up at a very short distance from the trenches a fairly large aid post with beds in which it was possible for us to keep a few wounded under observation for the time required. We made a special point of noting the pathological phenomena following explosions as soon as they actually occurred. We are of opinion that some account of these daily observations made during action may be useful, though they were necessarily rapid and incomplete in consequence of the insufficiency of our methods of investigation.

"Whether due to the explosion close at hand of a mine or torpedo or an ordinary 77, or the whistling of bullets, or the spectacle of a scene of carnage, the state of emotional shock in the course of battle remains much the same. *There is no emotional reaction peculiar to large projectiles.* Whatever may be the cause, the individual will react in his own manner, and according to his own fancy: the post-emotional state thus produced will be, properly speaking, one of the infinitely varied pathological expressions of fear, such as cries, tremors, tears, and rushing forwards accompanied by various psychical manifestations and convulsive attacks; in short, by apparently hysterical phenomena.

"We may remark in passing that the convulsive attacks

which occur under such circumstances with or without rushing forwards, and often labelled unreasonably 'epileptic attacks' or 'epileptiform attacks,' very exceptionally occur in an exposed position; it is always at the bottom of a trench, in a shelter, and often also at the beginning of a bombardment, or on going up to the trenches; we never saw a case among men who were going to be relieved. When they rush forward it is very rarely in the enemy's direction, and almost invariably the patients come without hesitation to an aid post or a company headquarters.

"These men with their haggard and hallucinated looks, who make no reply to questions and do not recognise their officers or fellow-men, retain a lively instinct of self-preservation in their subconscious mind."

This interpretation may be illustrated by another example.

"One day during a violent bombardment, some men suffering from 'commotion' came helter-skelter to the aid post. They had no obvious wounds, but came tottering along with a typically haggard expression apparently unable to respond to questions or to recognise any one they met. One of us walked up to the soldier who seemed to be the worst sufferer and tried without success to show who he was; finally the man was dragged to the aid post by the arm so that he could be examined at leisure. Just as he was going in he saw the recent signs of a shell which had penetrated through the top of the entrance. The man at once stepped back, struggled and cried out, 'No, major, I won't go in there, shells were falling there too, not long ago.' It was impossible to make him advance a step. As soon as he was let go, he ran with his comrades in misfortune to hide himself in a little dug-out opposite, which we had made to protect the wounded until they could be evacuated. The men remained crouching there, trembling all over, not answering any questions, and apparently incapable of any voluntary act. But when the ambulances came to take them away there was no need to give them any explanation; they quickly understood, and took their place without any

help in the most normal manner possible. Their journey was quite uneventful."

Clovis Vincent, who remained a long while in the firing-line, where he distinguished himself by his courage and sang-froid, made some interesting observations as to the effects of emotion. We will quote the following extract from the notes which he sent us—

"In places where projectiles came in large numbers causing deaths and wounds I never saw any hysterical phenomena such as fits, contractures, or paralysis of one or more limbs. I saw emotional phenomena only, of which the most frequent were tears, trembling, a state of hebetude in which the man does not move or answer questions, tachycardia, tachypnœa, and micturition."

To this evidence we must add the series of striking observations made by Clunet at the time of the recent shipwreck of the mail steamer *La Provence II*, on which he happened to be. The following is an extract from the note which he kindly sent us.

"When *La Provence II* was torpedoed on February 26, 1916, we were able to study the manifestations of emotion close at hand immediately after the accident and *apart from any commotional state.*

"We found that the pithiatic phenomena did not occur till later, when the survivors were in safety. These phenomena yielded to an energetic treatment which was immediately applied, and did not recur during the week which followed the accident. To make our description clearer, we will divide our experience into four periods.

"1. On board the boat, during the seventeen minutes between the explosion of the torpedo and the complete disappearance of the boat (period of emotion pure and simple).

"2. In the sea for eighteen hours, including a whole night hanging on to a raft (period of emotion and physical suffering due to cold).

"3. On board the torpedo-boat which came to our assistance the next day (period of hysterical phenomena, and treatment).

"4. Off Milo, on board different vessels among which we were distributed, during the week preceding our departure (period of return to normal life).

"1. *On board. Period of emotion pure and simple.*—At 3 p.m. I was just going to read in the saloon when I heard a faint explosion (like that produced by a 77 three hundred yards off), and I felt a slight quivering of the ironwork, as if the boat was running on a rock, and the machinery stopped immediately. I went up on the bridge and found the ladders filled with a dumb and anxious crowd. On the bridge I met a naval officer who was a passenger, wearing his lifebelt. He was calm but quite livid, and said, 'We've been torpedoed; it's all up.' I tried then to get to my cabin to find my money; it was impossible, ladders and corridors were completely blocked by the soldiers; the news had spread, 'We've been torpedoed.' The panic began about five minutes after the torpedoing, when the boat, which was just beginning to sink at the stern, seemed motionless, and looked as if she could weather the shock. The panic remained a silent one. There were no cries, only a few gasps from men who were being choked or stifled in the crowd on the ladder.

"Some were in a state of stupor, and remained motionless on the bridge, but the majority were in a state of great agitation and acted in an irrational way; some crowded into the boats on the bridge without trying to lower them, others ran up into the rigging, while others fired their revolvers or rifles into the air. I went up to a ship's officer who with a fixed expression was discharging his revolver into the sea and asked him if he had any orders. He seemed to wake up out of a dream, and replied, 'Orders, why should I? It's all up.' 'Then why are you firing your revolver?' 'To stop the panic.'

"In a few moments the firing took a different turn: an infantry officer shot himself in the head. This example was soon followed by several men, and I witnessed a real epidemic of suicide. Many men threw themselves into the

sea from the bridge in the front part of the vessel, which was now raised more than fifty feet above the surface of the water.

"In this panic-stricken crowd there was not a single pithiatic phenomenon such as fits, convulsions, paralyses or barking—almost all kept silence; but there was no mutism, they replied quite well to a direct and definite question. Side by side with these panic-stricken people, a few officers, soldiers and sailors maintained complete self-possession, endeavouring, but unsuccessfully, to launch the boats into which the men had crowded, and throwing everything that could float into the water.

"At 3.15 p.m. the stern began to sink, so to escape the fall of the masts and the suction cone produced by the sinking ship, I made my way to the level of the water towards the stern and swam to a small raft which was floating a few hundred yards from the vessel. At 3.17 p.m. (in spite of being in the water my watch had not stopped) there was nothing left on the water but wreckage, swimmers and drowned.

"2. *On the raft. Period of emotion and physical suffering due to cold.*—I was the first to reach the raft, where I was soon joined by two other swimmers; we at once endeavoured to save as many of our comrades as possible, so that in a few minutes there were seventeen hanging on to the open raft measuring less than ten feet by four. It was very cold (not more than 44–46° F.), the water seemed warmer, but we were covered with water by every wave, and the maceration of the skin soon became very unpleasant.

"Several of our companions had stripped so as to swim better, and we shared our clothes with them.

"At first there were isolated expressions of despair and lack of discipline—I was the only officer in the little group—some crying out, 'We are lost; it's sad to die like this.' In about an hour's time things improved, and the men recovered courage. They followed the lead of a cheerful fellow, who had often been 'in a much worse hole' and had always got out of it, and was sure that he would this time. I dressed a broken nose and collected objects

floating in the sea, *e. g.* some apples, a piece of bread, a flask half full of wine, some Cosson signals and an oar. On my advice the food was kept in reserve for the second twenty-four hours. We changed places frequently to prevent our joints getting stiff, those in the centre of the raft who did not have to hang on so vigorously as the others rubbed their neighbours and smacked them on the back.

"In the middle of the night a native of Martinique said that he was done for; he began a religious lamentation, thought he saw heaven, commended his soul to the Virgin and the saints and began to cry. His neighbours appeared to be impressed, so I told him to say his prayers to himself. As he did not obey, I took him by the wrists and threatened to throw him into the water, which had the effect of keeping him quiet. The *moral* which had been shaken for a moment by this occurrence was re-established by a funny yarn about Morocco, which set every one laughing. During the eighteen hours on the raft I did not see any pithiatic phenomenon. None of my men (sailors, stokers and colonials) died, and none of them showed any nervous disorders during the following days.

"3. *On the torpedo-boat. Period of pithiatic phenomena and treatment.*—The rescuing began at about 7 a.m. and was extremely long and difficult owing to a heavy swell. We were all taken off at about 9 o'clock. I went to see the survivors collected in front of us. Some of them were wounded (from struggling during the last moments on the *Provence*, or from the fall of rigging). One even had a fractured thigh, and I rigged up a make-shift splint for him. Several showed neuropathic or pithiatic phenomena, such as quadriplegia, paraplegia, or mutism, incessant snarling, spasmodic weeping, groaning, hiccoughing, barking and shaking amounting to spasmodic movements of the upper limbs, but no generalised convulsions. I sent the patients down to the engine-room close to the engines, where the temperature was very high. The number of my patients increased as new survivors arrived, so that out of six hundred shipwrecked persons collected by our torpedo-boat, I found thirty to forty with nervous disturbances.

The treatment was simple, they were entirely stripped in an over-heated room, and energetically rubbed by two vigorous sailors with a hair glove soaked in alcohol. As soon as they had been warmed externally and internally (rum), I took each one separately and smacked him harder and harder until the disturbances disappeared, all the time speaking kindly to them and expressing my delight at the rapidity of their recovery. No one resisted more than ten minutes; many were cured by contagion, on witnessing the treatment of the others.

"The majority expressed to me their gratitude on the spot and during the following days.

"In my opinion the cold, which caused a large number of deaths on many of the rafts, played a part in the phenomena of contracture which in many cases were sufficiently intense to prevent the appearance of the slightest tendon reflex in the affected limbs. In one case of contracture in the lower limbs, the plantar reflex was impossible to obtain for many minutes, and then it became normal.

"4. *Off Milo. Period of return to normal life.*—I stayed at Milo about a week before returning home. During this time I had several opportunities of seeing my patients on the torpedo-boat, but none of them showed any marked symptom of nervous disorder. It is probable that if at the time when their neuropathic symptoms appeared these persons had been put to bed and received delicate attention from admiring women, the therapeutic results would have been very different."

As Clunet remarks, the observations on board *La Provence II* in the first stage of the catastrophe are particularly interesting to one who wishes to judge of the rôle of emotion in the genesis of nervous symptoms. Emotion in the sense of a shock must have reached its maximum intensity, and was acting without any physical commotion being superimposed on the psychical shock; its field of action was thus much easier to define. Now, in the midst of all the mental disturbances which arose under these circumstances, no pithiatic disorder appeared at that time. We may

add that one of us served in a divisional ambulance during the first eight months of the campaign. All the wounded and sick from the corresponding section passed through this clearing-station, which was operating in a zone from two to three miles behind the firing-line, first in Alsace, then in the neighbourhood of Saint-Dié, and lastly on the Somme. Neither in the military nor the civil element did he meet with any cases of hysteria, either during the period of retirement or at the time of the exodus of the population which, alarmed by the first effects of the bombardment of Saint-Dié, made a hasty departure, and for several hours defiled in front of the ambulance. Nor did he see any when the ambulance was bombarded in turn.

The last circumstances deserves to be related in some detail, for it may have seemed *a priori* specially suitable for the development of hysterical symptoms. It was on August 28, 1914, when the ambulances 1/14 and 3/14 had just been drawn up side by side by the Burgonce after a period of ten days' continuous retirement which had had a powerful demoralising effect upon the men. All of a sudden heavy shells, which had hitherto been falling at about a mile off, began to fall nearer and ended by reaching the ambulance. Although the bombardment lasted only an hour, out of an effective of forty men one of the ambulances had seven wounded and twelve killed. The latter were hardly recognisable, in many of them the trunk had been separated from the limbs, which had been torn off and hurled to a distance. The effects of the bombardment had made a great impression upon the survivors, all the more so as they were not combatants but hospital orderlies, to whom this painful episode was unexpected, and constituted their baptism of fire. And yet, neither that day nor during the following weeks did any of them present any hysterical manifestation.

He had, however, the opportunity of seeing two individuals with hysterical symptoms, but this was

during a relatively calm period, among troops in a rest camp.

In a communication made with Major Plisson to a medical meeting of the 2nd Army in March 1915 he drew the attention of his colleagues to the extreme rarity of hysterical accidents seen at the front, showing the similarity of this observation with those made before the war (*e. g.*, in hospitals, or the enquiry into the earthquake at Messina, *v.* p. 23).

This communication did not provoke any contradiction.

It is important to note that the evidence we have brought forward has met with no opposition. At the front, therefore, under conditions likely to cause the most violent emotions various emotional disturbances may be observed, but no hysterical symptoms have been seen to develop on the occasion of an emotion.[1]

The results of the observations have been quite different in places distant from the firing-line. At nine to twelve miles from the front lines in the sanitary units in the line of communication hysterical manifestations are frequent. This fact has been the motive for creating neurological centres at the front for the special purpose of retaining persons suffering from disorders of this kind in order to submit them immediately to psychotherapy, which is all the more likely to be successful the less it is delayed.

Pithiatic phenomena are still more frequent in neurological centres at the base among soldiers who have spent many months in various hospital units, but their number varies considerably comparing one centre with another. Considering the time of onset of these phenomena one is not justified in eliminating suggestion, which is all the more likely to intervene

[1] Information supplied by other medical officers at the front with whom we had the opportunity of discussing this question has been entirely unanimous : *e. g.*, Major L. Lévy and O. Monod, who were attached to ambulances engaged near the firing-line, assured us that they had never seen any symptoms resembling hysteria.

as men suffering from severe emotions often show an abnormal degree of suggestibility associated with a slight confusional syndrome. This fact has been brought into prominence by George Dumas, psychiatric expert in the 1st Army, in a very remarkable analysis of the mental state in emotion (101).

" All persons experiencing a great emotion and all who have received a commotion, or almost all, present characteristic mental disorders, when an examination is made of their intelligence, memory or imagination. In some these disorders are very marked, and one finds dulness, dysmnesia of evocation, and especially of fixation, and fairly often oneiric delirium, in other words, very definite and pronounced symptoms of mental confusion.

" In others one finds the same symptoms much less marked and usually reduced to a certain difficulty in comprehension and fixation ; one is thus led to conclude that the confusional syndrome exists in various degrees in most of those suffering from great emotions or commotions reaching us from the front. . . .

" These observations are not only of interest in themselves, but they are of still greater interest when an attempt is made to find an explanation in their state of mind for the nervous disorders which these patients frequently present. The pithiatic character of a very large number of symptoms is not contestable, and has not been contested, and their pathogeny has almost always appeared to me to be associated with a slight confusional state. This condition, the mental characteristics of which I have described, is revealed by a special suggestibility, an absence of initiative, and a tendency to exaggerate all the difficulties of an effort and to transform them into permanent obstacles. The patient who has not lost consciousness of himself, or who is beginning to find it again, readily carries out a negative auto-suggestion in the performance of his various functions, and in the presence of the slightest obstacle he imagines that he is dumb, paralysed or deaf. . . .

" In offering an explanation of the hysterical symptoms of our patients one should admit the existence of an inter-

mediate period which is interposed between the initial shock and the appearance of the symptoms, this intermediate period being one of slight mental confusion. This allows the patient the exercise of a functional activity during which he easily runs the risk of giving way to auto-suggestion. This intermediate confusional state may be suspected or even found in many of the cases published a long time ago, in which the authors attached importance only to emotion, the nervous shock and the symptoms which followed. There is a chance that in some cases the confusional state may have passed unnoticed."

Violent emotions obviously prepare the soil and create a predisposition for hysterical manifestations. They increase suggestibility at the expense of the critical sense, and by occasionally producing actual states of slight mental confusion. The events of the war have confirmed in this respect the following opinion expressed by one of us in the course of a discussion on emotion (55). "I readily admit that a moral upset by weakening the critical sense may increase the patient's suggestibility"; and Dupré said in the course of the same discussion, "Emotion being an element in the dislocation of the personality favours suggestion." But the hysterical manifestations which arise from this new state of mind do not appear at the moment of the emotional shock. Striking observations such as we have just related confirm this opinion, which we had already arrived at from observations made before the war. Between the emotional shock and the appearance of pithiatic phenomena there is a fairly long interval to which Charcot gave the name of "period of meditation," during which auto-suggestion and hetero-suggestion have plenty of time to intervene. In support of the contrary idea according to which hysterical symptoms could be caused by emotion exclusively, the only cases worth considering are those in which the disorder had immediately succeeded the moral shock.

The study of hysterical symptoms observed in the

neurology of war has not furnished any conclusive case of the kind.

As regards the opinion of Dejerine (55), who formerly used to attribute the absence of neuropathic phenomena in soldiers who had faced death and seen their comrades fall at their side to the nature of the emotion which was, so to speak, foreseen, such a view in our opinion seems hardly tenable. Considering the range of heavy artillery and the power of big shells which come from every conceivable direction and unexpectedly explode sometimes in the midst of a rest camp with results comparable to an explosion in a coal mine, how would it be possible to admit that the resulting emotion does not constitute an emotional shock in the most complete acceptation of the term ?

We have even maintained formerly that hysterical symptoms disappeared infallibly under the influence of a profound emotion.

In the publications of these last two years we have found only a single case, recorded by Chartier (90), which appeared to be in opposition to this point of view. His case was that of a man with paralysis of the hand without any sign revealing the existence of a lesion of the nerve centres or of the peripheral nerves, and which the author attributed to hysteria. Under dramatic circumstances and at the moment when the wounded man, who had already tried to commit suicide by throwing himself into the water, was in danger of death, Chartier found that the paralysed hand did not show any movement. This case would be conclusive if the diagnosis of hysteria was incontestable, but this was by no means certain. It should be noted that this paralysis developed after a gunshot wound, was accompanied by a slight degree of contracture, and that the results of psychotherapy were very incomplete. For all these reasons one is justified in thinking that it was really a paralysis with reflex contracture. Now, disorders of this kind are hardly more amenable to psychic influences than those which are connected with lesions of the nerve

centres or nerve trunks. None of the features of the case allow one to exclude this diagnosis, which was not even considered. No fact, therefore, has hitherto been brought forward to contradict what we said, viz. that hysterical symptoms and violent emotions are incompatible.

Rôle of Traumatism and the Doctrine of Hystero-Traumatism

In 1886 Charcot drew attention to the rôle of traumatism in the genesis of local hysteria; this conception was defended and developed by his pupils, especially by Bouveret (13), and by Blum (23). Until then nervous troubles of this kind (railway spine, railway brain) were considered without any discussion as organic manifestations, in conformity with the opinion expressed by Erichsen in 1866.

The idea of hystero-traumatism was a very fruitful one, and recent events have shown the frequency with which traumatism determines the outbreak of pithiatic phenomena. It is equally true that nervous symptoms of an entirely different nature have very often been attributed to hystero-traumatism. Thus at the beginning of the war medical men seemed to have completely forgotten the existence of those amyotrophic paralyses and so-called reflex contractures which have been so well described by Charcot and Vulpian. Any paralysis or contracture which did not present any of the signs of the classical organic affections were attributed without hesitation to hystero-traumatism. All the cases, therefore, which have been published under this name cannot be accepted. This is a point to which we must often return later.

We will now discuss by what mechanism traumatism and especially the traumatism of war can produce hysterical symptoms.

In the case of local traumatism (gunshot wound, shell wound or contusion) the question is relatively simple; the pain and the more or less persistent

inhibition of movement resulting from it are the starting-point of a process of auto-suggestion. The organic factor, however slight it may be, acts as a bait, so to speak, for the hysterical symptoms which settle in the region of the trauma and usually survive the exciting cause.

In the case of another variety of traumatism consisting in commotions caused by explosion of large shells, minenwerfer and mines the question is more complicated. First of all the actual nature of the nervous troubles which develop in such cases may be a matter for discussion (101). Whereas Roussy, for example, thinks that it is exceptional for explosions a long way off to produce organic lesions, Guillain, on the contrary, maintains that organic disturbance of the neural axis in such cases is frequent. The former is of opinion that the nervous troubles which result "should in the immense majority of cases be classified among the so-called hysterical or pithiatic disorders"; while the latter, in the course of the discussion at the Neurological Society devoted to the study of commotion due to shell explosions, expressed the following opinion: "Many patients are wrongly considered as pithiatic, hysterical, exaggerators or simulators."

Between these two extreme opinions is to be placed that of Claude: "What we most frequently observe in the zone of the interior are psychoneuropathic states, focal organic lesions constituting the exception, but owing to the frequency of changes in the cerebro-spinal fluid and especially of variations in its tension, it is possible that the functional disorders observed are kept up by slight modifications in the composition and circulation of the cerebro-spinal fluid."

Hystero-organic associations appear to us to be common after traumatism of this kind. The reality of an organic lesion sometimes admits of no discussion, even in cases in which the remarkable success of counter-suggestion affords a proof of the pithiatic nature of the nervous disorders observed. This fact is illustrated by the following case (Leriche and Froment)—

As the result of the commotion produced by the explosion of an aerial torpedo a soldier fell and lost consciousness. He was taken in a comatose state to the ambulance and thence to a clearing-station. The coma ceased in forty-eight hours, but complete mutism and contracture of the lower limbs developed. Lumbar puncture gave issue to a definitely hæmorrhagic fluid. On close examination, however, the contracture presented all the characters of a psychical contracture; in a few moments it could be caused to disappear by counter-suggestion and the patient was enabled to walk. During a second spinal puncture he was seized with a spasm of the upper limb, which was also caused to disappear at once by persuasion. In the night following this examination the patient began to speak in the course of a dream, and from that moment he was cured of his mutism. A month later he was transferred to a neurological centre, where he was again examined by one of us for motor troubles resembling rhythmic chorea, which rapidly subsided when he was assured that the symptoms were not serious. In a few days he showed some impatience to leave hospital, declaring that he was perfectly cured and asking to return to the front. It is interesting to note that he was a vigorous, well-balanced individual without any neuropathic taint and not alcoholic. The pithiatic nature of the symptoms was so obvious and indisputable that had it not been for a lumbar puncture, one would have had no hesitation in admitting that it was a case of pure hysteria. The result of the examination, however, enabled us to affirm the reality of a central hæmorrhage. In other cases there are no grounds for supposing the existence of a concomitant lesion, and traumatism alone appears to have caused the pithiatic disorders. Whether the commotion caused by a shell explosion can produce lesions of the nervous system or not, there is every reason for supposing that it can increase the suggestibility and be thus the cause of hysterical disorders as much as a psychical commotion or emotion.

The hysterical symptoms will vary in their form, intensity and localisation according to the sensations caused by the actual shock and the various circumstances in which the patients are placed. But it is essential, we repeat—and the reader will better appreciate the justness of this remark after reading the chapters devoted to reflex nervous phenomena—not to attribute to hysteria all the disorders following traumatism and independent of any lesion of the central or peripheral nervous system. However correct may be the idea of hystero-traumatism, it has sometimes been misapplied in the neurology of war.

Rôle of suggestion.—We may remind the reader that, according to our conception, suggestion plays the essential part in the production of hysterical manifestations : these are absent or very rare in circumstances unfavourable for suggestion; they are very common under the opposite circumstances, their frequency, intensity and duration depending on the conditions which are suitable to produce and maintain suggestion. Some neurologists, however, thought they had the right to assert that in certain cases of hysteria observed in the war suggestion could not have intervened. To prove this they thought it sufficient to mention the absence of any previous medical examination, and to declare that they had taken all the requisite precautions for avoiding medical suggestion. But the defect of such a method of reasoning is that it does not take into account other modes of hystero-suggestion and auto-suggestion. It must be admitted that under the present circumstances, considering what they see and have heard said or think they know of the effect of various wounds in war, the patients concerned are almost inevitably exposed to suggestions of all kinds, of which they may not be conscious, but which, though unrecognised, are none the less efficacious.

The result of the evidence set forth in this chapter has been that the neurology of war has not produced any argument against the opinion which we have

maintained. It even tends to strengthen the idea of the indispensable rôle of suggestion which determines the appearance of hysterical phenomena, moulds them, and, as we shall see, guides their course. Emotion and traumatism only predispose to manifestations of this kind. They increase suggestibility and sometimes provide the elements of an auto-suggestion.

CHAPTER III

SYMPTOMATOLOGY

Although hysterical manifestations are common in the neurology of war, it is equally true that other nervous symptoms besides pithiatic phenomena are constantly described by this name, although they do not originate in suggestion and counter-suggestion cannot disperse them.

This confusion is much to be regretted, inasmuch as it involves two kinds of disorders quite distinct in their mode of evolution, prognosis and treatment, as well as in the medico-military decisions they give rise to.

We will therefore endeavour to separate what really belongs to hysteria from that which has been improperly attributed to it, by a critical examination of cases published during the two years of war.

Hysterical manifestations are essentially polymorphous. As they are the product of suggestion, they are modified by current ideas and are modelled on the conceptions of the individual.

A complete and detailed description of the hysterical symptoms observed in the neurology of war would consequently present no special interest. We will merely allude to them, laying special emphasis on those which are most frequent, with practical suggestions in passing, and dealing particularly with questions which, still forming the object of controversy, deserve to be discussed.

Hysterical Stigmata

Are the observations which have been made during the war likely to make us resume the old conception of the permanent stigmata of hysteria ?

A few neurologists seem to be inclined to this opinion. Lentz (66) has noted the existence of a large number of hysterical stigmata in the soldiers of a Russian regiment which had taken part in many battles and had suffered considerable losses.

Mondino (101) also remarks that in numerous cases following explosions " a persevering physical examination " had always enabled him to find undoubted hysterical stigmata.

The mere use of the term " persevering " applied to the examination of subjective phenomena justifies one in thinking that medical suggestion intervened in these investigations.

Chavigny and Sollier have, it is true, found stigmata in subjects who had undergone no previous examination, and although they had taken every precaution to avoid medical suggestion, but this opinion is in opposition to that of a very large number of neurologists who are more convinced than ever by their experience in war that there is no foundation for a belief in the permanent stigmata of hysteria. As regards the so-called ocular stigmata, the reader will see later, in the paragraph on " Hysterical visual disorders," what view should be adopted (*v.* p. 68). The nervous disorders, therefore, which have been described by the name of stigmata show a very variable frequency according to the observer, the cases observed, and the actual circumstances of the observation. In any case it is beyond dispute that at the present time these stigmata are infinitely rarer than formerly, and that medical men are more on their guard and so create them less frequently. But it is natural that they should reappear as soon as proper precautions during investigation are neglected. Moreover, in order to conclude that these stigmata do not originate in suggestion it is not sufficient to eliminate medical suggestion only. It must not be forgotten that other forms of hetero-suggestion or auto-suggestion may still intervene. We have already dwelt at sufficient length on this subject.

What clinical significance should be given to stigmata? They have exactly the same meaning and value as all the other symptoms which suggestion can produce. They constitute in themselves hysterical phenomena (we have never disputed this), but—and this is the essential point on which we must insist—they cannot in any case justify us in attributing to hysteria the nervous symptoms which accompany them (*v.* p. 9).

Some join Chavigny (99) in thinking that by refusing these stigmata the position they formerly possessed there is a risk of hysteria being overlooked. Our opinion is that it is much more dangerous to attach an excessive importance to these phenomena. In fact, by adopting this method in cases with hystero-organic associations which are so common in the neurology of war, there is a risk of not seeing the organic element. There is also another risk, viz. that of failing to recognise the numerous cases of paralysis and contracture in which stigmata are completely absent.

In the chapter on "Diagnosis" we shall see what method should be adopted and what other criteria should be taken to establish with all possible rigour the diagnosis of pure or associated hysteria.

Hysterical Fits

Hysterical fits have frequently been observed in some neurological centres.

They are distinguished from epileptic fits in the first place by the constant absence of objective signs characteristic of epilepsy: cyanosis of the face with lividity of the lips, subconjunctival hæmorrhages and subcutaneous petechiæ, and extensor plantar reflex.

The other characters of the epileptic attack—initial cry, sudden fall, complete loss of consciousness, biting of the tongue, presence of bloody froth on the lips, incontinence of urine, and subsequent prostration—though they may be valuable elements in diagnosis,

are not conclusive, for they may be consciously or unconsciously imitated.

Hysterical attacks are also distinguished by the form which they assume (wide-ranged movements, gesticulations and opisthotonos) (*v.* p. 2), and by another character which is conclusive, the possibility of reproducing it exactly by suggestion, and causing it to disappear immediately by counter-suggestion.

This test is of great practical value when one cannot witness a spontaneous attack. We have very often had recourse to it with success. This is how we proceed—

We first of all announce in the patient's hearing that we are going to try to reproduce the attack, this being indispensable to enable us to lay down the treatment and to get a proper understanding of the case. We add that electricity is almost infallible in such cases, especially when the electrodes of the faradic machine are placed on a definite spot. It is not necessary to employ strong currents; sometimes, even, we content ourselves with merely applying the electrodes without passing the current.

Shortly after we have put the electrodes in position, we declare that the attack is going to begin and that the patient will struggle. To prevent his falling we put him at full length on the ground or on a bed. As a rule, in cases of hysteria the effects of suggestion appear rapidly: the legs become stiff, the body is thrown into contortions, and the fit proceeds with special modifications according to the individual. As soon as the attack is fully developed, we declare that we have an infallible method for arresting it. We then apply the electrodes to another region, or we exercise a pressure on the abdomen or trunk, saying in a confident tone that the attack will be over in a few moments. In fact, an hysterical attack produced in this way does stop, and the subject is at once able to answer questions put to him and to leave the room where the examination has taken place.

It must not, however, be forgotten that the same

individual may be subject sometimes to hysterical fits and sometimes to epileptic fits; it is therefore advisable to question the attendant or friends to ascertain whether the spontaneous attacks closely resemble the artificial one. If this is the case, no further doubt can be entertained as to the hysterical nature of the attacks.

Finally, there is one other remark which we should make: the patient during his attack of hysteria and while apparently quite lost to all that is happening about him hears everything that is said, as in his normal state. It is therefore essential to avoid any remarks which might originate a suggestion.

Disturbance of Sensibility

Hysterical anæsthesia.—Hysterical anæsthesia appears in various guises and does not obey definite rules.

It sometimes assumes the form of hemianæsthesia, as we have stated in dealing with the stigmata, sometimes the segmentary form, and sometimes the form of isolated patches; not unfrequently it imitates the anæsthesia of peripheral type so frequently observed at the present time, but in that case it reproduces only approximately the anæsthesia associated with lesions of the nerve trunks.

These sensory disturbances do not cause any inconvenience; the patient is never known to burn himself like a wounded man suffering from anæsthesia due to a lesion of the ulnar or median. They often vary from one moment to another, and become modified according to the conscious or unconscious suggestions of the observer: they diminish and tend to disappear as soon as no further notice is taken of them.

The following, in our opinion, is the right way to proceed in an examination of the sensibility, which is always rather a delicate matter. First of all it is advisable to blindfold the patient and carefully to avoid influencing him by the questions put to him. One must also take care not to ask him if he feels as

distinctly in one region as in another, and one should refrain from any reflection which might suggest to him the idea that his sensibility might be diminished. The best thing is merely to say before beginning : " Attend to me, and tell me as soon as you feel that I am touching you." We often appeal to the patient's self-esteem, by telling the students loud enough for him to hear that, judging by his looks, he must be an intelligent person and will probably give us exact information. We then proceed to touch very lightly different parts of the body, pinch and prick the skin, exercise pressure upon it with the finger, flex and extend different segments of the limbs, separate the patient's fingers and cross one over the other, give him various things to handle of a round, cubical, cylindrical, spherical or oval shape, and apply warm or cold objects to the skin. All this is done sometimes on the left and sometimes on the right, sometimes at the extremity and sometimes at the base of each limb, without the examination seeming to follow any preconceived idea or any apparent rule. If the subject does not say spontaneously what he feels, we simply ask him : " What do you feel now ? What am I doing ? " It is most important, to try to bewilder the patient, and to act as if one wanted to catch him in the act of contradiction, without this method of procedure in any way implying a suspicion of simulation. One should also carefully note all the movements and gestures caused by suddenly pricking or pinching a region supposed to be anæsthetic, or by the unexpected application of a hot or cold object. When these precautions are taken to avoid any suggestion and any wilful or unconscious trickery, one becomes convinced of the variety and instability of hysterical anæsthesia.

Lasègue, in an unpublished note which we owe to his grandson Cesbron (54), expressed himself as follows : " It is common to find that hysterical patients who have not yet been enlightened by the doctor's investigations do not make any mention of anæsthesia." " I

have carefully examined," he adds, "a large number of hysterical subjects and earnestly implored them not to omit any of the inconveniences they felt, and I have never met with a single one who spontaneously mentioned anæsthesia among the symptoms of which he had to complain. It is very different with patients whose attention has been directed to this kind of phenomena. But even when they have received this information, how many are there who really suffer from it or complain of any inconvenience resulting from their lack of sensibility?"

It is certainly due to the precautions taken that we have never found in the neurology of war a characteristic and stable hysterical anæsthesia, any more than we have met with stigmata.

Chavigny (99) declares, on the other hand, that such disorders are very common at present, but are usually overlooked. The article in which he maintained this opinion has been criticised as follows by A. Léri (104)—

"It is not without surprise that we have seen some of the best-known writers broaching reactionary theories with regard to the present conception of hysteria. According to them, during this harvest of hystero-traumatic disorders which we see to-day, there are numerous observers who would deny the existence of hysterical hemianæsthesia limited to one limb and other disturbances of the same kind; these are 'ignored diseases'; hysterical patients are systematically regarded as simulators or considered to be suffering from organic diseases; hysteria is actually an archaic syndrome which has become unfashionable and out of date; nobody dares to make a diagnosis of hysterical disorders, and there is no longer any question of it either in symptomatology or differential diagnosis.

"I suppose that this is a severe criticism of the partisans of the present conception of hysteria, who include to-day the overwhelming majority of the leading neurologists; but I am quite certain that this criticism is not justified. Unless I am mistaken, no

one has denied hysterical anæsthesia or deliberately regarded hemilateral or segmental anæsthesia which does not prove to be organic as signs of simulation; nor has any one maintained that the doctor alone was responsible for hysterical disorders, and that subjects who had not been subjected to any previous examination could not present perfectly genuine symptoms.

"The 'current doctrine,' which chiefly originates from Babinski's work, far from denying the existence of hysterical disorders, considers them, on the contrary, as the result of auto- or hetero-suggestion. They can merely reproduce, it is true, what the will can produce, but that by no means signifies that they are actually produced by the will, and that there is consequently any question of simulation. There is no doubt that they can be caused by a medical suggestion, but they may also be produced by any other hetero-suggestion, *e. g.* the sight of a comrade with paralysis or anæsthesia, organic or otherwise. They may also be produced by auto-suggestion alone, and it is conceivable that this often plays a considerable rôle; from a tired feeling in a limb to its relative impotence there is but a step; thence to paralysis and anæsthesia there is but one step more, and these steps are small and soon taken, although in good faith, by neuropathic temperaments. The present exceptional circumstances do not appear to have altered these conceptions in any way; among the countless cases of purely functional disorder which I have observed since the beginning of the war, I have seen a large number in which there did not appear to be any question of simulation, but I did not find any case where the influence of auto- or hetero-suggestion could be eliminated."

Some persons have wrongly attributed to us the idea that we regarded these disorders as a fiction, or as the result of simulation. What we did say was very different, viz. that they were the result of suggestion.

It should also be added that some forms of organic hemianæsthesia may simulate those of hysterical origin.

Anæsthesia of a more or less segmental type may also be observed in Volkmann's syndrome, and in reflex paralysis and contractures (Gougerot and Charpentier (151), Sicard (157), Babinski and Froment (145)). They were formerly noted in cases of hæmorrhage into the spinal cord and syringomyelia, and have recently been found at the onset of hæmatomyelia following shell explosions (Froment) (205).



Fig. 1.—Neri's sign in a patient with left sciatica. When the trunk is bent forwards the knee is flexed on the affected side.

If anæsthesia corresponding to this type were always regarded as hysterical in nature, grave errors of diagnosis would be committed. Errors of this kind have undoubtedly led some neurologists to give hysterical anæsthesia the power to modify or abolish the cutaneous reflexes. We will discuss the cases brought forward in support of this view in a special section devoted to the question of the reflexes in hysteria (*v.* p. 65).

Hysterical pains.—Of all the hysterical pains, the most frequent undoubtedly is hysterical pseudo-sciatica, in which the signs of sciatica properly so called are absent, viz. loss of the tendo Achillis reflex, scoliosis, Lasègue's sign (pain caused by flexion of the thigh combined with extension of the leg), Neri's sign (*v.* Fig. 1), and Bonnet's sign (pain caused by adduction of the thigh).

Motor Disturbances

Hysterical paralysis.—Hysterical paralysis presents the most varied types, such as *hemiplegia, paraplegia* or *monoplegia* of the upper and lower extremities.

The most frequent of all these forms of paralysis appears to be paraplegia. It develops as a rule as the result of commotion due to a shell explosion accompanied sometimes by a fall or being buried in a trench. Although the above-mentioned causes can provoke hæmatomyelia (Jumentié (213), Ravaut (240), Heitz (211), Froment (205), Jean Lépine (221)), the communications of Pierre Marie and Mme. Athanassio-Bénisty (70), A. Léri (73), Roussy and Boisseau (109), in France, and of Bonhœffer and Karplus in Germany, as abstracted in the *Revue Neurologique*, have proved the purely neuropathic nature of a considerable number of paraplegias occurring under these conditions. Laurent had previously seen cases of the same kind during the Balkan War; and there is every reason for supposing that many of these cases, in which a cure was obtained rapidly, were due to hysteria. But hysteria is not always the only factor; the existence of sphincter troubles, of short duration, and certain changes in the cerebro-spinal fluid, indicate, even when counter-suggestion is decidedly successful, that there had originally been real organic disorders on which were grafted the pithiatic phenomena which persisted. Complete brachial or crural monoplegias are also observed, and not unfrequently motor disorders roughly simulating paralysis of the brachial plexus or musculo-spiral paralysis.

Typical astasia-abasia, simple or spastic, or other forms of systematic paralysis (*v.* p. 3) are not rare in the neurology of war.

We will not describe here the distinguishing features between these different varieties of hysterical paralysis and organic paralysis, as we shall deal with this question at length in the chapter on "Diagnosis."

Hysterical contractures.—Hysterical contractures are less frequent than was supposed during the first months of the war, when a large number of contractures were regarded as hysterical, though, as we have since shown, they should have been ranged among reflex nervous disorders. Genuine hysterical contractures,

however, which are cured rapidly and completely by counter-suggestion are seen after wounds in war. In the upper limb they appear in the form of claw-hand, ulnar pseudo-clawhand, or the so-called illogical clawhand; in the lower limb they are chiefly shown by extension of the leg on the thigh and by club-foot.

A. Léri and Roger (123) were of opinion that contractures in a position of extension were almost always of hysterical nature. But at the time of their communication little was known about reflex contractures, which, as we shall see, sometimes show a similar condition. As a matter of fact, the diagnosis of hysterical contracture is principally based on the absence of the objective signs peculiar to organic or reflex contractures, and which cannot be reproduced voluntarily. It was held formerly, it is true, that hysterical contractures and hypnotic contractures, which are both the same, were quite distinct from voluntary pseudo-contractures. It was claimed that if an attempt was made to correct the vicious attitude, there was no return to the old position or jerky movements which are always present in the latter. Some writers even have maintained that hysterical contractures may persist in natural sleep. But none of the cases which had been formerly brought forward in support of this view had presented all the features necessary to guarantee their authenticity.

What does the neurology of war teach us in this respect? All the cases of hysterical contracture which we had the opportunity of examining resembled voluntary contractures in every respect. If an attempt was made to overcome them, one noted the existence of a return to the old position, of jerky movements, of intermittencies and variations in their attitude, which were all the more frequent and pronounced as the patient's fatigue increased under the influence of the exercise. Moreover, if after carefully diverting the patient's attention, the contractured limb was suddenly seized, it was often possible without any

effort to overcome a contracture which had resisted the most vigorous traction a moment before.

Other observers have been struck by the same peculiarities. The following is the opinion of A. Souques (71): "Neuropathic contracture or pseudo-contracture is not accompanied by any disturbance of superficial or deep sensibility, of reflex action, or vaso-motor disorder. It cannot be distinguished by any clinical sign from voluntary contractions. Its localisation is roughly related to the position of the wound, but the vicious attitude usually bears no relation to physiology, but depends upon the personal ideas of the individual."

In a thesis inspired by Roussy Mme. Grutzhaendler-Judelson (77) wrote of hysterical contractures as follows: "All sorts of clawhands may be met with, including those which resemble that caused by a peripheral nerve lesion and others which are entirely illogical. One of their characters is to disappear in sleep, while an organic clawhand persists."

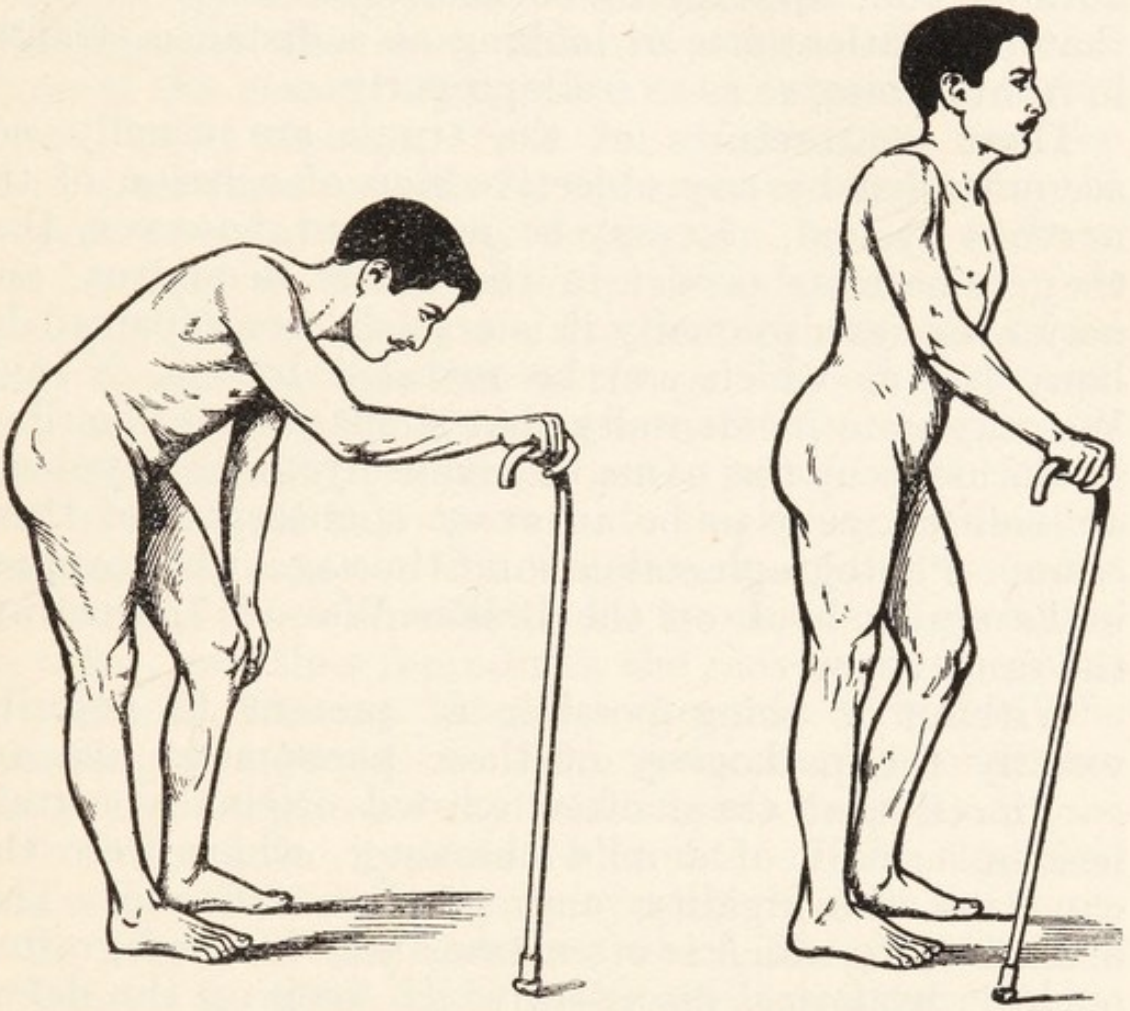
As to this last point agreement is not yet established. G. Ballet (84) has invented an arrangement the use of which he thought would enable him to settle the question in dispute. The following is the method which he adopted in a case in which he made the diagnosis of hysterical contracture: "I put a strip of stamp-paper along the inner side of the leg and foot. The perforations, separating the different sections of the strip, prevent it resisting even a slight traction. It was therefore obvious that if the foot, which was in a position of forced adduction, returned in the course of the night even in a very incomplete manner to a normal or nearly normal position, the strip would break. On the other hand, it is improbable that a patient who was not complaining of insomnia would remain awake the whole night, especially if, as was actually the case, he was encouraged to sleep by giving him six grains of veronal. It may, therefore, be granted that the unbroken condition of the strip in the morning is the proof of the persistence of the contracture during

sleep. Now, in the present case the band was not broken. The fact which I have just related, therefore, helps to show that some hysterical contractures at least persist during normal sleep." Other observations of the same kind have been reported by Sollier (89).

Are these facts really conclusive? As we have definitely stated before, it is essential to eliminate from the discussion all cases in which fibro-tendinous retractions are associated with the contracture. Examination under a general anæsthetic is the only certain means of recognising their absence. This method of investigation has also the advantage, as we have shown, of occasionally revealing certain peculiarities in the state of the tendon reflexes and muscular tonicity which help to exclude hysteria without any doubt (*v.* p. 97). In none of the above-mentioned cases was examination made during narcosis. The decisive proof, viz. disappearance by counter-suggestion, was also lacking. Lastly, we may remark that the individuals concerned had undergone traumatism; in G. Ballet's case, in particular, the contracture had developed after an operation on the first metacarpal bone. It is possible, therefore, that it was a case of a reflex contracture. Such contractures may show no change in natural sleep as Duvernay (124), Sicard (129), and ourselves have noted; they persist sometimes, as we have shown, until an advanced stage of chloroform narcosis; they are as persistent and fixed as the contractures associated with lesions of the nerve centres. Now, the diagnosis of reflex contracture had not even been considered in the writings with which we have just dealt. The facts in question, therefore, do not justify us in concluding that hysterical contracture properly so called behaves differently from a voluntary pseudo-contracture.

Vertebral curvature.—Following traumatism of the back and loins, as well as after commotion due to the explosion of large shells, one may observe curvature of the trunk (simple kyphosis or kypho-scoliosis),

which has been described by one of the following terms : " vertebral curvature," " vertebral antalgic attitudes " (Sicard) (83), " traumatic kyphosis," " spondylitis," " contracture of the abdominal muscles," and " camptocormia " (Souques).



FIGS. 2 and 3.—Traumatic kypho-scoliosis following commotion by a shell explosion (August 1914), showing patient's attitude before (Fig. 2) and after (Fig. 3) the first treatment (July 1916). The improvement thus obtained progressively increased.

Souques and Mme. Rosanoff-Saloff (93) (100) have carefully studied its morphology. The modifications of the folds, dimples and muscular prominences in camptocormia, they say, are identical with those which accompany the physiological flexion of the trunk described by Richer. The only difference is that in the first case when the subject extends his head he shortens the nape of the neck, which presents several transverse folds at the same time that the vertebra

prominens disappears, whereas in the second case flexion of the head accompanies flexion of the trunk. But if a normal subject in this flexed position is told to extend his head, the same morphological changes in the trunk appear. Extension of the head, these authors add, appears to be necessitated by the need that the patient has of looking at a distance straight in front of him, so as to walk properly.

These contractures of the trunk are usually not accompanied by any objective sign of a lesion of the nervous system. It may be remarked, however, that they sometimes persist in the dorsal decubitus, and may even, exceptionally it is true, be accompanied by bony lesions which can be revealed by the X-rays. We may note incidentally that similar cases described in Germany by the name of severe hysterical kyphosis or scoliosis seem to be an exact counterpart of these cases. Photographs taken some time ago, which appear in Laurent's book on the Balkan War (217) illustrate the same type.

Without it being possible at present to describe exactly the pathogeny of these phenomena, we are convinced that there often existed originally certain lesions, usually of a mild character, which were the cause of the rigidity and peculiar attitude. This organic state which is often transitory has had grafted on to it hysterical disorders which keep up the deformity. As a rule, one succeeds in rapidly modifying the curvature under the combined action of psychotherapy and movement, but its complete disappearance is not always obtained at once. The kyphosis persists in a certain degree, and at first it has a fairly marked tendency to recur. Even when the patients are placed under the best conditions for treatment, complete cure often demands several weeks. At least this is the result of our own observations, as well as those of Clovis Vincent, in a large number of cases.

As regards the future of these patients and their ability to resist prolonged effort and fatigue we have not yet come to a decision, and to get accurate infor-

mation, we must wait for the observations made by regimental medical officers and by those belonging to units at the front. A general enquiry as to this particular point would doubtless furnish interesting results.

Claudication.—Hysterical claudication is not rare, and presents the most different types. First of all there is the claudication which it is impossible to describe, as it changes from one moment to another. It is sometimes enough for the person supporting the patient to pass suddenly from right to left or from left to right to make the limping undergo a complete change. The necessity of transferring the weight of the body to another side throws the patient off his guard, and he changes his claudication without realising it. The claudication often presents paradoxical forms, and in that case belongs more to the sphere of dancing than to neurology. For instance, a soldier wounded in the right lower limb bends his two knees at each step he takes, and thus reproduces the movements peculiar to certain Russian dances. Another imitates the pedalling of a bicyclist. Such cases merely constitute one of the varieties of rhythmic chorea (*v.* p. 4).

Sometimes the hysterical character of the claudication is less obvious, and only appears on close examination. Such are the cases to which Meigè (88) drew attention, in which the subject while walking retains an attitude of one suffering from hip disease, and presents an apparent shortening of the lower limb from inclination of the pelvis. This shortening disappears when the patient kneels or walks on his knees. Such again is another type of limping which resembles in some of its characters the gait of subjects with a "Spring knee." As a rule these show abnormal attitudes or movements caused in the first place by a transitory organic disorder and rendered permanent by habit. "Habit creates a tendency to habit," writes Meige. "A large number of anomalies in standing or walking," he adds, "are the result of bad habits caused by a pain or weakness, which though real is only

transient. During the time that the patient really feels this pain or weakness localised in the lower limbs or trunk, he instinctively adopts the position in standing or walking which is most likely to diminish the pain and the weakness. Consequently, when the pain or weakness has improved or even completely disappeared, the patient still retains his abnormal habit of standing or walking."

But it would be wrong to attribute to hysteria all the varieties of traumatic claudication which do not appear to be adequately explained by the lesion which has caused them. We have shown that a certain number of them belong to nervous disorders of a reflex character (*v.* p. 114). A minute examination is necessary in every case. By adopting this method in dealing with a patient presenting a claudication which did not correspond to any known type, we were able to discover by X-ray examination a fracture of the vertebral column in the lumbar region, which had escaped notice.

Tremors.—In the neurology of war obstinate tremors are very frequently observed, usually as the result of the shock caused by a shell explosion.

The sufferers do not present any sign of paralysis agitans, disseminated sclerosis, Graves' disease, cerebellar affection, general paralysis, mercurial or alcoholic intoxication, nor is there any question of hereditary tremor. These tremors are usually attributed to hysteria. H. Meige (98) protests against "the abuse made of the diagnosis of hysterical tremor to describe tremors of unknown nature." "The tremor observed after shock," he adds, "resembles those regarded as neuropathic manifestations and commonly seen in traumatic neurosis. It is not impossible, however, considering its etiology, tenacity and unchanging character that it is the consequence of a material change in the nervous system caused by a violent explosion."

G. Ballet (94) has noted that some of these tremors are accompanied by an expression of fear or alarm,

and appear to be associated with a mental disorder. Side by side with this peculiar mental state there is another, which would also help to make the tremor persistent, viz. the tremophobia described by Meige.

"The physical phenomenon," he writes, "produces the obsession, which in its turn amplifies the somatic reaction. The exaggeration of the latter reacts in like manner on the mental disorder; a vicious circle is thus formed of interchanging psycho-physical reactions, the final result of which is an obsession." In any case, we must recognise that we have here a problem which is not completely elucidated at the present time. Apart from those cases in which the tremor has been cured by counter-suggestion, and of which the hysterical nature was undoubted, there are others the mechanism of which is not settled.

The State of the Reflexes in Hysteria

No new case has been brought forward to throw doubt on the law which we primarily established to the effect that hysteria never modifies the state of the tendon reflexes and pupillary reflexes.

Is it the same with the cutaneous reflexes? None of the numerous cases of hysteria which we have observed has hitherto served to change our opinion. In a communication to the Neurological Society of Paris on February 4, 1915, Dejerine (75) brought forward three cases connected with the neurology of war in support of the contrary opinion. "The cases which I am bringing forward to-day," he said in conclusion, "appear to me to demonstrate absolutely that functional anæsthesia, whether due to hystero-traumatism or another cause, may in certain cases produce complete abolition or very great diminution of the plantar cutaneous reaction (plantar cutaneous reflex and movement of defence)." Other cases were brought forward in support of the same view by Paulian (72), Jeanselme and Huet (81), and Sollier (95). But

were these cases really conclusive? In the discussion following Dejerine's communication one of us made the following remarks :—

"If voluntary movements may be mistaken for reflex movements, on the other hand a reflex may be masked by a voluntary muscular contraction; this applies to cutaneous reflexes as much as to tendon reflexes. Many normal individuals by an effort of the will are able to keep the lower limb motionless when their sole is stimulated. Moreover, it is not uncommon for a subject who has reacted to the first or first few cutaneous stimuli to show no more reactions when the stimuli are renewed, and he is to a certain extent upon his guard. In examining these reflexes one should make sure that the leg, foot, and especially the toes do not become stiffened as the result of a voluntary contraction.

"Now, in Dr. Dejerine's first two cases this fundamental condition is not realised, far from it, since they both present contractures, on the intensity of which Dr. Dejerine actually insists. In the third patient, it is true, Dr. Dejerine shows that though the foot is in a state of contracture, the toes are not; but it was in this third patient, whom I have just examined, that I succeeded in obtaining a definite flexion of the little toes by stimulating the sole. In the two cases to which Dr. Dejerine alludes, and which are illustrated in his book (64), the plantar cutaneous reflex appeared to be abolished, and the muscles were also in a state of contracture. To sum up, out of the five cases related by Dr. Dejerine in which he thought the reflex was abolished there were four with contracture; in the fifth, in which contracture of the toes was absent and was nevertheless accompanied by hysterical anæsthesia, the reflex movement could be produced. These cases therefore cannot serve to prove that hysterical anæsthesia is capable of abolishing the plantar cutaneous reflex. They serve rather to establish the contrary, and to show that there is only an apparent absence due to hysterical contracture which is as capable as

voluntary muscular contraction of masking reflex movements."

To this criticism we may add another which is of fundamental importance In almost all the cases mentioned above, as far as one can judge by the brief account which is sometimes given, the patients had undergone various forms of traumatism, such as wounds of the limbs by a projectile, contusion, or commotion by shell explosion. It is very possible, therefore, that the nervous troubles incriminated were not hysterical but reflex in nature. As cases of this kind had not attracted attention at the time of Dejerine's communication, this diagnosis was not even discussed. Now, in the so-called reflex pareses and contractures, as we have often noted, the plantar cutaneous reflex may be abolished, the loss of the reflex being apparently connected with vaso-motor troubles and hypothermia. It is enough to warm the foot artificially and sometimes only to leave the patient in a warm room to see the reflex return. It is important to emphasise the instability of this reflex, and we seize this opportunity to repeat once again that the rapid disappearance of a phenomenon by no means implies the idea of hysteria, as some suppose. It only has this signification when the disorder has yielded to the sole influence of counter-suggestion (*v.* p. 153). To sum up, the new cases which have been brought forward to prove that hysteria is able to abolish the cutaneous reflexes are anything but conclusive.

CHAPTER IV

SYMPTOMATOLOGY (*continued*)

Disorders of Special Sense

Hysterical visual disorders.—We asked Dr. Morax to tell us about his observations on hysterical visual disorders since the beginning of the war, and to give us his present opinion as to the "ocular stigmata" of hysteria. We applied to him because in addition to being an ophthalmologist he possessed a special knowledge of nervous diseases, having formerly been attached to Charcot's service at La Salpêtrière, and was therefore particularly qualified to give an opinion on the subject in question. The following is the note which he kindly sent us—

"The visual troubles formerly attributed to hysteria may be divided into two groups, one comprising the phenomena which are present before any medical examination, like blepharospasm, amaurosis, etc., and the other the symptoms unknown to the individual and which a methodical examination alone brings to light, or seems to bring to light, like narrowing of the visual field, monocular polyopia, dyschromatopsia, etc., which were regarded as stigmata of hysteria.

"It appears to me advisable to make this distinction at the beginning of this note, and to state that, while the manifestations of the first group retain all their nosological importance, it is not the same with the others. Their reality has been rightly disputed, and what we have seen during these two years of war is in agreement with this opinion. I will also draw attention to the extreme rarity of hysterical ocular manifestations, in spite of the frequency of cephalic and general

traumatism, and in spite of the introduction of new methods, such as the use of lacrymatory gas, which is liable to act on the imagination and to cause visual suggestion. Among many thousands suffering from diseases or wounds of the eyes I can find only a few cases which can be attributed to hysteria.

"*Ocular hyperæsthesia and blepharospasm.*—Among other disorders lacrymatory gas causes a change in the corneal epithelium which produces the hyperæsthesia and pain like that resulting from a foreign body imprisoned between the lid and the eyeball. The sensitiveness to light is extreme, resulting in a very marked reflex lacrymation and a contracture of the orbicularis palpebrarum. Under normal conditions the repair of the epithelium takes place rapidly; usually in less than a week, rarely in more than a fortnight, everything is all right again.

"I had the opportunity of observing, under conditions which I am going to describe, a wounded man in whom the phenomena of ocular hyperæsthesia, photophobia and blepharospasm persisted in an abnormally prolonged manner. As he had been nursed in an auxiliary hospital for several weeks with his head and eyes covered with a voluminous dressing, and was the object of the sympathy of the female staff, who shared his fears that he would remain blind, he was in the most favourable circumstances for submitting to the suggestion of his entourage. Although he presented no ocular lesion, the removal of the bandage was followed by so much lacrymation and photophobia that a new one was at once applied. Examination of the eye and the visual function after superficial anæsthesia by cocaine drops did not show any pathological change.

"I drew attention to the harm and danger of an eye-dressing in this case, reassured the wounded man by telling him that the eye lesions produced by gas were not serious, and in a few days the trouble had disappeared.

"*Hysterical amaurosis.*—In hysterical amaurosis the peripheral visual apparatus and the pupillary

light reflexes are perfectly normal. The affection is only revealed by what the patient says and by the fact that he behaves like a blind man.

"After a superficial wound of the scalp a patient showed complete blindness lasting for four months until the surgeon performed craniectomy. The following day vision began to return and continued to do so until its restoration was complete, without the appearance of hemianopsia, lesions of the fundus, or dyschromatopsia. I did not see him when he was blind, and examined him only after he had recovered; but I cannot explain the case except by supposing that the amaurosis was hysterical; the wound of the scalp had been quite superficial and had healed in a few days. The absence of any fracture or fissure of the bone was shown at the craniectomy. When a meningeal or cerebral lesion causes blindness it may be due to œdema of the optic nerve and hypertension of the cerebro-spinal fluid. Œdema of the optic nerve which has lasted four months always leaves changes in or near the discs visible on ophthalmoscopic examination. In this case the absence of such changes allowed me to conclude that the amaurosis was of an hysterical nature. When I examined the patient the retinal sensibility, the visual fields and colour sense were normal.

"*Spasm of accommodation. Spasmodic myopia.*—There has been described under the name of spasm of accommodation or spasmodic myopia a special state of the vision which appears peculiar to hysteria, for it is not observed in any organic affection of the eye. In this condition the refraction of the eye undergoes an increase similar to that which is produced by the refractive change of the lens in the act of accommodation. The patient, whose distant vision was previously normal, no longer clearly distinguishes distant objects unless a concave glass is placed in front of his eye. His eyes have become myopic; but it is a peculiar myopia, paralysing the accommodation by atropine being sufficient to make the refraction normal again.

"As the result of a shell explosion at a certain distance from where he was, and without having been hit by the fragments, a soldier lost consciousness and was taken to a hospital in the south. According to what he told me, for I did not examine him at this period, he was deaf and blind. After several months the deafness disappeared and the vision partly returned, but he still had much difficulty with distant objects, although reading had become possible again. A month previously he had been examined by a very competent medical man, who had found a myopia of −7 D, and had ordered him the glasses which he had since been wearing. With these glasses distant vision was only $\frac{1}{3}$–$\frac{1}{2}$, and he was sent to us for further examination. I found that the glasses which he was wearing gave him the best distant vision, but I was puzzled by his blindness and deafness, and decided to make a complete examination of the refraction under atropine. The new examination showed me that the refraction of the eye was normal and the visual acuity = 1 without glasses. I may add that apart from the spasmodic myopia the visual function was perfectly normal.

"I have related these cases to show that the hysterical visual troubles observed in this war do not show anything to differentiate them from what we find in civil practice.

"*The so-called ocular stigmata of hysteria.*—As I said before these are signs which have to be looked for, as the subject does not present them unless he is examined in a special manner.

"*Concentric narrowing of the visual field* was rarely absent when it was given a special significance. To demonstrate it, a perimeter was used, care being taken to cover the eye which was not examined. Examination of the visual field under these conditions is an infinitely more delicate matter than it may appear. The causes of error are numerous, and among the most important must be mentioned the difficulty of the patient and observer understanding each other without the former submitting to the latter's sugges-

tion. If care be taken to control the result of a perimetric examination by methods which are apparently less precise, but are really much more accurate, such as the study of the visual field, not with an index but with familiar objects, the finger, etc., it will be found that the results of these two examinations do not agree. Formerly I had many cases of narrowing of the visual field in hysterical patients at La Salpêtrière, but now that I have had more experience in this examination, I do not hesitate to say that none of my previous findings appears to me to-day to be able to bear criticism, and I have not found any concentric narrowing of the visual field from retinal anæsthesia of neuropathic origin for a very long time, either in civil practice or in military practice during the last few years.

"I must say the same of the peculiar *dyschromatopsia* attributed to hysteria. In examining the visual field with a coloured index, the field of perception of red is found to be more extensive than that of the blue. If examination of the visual field with a white index is difficult, examination with a coloured index is so difficult that few oculists have been successful with it, owing to its being almost impossible to make an examination with indexes of the same distinctness. To demonstrate *monocular polyopia* a match was brought close to and moved away from the eye. Under ordinary conditions, if accommodation is normal and the object removed is in the field of accommodation, it appears single. If, on the contrary, the change in accommodation does not correspond to the movements of the object, it appears double. As I have said before, there is sometimes a state of spasm of accommodation which may explain this phenomenon, but this is a rare disorder, and in looking for it care must be taken not to suggest the reply by the manner of putting the question.

"To summarise my present views as to the nature of the visual disorders described as stigmata of hysteria, I will say that the doctor who avoids suggestion in

questioning his patients will have no chance of finding them."

It is obvious that the conclusions of Morax are identical with those drawn up by one of us (*v.* p. 19). We will remind the reader that concentric narrowing of the visual field was formerly considered as a cardinal symptom, and occupied the highest rank in the hierarchy of the signs of hysteria. To show the importance attached to it by the partisans of the traditional doctrine, we will quote some passages from a recent book by P. Janet on *The Mental State of Hystericals.*

" I will emphasise only one special point which has always keenly interested me—namely, contraction of the visual field. The visual field is a whole or a system of sensations perceived simultaneously which contracts in the same manner as the field of consciousness. The sensation which serves as a centre round which all the others are grouped, the one which always enters most into consciousness, is naturally, save in exceptional cases, the clearest visual sensation, or the one which corresponds to the point of fixation. . . . Although the visual field is concentric as a rule, it is extremely variable in its extent; as it widens out it seems to follow the modifications of the patient's mind; in some cases it is a sort of barometer for hysteria.

" In short, in a very large number of cases in weak-minded persons, the effort of visual attention very considerably narrows their visual field.

" This finding is not without interest; from the clinical point of view it furnishes an element of diagnosis and enables one to find this important hysterical symptom, narrowing of the visual field, when it is hidden.

" Narrowing of the visual field may be regarded as the emblem of hysterical sensibility in general " (54).

When the former doctrine of hysteria is compared with the conclusions resulting from our own observations, which are confirmed to-day by the neurology of war, one can realise the distance separating the modern from the old conception of hysteria.

Disorders of hearing.—Hysterical deafness is one of the most frequent phenomena in the neurology of war. It is generally bilateral and apparently complete; it develops after commotions due to the explosions of large shells. When left to itself, it may last very long without undergoing any change: cases of deafness which have lasted eight to ten months are not rare. The persistency of deafness due to a psychical cause is all the greater, as it is often not recognised, and patients suffering from it are considered and treated as if they were really deaf. One frequently finds noted on their case sheet, "incurable deafness," or "permanent deafness." How is the chronicity of such disorders to be wondered at when medical suggestion thus adds its weight to those of auto-suggestion and corroborates it? And yet, however old the trouble may be, as soon as it is recognised and treated in the proper manner, it gives way as a rule rapidly and completely, sometimes even in a few moments.

This view is confirmed by Lannois and Chavanne, who cured fifteen out of thirty-two cases of deafness in one sitting. Contrary to what might be supposed, it is occasionally difficult to distinguish hysterical deafness from some forms of organic deafness. Organic war deafness (Lermoyez (223), Lannois and Chavanne (215)) may be due to various lesions; they consist of direct traumatic deafness, following fracture of the skull and the petrous portion of the temporal bone, and indirect traumatic deafness due to labyrinthine commotion, either pure or associated with other lesions of the ear (purulent otitis media, rupture of the drum). Lesions of the middle ear are easy to recognise, but it is not the same with pure labyrinthine lesions, which may be difficult to detect.

There is often some difficulty in establishing the diagnosis, and even very competent aurists may be in doubt. Patients of this kind have several times been sent to us with the request to examine them for the stigmata of hysteria to decide this question. Now, as we may remind the reader, such an examination

would not help to settle this problem. Moreover, it was fortunate that we did not pay any attention to the stigmata, for they were often absent in cases of hysterical deafness, and sometimes present in subjects suffering from labyrinthine commotion.

On what symptoms, then, can we depend for establishing a diagnosis ?

E. J. Moure and P. Pietri, in an interesting study (235), have given a series of tests to which aurists should have recourse in such cases. We will confine ourselves to mentioning some of the methods which may serve as a guide to medical men who are not specialists.

It should be stated in the first place that a change in the voice, such as a trumpeting or uncontrolled voice presenting sudden and inopportune changes in tone and intensity, may be sufficient to characterise true deafness. But this peculiarity is far from constant; it appears to be frequently absent in war deafness, though the reason for this is not properly understood. The absence of this sign, therefore, does not allow us to dismiss the hypothesis of organic deafness. Other symptoms justify more reliable conclusions.

When a noise occurs suddenly, it is not uncommon to detect in a subject of psychical deafness an involuntary movement which is often quickly repressed and shows that the deafness is not real. Gault (208) has recently shown the practical value of the cochleo-orbicular reflex; a moderate acoustic stimulus (a bicycle horn blown six feet off) causes in hysterical deafness, as in the normal condition, a contraction of the orbicularis palpebrarum which is entirely absent in complete organic deafness.

There is another diagnostic method suitable for deaf persons who have been taught lip-reading and which enables one to detect "sham reading." To succeed in this it is sometimes sufficient to mask the movements of the mouth, in an apparently inadvertent way, while speaking. If this act is cleverly carried out, and if the subject of psychical deafness is not too

much on his guard, he will continue to follow the conversation as if nothing had happened to prevent him. The wounded may also be subjected to the very ingenious and simple test invented by Mr. Thollon, Inspector of the National Deaf and Dumb Institution (243), in which the patient has to repeat syllables or words pronounced in front of him and selected from those which the deaf lip-reader often confounds with one another.

"From a superficial point of view," writes Mr. Thollon, "it may be said that each element of speech has corresponding to it a mouth pattern, knowledge of which supplies a speaking deaf-mute with the key to lip-reading, just as knowledge of letters of the alphabet supplies the key to print or manuscript. But more careful consideration shows that things are not so simple. . . . Each sound is dependent at once on the action of the vocal chords, the tongue, lips, and soft palate, and relies at once on sight and touch. This description establishes such definite distinctions between the various phonetic elements that no confusion is possible. But when it is reduced to the features furnished by the play of the lips, tongue (often invisible), lower jaw and physiognomy, it is inadequate, and confusions become not only possible but easy and inevitable. Physical lip-reading is insufficient to allow a deaf man to repeat a phrase pronounced before him, psychical reading must intervene and the general sense of the phrase must allow him to guess the sounds and syllables which he has been unable to distinguish. By lip-reading alone it is impossible to distinguish from one another the consonants belonging to the group *p*, *b*, *m*. It is the same with the following groups of sounds : *t*, *d* and *n* ; *e*, *g*, *gn*, *r* (guttural) and *y* ; *f* and *v* ; *s* and *z* ; *ch* and *j* ; *l* and *r* (lingual) ; *a* and *ar* ; *eu*, *un*, *o* and *on* ; *ou* and *v* ; *i* and *é*."

"The same mouth image," continues Mr. Thollon, "may express, for example, *chapeau*, *chameau*, *jabot*, *Japon*, *jambon*, or *palais*, *ballet* or *malin*."

The person who is really deaf, not being able to distinguish the different words by lip-reading alone, will inevitably make mistakes, if he is not guided by the words forming part of a phrase.

This peculiarity will enable one to detect simulated or hysterical deafness. When the subject is made to repeat a series of isolated syllables or words containing those sounds which cannot be differentiated by sight only, it may be affirmed that, if he makes no mistakes, it is not a case of complete organic deafness.

In addition to the previous characters by which hysterical deafness can sometimes be differentiated from organic deafness, there are others which may supply the means of resolving the problem; we mean the signs indicating a perturbation of the vestibular apparatus. The existence of such a disorder, though it does not give us the right to declare that the deafness is also organic in nature, makes this hypothesis at least probable. A completely normal condition of the vestibular apparatus, on the contrary, leads us to suppose that the deafness is psychical.

For some years the diagnosis of disorders of the vestibular apparatus has acquired a certainty and precision which were lacking when it simply rested on the interpretation of subjective troubles. To-day it chiefly depends on the changes which occur, as the result of pathological conditions, in objective reactions to various stimuli, as in the gyratory (Mach, Egger), caloric (Barany) and voltaic tests (Babinski) (61). To these signs may be added the loss of orientation and equilibrium caused by various walking exercises (Stein, Babinski and Weill, E. J. Moure (234), Cestan, Descomps and Sauvage (191)).

We must emphasise the value of the voltaic vertigo test which appears to be less well known by aurists than other methods of examination. In order to investigate voltaic vertigo, one proceeds in the following manner: the electrodes of a voltaic apparatus are placed on the temples or mastoid processes, one on each side, and an electric current of a few milliamperes

is passed. This causes *in the normal condition*, among other phenomena, a feeling of giddiness, nausea, nystagmus and a lateral inclination of the head to the side of the positive pole. A rotation of the head is produced, and sometimes also rotation of the trunk by placing the electrodes as follows : the one connected with the negative pole behind the lower jaw, and the other above the tragus. The head executes a movement of rotation from the side of the positive pole beginning at the time of the closure of the current and continuing slowly. This movement is a physiological phenomenon, but is not constant ; it is more or less pronounced according to the individual, sometimes it occurs by itself and sometimes it is associated with inclination of the head. The following are the various modifications of voltaic vertigo which are observed in labyrinthine disorders and do not occur in hysteria : increase of resistance to the stimulus caused by the voltaic current, movement of the head backwards and forwards, replacing inclination or rotation ; cephalic nystagmus ; unilateral inclination or rotation ; inclination and rotation occurring on one side only ; unilateral inclination to one side with unilateral rotation to the other, and occasionally circumduction of the head. The value of these signs has previously been confirmed by several observers, and quite recently Moutier (236) has emphasised their importance. The following is a quotation from his work on the subject.

" The tests generally employed have been Babinski's test or voltaic vertigo and Barany's test or caloric vertigo. I do not hesitate to give the preference to the former. Its technique is extremely simple ; its various stages are readily controlled, and the results are particularly easy to compare. . . .

" *Systematic exploration of the labyrinth*, apart from its scientific importance, also furnishes conclusions of immediate interest. It proves, in fact, the sincerity of numerous wounded men whose subjective troubles would otherwise appear doubtful, and thereby facilitates the preparation of the necessary documents for pro-

posing discharge from the army or transfer to the reserve."

The results obtained by psychotherapy have seemed to us to agree with the conclusions furnished by the test of voltaic vertigo. If the vertigo was normal the deafness yielded in most cases to counter-suggestion, whereas this has only been partially successful (hystero-organic association) or a complete failure when the characters of the voltaic vertigo were altered.

Mutism.—Hysterical mutism occurs either alone or in association with deafness. It is just as curable as psychical deafness, if not more so. It may disappear spontaneously; sometimes the dumb man in the course of a dream begins to speak or cry, he hears his own voice and as soon as he wakes declares that he is cured. But, as a rule, the mutism persists unmodified for months, if it is treated improperly. Various treatments have been proposed which are all equally efficacious and whose mode of action is always due to counter-suggestion, whether this be applied voluntarily or involuntarily. Contrary to what is the case in deafness, hysterical mutism is easy to recognise. Charcot has given a masterly description of it (*v.* p. 4). Exceptionally it has been possible to mistake a case of aphasia whose language is extremely reduced for mutism, but the opposite error is more frequently committed; it is, however, fairly easy to avoid. Unlike the mute who emits no sound the motor aphasic can always articulate a few words or syllables; he may even emit under certain conditions all or almost all the sounds which constitute oral language (Froment and O. Monod (200)). Written language is always intact in the mute, while it is more or less affected in the motor aphasic, without even excepting the pure motor aphasic (Froment and Mazel (199), Froment and Pillon (201), Pélissier (238)). Finally, and this last peculiarity should not be neglected, because it may be a guide to diagnosis from the beginning of the examination, the faculty of pantomime is remarkably intact in the mute, while on the contrary in the motor

aphasic it is poor, monotonous and unable to supply the defects of language. It may almost be said that a person suffering from defects of language who succeeds in making others understand, by a series of varied and expressive gestures, the various circumstances which accompanied his wound is not an aphasic but a mute. As regards hysterical aphasia, no case has been published to our knowledge since the beginning of the war. A certain number of cases which had been recorded previously should be accepted with caution.

Œdema, Vaso-motor and Trophic Disorders attributed to Hysteria

No neurologist was able to bring forward a single well-established case of *hysterical œdema* at the time of the discussion in 1908. The old conception seemed to have arisen from an error of diagnosis, simulated œdema artificially produced by a voluntary constriction and œdema associated with organic affections having been attributed to hysteria.

Since the beginning of the war we have not observed any case of œdema which could properly be attributed to hysteria. A certain number of traumatic œdemas which would doubtless have been considered formerly as hysterical were due to voluntary constriction of a surgical nature, as in the cases described by A. Léri and Roger (85). Sicard and Canteloube (103) made a further study of these " constriction œdemas " recently and distinguished two stages in their course; in the first stage the œdema disappears as soon as the constriction ceases, but in the second period it becomes organised and its disappearance is then slow; it may even become permanent.

Some cases, however, of hysterical œdema have been published by G. Ballet (82), Lebar (86) and Raynaud (87). One of them provoked a discussion in the course of which Roger made the following remarks: " The question of hysterical œdema seems to me to be

settled for the present. Since Babinski's work everybody is agreed that this form of œdema does not exist. Cases of the kind always indicate trickery on the part of the patients or an organic lesion of vascular or nervous nature. In Dr. Raynaud's patient, who presented a wound on the inner aspect of the upper arm, just at the level of the brachial nerves and vessels, the existence of an organic vascular lesion seems at least probable and would explain the œdema observed."

To these hypotheses may be added another, viz. that of reflex vaso-motor disorders. In three out of four of the cases published, the œdema was associated with a contracture and had developed in an injured limb. Attention has already been drawn to this condition in dealing with the question of persistence of contractures during sleep (*v.* p. 60). We may add that in none of these cases did the therapeutic test give a positive result; in Lebar's case the œdema and contracture diminished after superficial scarifications, but did not disappear entirely. This mode of treatment, it is hardly necessary to state, cannot be regarded as having an exclusively psychical influence.

Vaso-motor disorders were formerly considered very common in hysteria. We contested this opinion, and a large number of neurologists adopted our point of view, although a final agreement was never reached. It may have been thought at first that the cases observed at the beginning of the war were in favour of the old doctrine, as many patients with symptoms which were regarded as hystero-traumatic presented marked vaso-motor disorders. But further examination led to their being separated from the hysterical group, and to their being regarded as reflex phenomena due to disturbance of the sympathetic system (*v.* p. 122). This question, which is of the utmost importance both from a practical and a doctrinal point of view, will be discussed later in detail. We will content ourselves by saying, what we hope to establish later on, that though an hysterical paralysis may cause a slight

thermo-asymmetry it never produces definite vaso-motor or thermic disorders.

In spite of the frequency of hysterical phenomena not a single case has been seen of erythema, vesiculation, ulceration, gangrene of the skin, hæmorrhage, hæmatemesis, anuria, or any of those symptoms the reality of which was formerly admitted without discussion.

Sollier (96) noted, it is true, the existence of trophic bone-changes in six cases of so-called neuropathic contractures which developed after wounds. But such phenomena have often been seen after fractures and injuries of the limbs in the absence of any hysterical manifestations. It may be questioned whether these were not trophic changes of a reflex character associated with disorders of the sympathetic system.

Apart from these observations, which we hesitate to accept, *no case of hysterical trophic changes* has been published since the beginning of the war. In this connection we may note that according to Cestan (192) changes in the finger prints are exceptional in functional paralyses. "They are never found," he adds, "except in cases where the neurotic phenomena have been produced by an organic factor." Villaret (245) also remarked that the trophic troubles of the skin, hair, nails, etc. (hyper- or hypo-trichosis), are absent in so-called functional paralyses, with the exception of cases corresponding to those which we have classified under the name of reflex paresis and contracture.

We think we are justified in concluding, therefore, that the modern conception of hysteria has not been shaken in any particular. On the contrary, it has been confirmed by numerous observations made during the last two years.

Although the contrary opinion has been held by some neurologists, this is doubtless due to the fact that the injuries of warfare have given rise to a number of nervous accidents which were at first misinterpreted and attributed, in the absence of a precise semeiology, to hysteria, although they were absolutely distinct

from it. In this respect there has been a confusion of ideas similar to that which existed in regard to symptoms connected with lesions of the central nervous system before their characteristics had been clearly determined.

The following chapters will be devoted to a study of these reflex phenomena, concerning which we have learned much that is new and for which a special place must be reserved in nosology.

PART II

REFLEX NERVOUS DISORDERS

CHAPTER I

HISTORICAL

Among the nervous phenomena observed in the neurology of war we must isolate a group of fairly numerous cases which present special clinical characters and which possess a definite autonomy. They include contractures, paralyses or paretic states which develop after traumatism. The motor disorders are not accompanied by any of the signs which are characteristic of typical organic affections, such as lesions of the central or peripheral nervous system, or lesions of the large vessels. They resemble in some features hysterical manifestations, inasmuch as the lesion which has caused them appears sometimes very slight and out of proportion to the resulting disturbance of function; they tend to spread beyond the limits of any known anatomical area; they show little response to treatment, and, unlike pithiatic phenomena, resist the influence of counter-suggestion.

They are distinguished from hysterical manifestations by various symptoms, all of which may not be present at the same time. In addition to contracture and paralysis, which may be associated though usually situated in different segments of the limb, the complete syndrome presents: muscular atrophy, exaggeration of the tendon jerks, changes in the cutaneous reflexes, which may amount to actual loss, hypotonus, mechanical hyperexcitability of the muscles with slowness of

the muscular contraction, quantitative changes in the electrical excitability of the muscles (increase or diminution in excitability without R.D.), mechanical and occasionally electrical increase in excitability of the nerves; disturbance of objective and subjective sensibility (anæsthesia and pain); disturbance of thermotaxis (especially hypothermia) and vaso-motor control (cyanosis, salmon-pink tint, diminution in the amplitude of the oscillations at the periphery of a limb when the atmospheric temperature is low); secretory disorders, and, lastly, trophic disorders of the bones, skin, hair and nails.

These various symptoms form combinations which differ according to the number, mode of association, and actual importance of each of the constituent elements. They give rise to various clinical types which, in spite of their differences, apparently belong to the same family and represent a nosological species.

We will set forth later the reasons which seem to us to justify these phenomena being considered as reflex in nature, and we will state what should be understood by this expression. But while admitting that the pathogenesis is still unsettled, the disorders in question, whatever names they may receive, constitute a special group, halfway, as it were, between organic affections properly so called and hysterical disorders.

These phenomena may be entitled *physiopathic*—a term intended to express the idea that, on the one hand, neither hysteria nor any other psychopathic state can produce them, and, on the other, that while indicating a physical and material disorder of the nervous system they do not appear generally to correspond to any nervous lesion which can be detected by the methods at our disposal.

Historical

Old views.—How was this nosological group formed? It originated a long time ago, and dates back to the work of Hunter, Charcot and Vulpian.

John Hunter (111) was the first to call attention to weakness and atrophy of the muscles which occur as the result of lesions of the joints. "It is remarkable," he states, "that an injury done to the tendons, ligaments, fasciæ, etc., especially of the strain kind, impairs the muscles more than when the muscles themselves are injured."

These early observations were confirmed and completed by a series of studies. We will merely mention the paper in which Gosselin (112) described muscular atrophy following fracture of the long bones, Ollivier's thesis (113) on muscular atrophy, the communications of Le Fort to the Surgical Society in 1872 and 1876, with the interesting discussion which followed, and Valtat's inaugural thesis (115), which consists of a clinical and experimental study and a detailed historical account. Lastly, a remarkable description of reflex disorders is to be found in the lectures of Vulpian and Charcot.

Charcot (119), in a study of the atrophies following lesions of the joints, showed that atrophied muscles presented a mere diminution of electrical excitability, or, in other terms, purely quantitative and not qualitative changes in the electrical reactions (such were also the results of Erb and Rumpf's researches). This amyotrophy is thus distinguished from degenerative atrophy. It is usually localised in the extensors, and is accompanied by a paretic state of varying intensity. The motor disorders are not always so closely circumscribed, and paresis of the foot sometimes occurs after traumatism to the knee. In such cases contractures may be observed with or without amyotrophy or amyotrophic paralysis.

Exaggeration of the reflexes appears to be a symptom common to the various forms of motor inhibition, which, as Charcot adds, are liable to develop after any joint affection, whatever its nature, intensity, and mode of evolution. "There is no necessary relation between the intensity of the joint affections and that of the paralysis and atrophy. . . . The persistence of

the deuteropathic symptoms (paralysis and atrophy) after the cessation of the protopathic affection (arthritis) is more or less the rule. . . . Months may elapse with the limb still useless, whereas the arthritis has for a long time only been manifested by a slight thickening of the periarticular tissues, if, indeed, there be even as much as that left."

Vulpian supplements this description as follows: "The sensibility of the skin and deep parts may be modified. Dr. Descosse in cases of arthritis of the knee has found evidence of neuralgia of the corresponding anterior crural nerve. The nerve was the seat of spontaneous pain, and pressure along its course produced a sort of numbness rather than pain in the corresponding area."

Vulpian emphasised the trophic disturbances of the skin, hair and nails, the secretory disorders, the coldness of the limb, and the cyanotic or dull pink colour of the skin. He pointed out that wounds accidentally inflicted on a limb affected by muscular atrophy are extremely slow in cicatrising, and even present a tendency to ulceration. Lastly, he adds that all peripheral lesions, including frost-bite, burns, and more or less deep wounds of the limbs, may become the starting-point of such phenomena. The following is a remarkable description of nervous disorders of this kind following wounds by firearms, resembling some of the cases which we had the opportunity of observing in this war. We think, therefore, that the passage should be quoted in full.

"Muscular atrophy is often not the immediate result of the peripheral lesion which gives rise to it. A gunshot wound, for example, in which only the soft parts of the leg have been involved, may cicatrise completely without the muscles of the leg showing any appreciable atrophy. Some months or one or two years after recovery the scar becomes painful as the result of a shock or fatigue or without any known cause; the pain becomes more or less intense and continuous, and is often accompanied by attacks of exacerbation. The pain seems to start from the old wound and to pass up the limb along the course of the

nerves.[1] Then the patient notices after one to three months that his leg is diminishing in size, and that it is the same with his thigh and buttocks. At the same time he has increasing difficulty in walking; he can at first just raise his toes from the ground, but later he is quite unable to do so; he drags his foot along the ground or walks on tip-toe, and is obliged to use a stick. If he has made careful observations on himself, he calls the doctor's attention to the changes in the coloration of the skin and shows that his foot is quite cyanosed when he is standing. Coldness of the leg and changes in the hair of the limb are observed; the skin is fairly often moist, especially in the lower part of the affected limb, while it may be dry on the sound side. When the lower limb is affected a more or less marked œdema of the lower part of the leg may sometimes be seen after a walk of any distance. These changes take from four to six months to develop, and continue to occur after the scar has become painless again, and all the pain has ceased in the limb.

"If the state of the muscular system be examined, it will generally be found that there are no fibrillary or fascicular contractions. Idio-muscular contractility

[1] Vulpian refers, in this connection, to Case CXLV (p. 745) in his Clinical Lectures at the Charité, where we find the following description: A soldier had been wounded on the outer aspect of the right leg at the junction of the lower and middle third, on August 6, 1870, at the battle of Reichshoffen. He was taken to a hospital at Chalôns, from which he was discharged at the end of August. He was able to resume his duties and take part in the Sedan campaign as well as in the military operations of the siege of Paris. At this period the wound, which appeared to be cicatrised and seemed only superficial, began to show some slight suppuration again. When he left the service in 1873 he joined a firm as accountant. In June 1875 he suffered from pain and a feeling of numbness in the wounded limb. The symptoms soon became complicated by a pronounced motor weakness, for which he was admitted to hospital in June 1876. Vulpian then found an amyotrophy which was most marked in the thigh, without obvious change in the electrical reactions, and pronounced vaso-motor phenomena. These nervous symptoms rapidly yielded to treatment, and six months after admission to hospital there was decided improvement.

may be increased. Electricity has less action on the muscles of the buttocks, thigh and leg on the affected side than on those of the sound side.

"Muscular atrophy in cases of this kind is very difficult to cure, and, as a rule, only very incomplete results are obtained."

We find very definite references in these descriptions to several of the principal features of the clinical syndromes which we are studying, viz. muscular atrophy with absence of R.D., paresis and contracture, either alone or combined, changes in the tendon reflexes, sensory disturbances (anæsthesia, neuralgia and pain on pressure on the nerve trunks), vaso-motor thermal and trophic disorders, and disturbance of the secretion of sweat. Moreover, it is noted that these phenomena may have an articular or abarticular origin, to use Dutil's expression; that they often seem out of proportion to the lesion which gave rise to them; that they sometimes develop late after complete cicatrisation, and, lastly, that they are usually very unresponsive to treatment.

For the sake of clearness, and in order to limit the subject which we have to discuss, we must anticipate a little of what we have to say about the pathogeny, and remind the reader of the meaning which Charcot and Vulpian gave to the term "reflex," when they applied it to the disorders in question. "The favourite theory," said Charcot, "with most contemporary writers appears to be this: the articular affections reflect certain irritant impulses along the articular nerves to the spinal cord, which impulses modify the trophic centres in that organ, whence emanate the motor nerves and the nerves which regulate the nutrition of the muscles." These ideas were admitted without discussion at that time by the majority of neurologists. No critical work to our knowledge has appeared since then to throw any doubt on the above descriptions.

Nevertheless, to judge by the place given to this subject in most modern text-books of neurology, it does not seem that the same importance has been

attached to it lately, and it may even be said that a certain amount of discredit has fallen on cases of this kind.

To what must we attribute this evolution of medical doctrine? It appears to us to be due to the following two causes: first, to the abuse which some writers have made of the term "reflex," and, secondly, to the extraordinary vogue of the idea of hysteria. We shall now try to illustrate these two points, before engaging in the study of cases recently observed in the neurology of war.

Formerly the name of "sympathetic paralysis" was used to describe a somewhat heterogeneous group of paralyses caused in certain regions of the body by affection of a more or less distant organ. These were the paralyses which Graves and Brown-Séquard afterwards called "reflex paralysis," and which Jaccoud and Weir Mitchell proposed to call "paralysis of peripheral origin," or "paralysis from peripheral irradiation." It is most important to realise that these are cases the nature and pathogeny of which are essentially uncertain. Examples of the kind are the paraplegias observed after inflammatory affections of the kidney (Rayer, Stokes, Leudet), or lesions of the uterus and intestine (Brown-Séquard); the hemiplegia observed in pneumonia; the amaurosis following bruising of the frontal nerve; the paralysis of the arm observed after gunshot wounds of the thigh (Weir Mitchell, Morehouse and Keen), and the cases of so-called reflex inflammation (Brown-Séquard), etc.

Having found vaso-constriction of the vessels of the spinal pia mater in the course of experiments in which he ligatured all the nerves and vessels of one kidney, Brown-Séquard thought that he was justified in supposing that in a certain number of the clinical cases mentioned above a similar constriction of the spinal vessels occurred, causing weakness and even complete cessation of the functions of the region thus rendered anæmic.

Vulpian judiciously discussed all these cases in one of his lectures on the vaso-motor system. He showed that in several instances of urinary paraplegia obvious lesions of the nerve centres had passed unnoticed. With regard to the two cases in which Weir Mitchell [1] had seen a gunshot wound of the lower limb cause a paralysis of the corresponding upper limb, he asked if it was possible to eliminate with certainty any fall or traumatism whatever in the case of the upper limb. He admitted the existence of a material change in the brain in pneumonic hemiplegia. This last conclusion had already been arrived at by R. Lépine (219), who showed that pneumonic hemiplegias did not form a homogeneous group and that some of them were caused by cerebral ischæmia. The same conclusion was also arrived at in researches made by one of us in collabora-

[1] During the War of Secession a service of 400 beds for nervous disorders was given to Weir Mitchell and Morehouse, with W. Keen as their resident surgeon. The cases related by these writers include some which may be compared with those which we are observing at the present time. Such was the case of the man (Case XXXII [116]) who had been bruised on the arm by a shell fragment at the battle of Chancellorsville on May 3, 1863, and a fortnight later developed "a tonic spasm of the palmaris longus, brachialis anticus and flexor carpi radialis, causing a considerable flexion of the wrist." These phenomena progressively improved under treatment, and the wounded man was able to re-enlist in the New Jersey Volunteers. But as the result of fatigue the contracture returned. At the same time it was noted that the hand was always cold (the patient *never* left off wearing a glove) and emitted a markedly acid odour. Tenotomy was performed in June 1864, and in July, when the account ends, there was obvious improvement, but recovery was not complete. Although he devoted special attention to the study of reflex paralysis, which he called "paralysis from peripheral irritation," Weir Mitchell only exceptionally related cases of this kind. The cases which he studied under this name were examples of paralysis occurring at a distance from the point injured in another limb, and cases of convulsions or delirium. Under the influence of Brown-Séquard's ideas, which he nevertheless opposed, he thought that a group of anatomical elements in the spinal cord might be rendered inactive as the result of a lesion situated in a region of the body which had no direct relation with these elements. The term "reflex paralysis" or "paralysis from peripheral irritation" was obviously used at that time for the most heterogeneous cases.

tion with C. Lesieur (225) relating to several cases of pneumonic hemiplegia in which the presence of pneumococci was found in the cerebro-spinal fluid.

We must accept unreservedly the conclusion arrived at by Vulpian, but it should be specified that it in no way applies to the syndrome considered in his work, but merely to the group of so-called reflex paralyses which has just been criticised. "To sum up," says Vulpian, "in a review of the group of so-called reflex paralyses it will be found that it includes a larger number of cases in which there is a material lesion of the nerve centres, nerves or muscles, while among the remainder there are some which should probably be classified among neurotic paralyses."

This conclusion was formulated in 1875, and yet in 1886 in his lectures on diseases of the spinal cord Vulpian devoted a whole chapter to the study of the so-called reflex muscular atrophies. The fact is, that he did not in any way regard these nervous disorders as the same as those which he had previously criticised and which on this occasion he did not even mention.

It is nevertheless true that the exaggerated vogue which the conception of reflex nervous disorders enjoyed at a certain period was followed by a reaction, and disqualified in some minds conclusions based on incontestable facts.

The discredit into which the old views of so-called reflex contracture and paralysis of articular or abarticular origin had fallen is also explained by another cause, viz. the exaggerated development of the idea of hystero-traumatism.

As we have already said, there had been a tendency to attribute to hysteria almost all the nervous disorders following traumatism and not due to a definite lesion of the nervous system.

This is what A. Pitres wrote in 1891 in his Clinical Lectures on Hysteria *à propos* of a patient suffering from muscular atrophy following traumatism: "The words 'reflex atrophy' do not correspond to any definite nosological conception. The name is used

to-day to describe a certain number of muscular atrophies following traumatism. But a few years ago it was the practice to give the name of 'reflex contractures,' 'reflex paralysis' and 'reflex tremors' to a large number of disorders which really belong to hysteria and which naturally joined the group of hystero-traumatic disorders as soon as it was invented by the genius of Charcot. It will doubtless be the same with a large number of the cases of atrophy."

This point of view was due to the formerly orthodox doctrine according to which hysteria was capable of anything, including exaggeration of the tendon reflexes, and vaso-motor and trophic phenomena.

It must be admitted that with the old conception of hysteria distinction between reflex nervous disorders and hysterical phenomena was practically impossible, and confusion was inevitable.

The modern conception of hysteria, on the other hand, led to the separation of these two groups, and sometimes, though not invariably, furnished means for differentiating them. On what symptoms, then, was it possible to rely in order to establish this diagnosis?

Amyotrophy of reflex origin, when very pronounced, as it often is, could not be confounded with hysterical muscular atrophy which is of slight degree, but this is not always a sufficiently characteristic symptom to be decisive.

Exaggeration of the tendon reflexes when definite enabled one to exclude hysteria, but it is sometimes ill-marked and doubtful, and may even be absent altogether.

Vaso-motor and thermal symptoms might also serve as criteria. As long ago as 1904, in a lecture devoted to the objective symptoms which the will is incapable of reproducing (33), one of us expressed himself as follows: "Trophic, circulatory and secretory disorders supply important elements of diagnosis. . . . If, for example, in a case of monoplegia, monoparesis or neuralgia in one of the lower limbs you find that the affected limb is colder than the other, that the secretion

of sweat is more abundant, and that the skin has a violet-red coloration, you may be sure that you are dealing with an organic affection."

In our first communications on reflex contractures and paralyses we emphasised again the importance of this fundamental characteristic, and we wrote (122): "We must admit that even in cases in which exaggeration of the reflexes was doubtful we had the impression that we were dealing with organic conditions, our impression being founded on the presence of local hypothermia." In the course of a discussion at the Neurological Society in October 7, 1915, one of us also made the following remarks: "I do not deny that a pithiatic paralysis may cause hypothermia or thermo-asymmetry when the paralysis is unilateral by reason of the lost or impaired functional activity, but the disorder in such cases is only slight. I am of opinion that a very pronounced and obstinate hypothermia is the sign of a more deep-seated perturbation. It is well known how frequent hypothermia is in organic hemiplegia, poliomyelitis and neuritis, but it seems to me that enough attention has not been called to the frequency and intensity of vaso-motor symptoms and hypothermia, which often develop after traumatic lesions and form part of the group of so-called reflex phenomena. These symptoms are common in cases of lesions due to gunshot wounds, even when these lesions have not caused much destruction of tissue and the nerve trunks and arteries have not been involved."

It should be stated, however, that the majority of neurologists did not share this opinion at that time.

Thus in a communication to the Neurological Society on July 1, 1915, to which we have already referred, Gilbert Ballet (82) demonstrated a patient with contracture of the right foot in a position of equino-varus, and said: "The forced adduction of the foot took place under the following conditions—

"On August 6, Lad . . . was operated on for hallux valgus by resection of the head of the first metatarsal. Three weeks later, when the operation wound had

cicatrised, the patient saw his foot assume a position of adduction, and the contracture fairly rapidly increased to the degree which you see at present. The patient was put under chloroform, and his foot immobilised in a plaster apparatus. In a few days' time, after the apparatus had been removed, the limb resumed its vicious attitude, and the dorsum of the foot showed a very marked œdema with coldness of the right foot as compared with the left." "This is obviously a case," Ballet concluded, "of a contracture of psychical origin with only a distant and indirect relation to the operation, which, as I may remind you, was performed on the first metatarsal, whereas the contracture involves the muscles of the tibiotarsal articulation. . . . This, then, is a contracture of psychical origin with œdema and associated vaso-motor disorders."

It should be noted that though this was an example of a contracture following traumatism and accompanied by vaso-motor symptoms, œdema and hypothermia, G. Ballet did not discuss or even consider the hypothesis of a reflex contracture.

This was not an isolated case; we have chosen it on purpose, because it was recorded by an eminent neurologist, to whose memory we are pleased to pay homage. It shows how much the principles established by Charcot and Vulpian had been forgotten.

Such were the ideas which were still in vogue a year ago.

New Ideas acquired by the Study of War Cases

We were induced to take up the study of reflex disorders and to add some observations of our own under the following circumstances. Our attention had first of all been directed to this study by the following case: In August 1915 a soldier came to our out-patient department at La Pitié suffering from a very marked limp with outward rotation of the foot following a wound of the upper and outer part of the right thigh. We found muscular atrophy of the thigh, without

Plate I

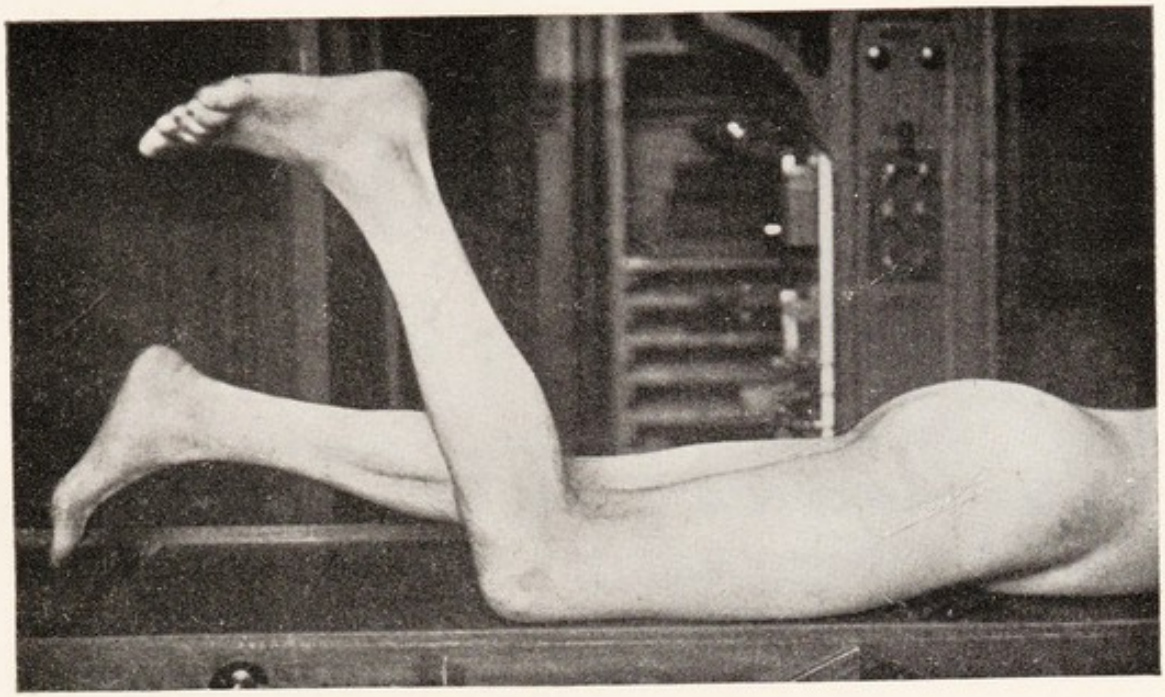
A. Contracture of the flexors of the leg on the thigh (126), following a wound of the middle third of the thigh (November 1914), without exaggeration of the knee jerk and without definite vaso-motor symptoms. The contracture persisted till a late stage of chloroform narcosis, and then completely disappeared. Its reappearance definitely preceded the return of sensation, cutaneous reflexes and conjunctival reflex, and was complete twenty minutes at least before consciousness returned (*v.* Appendix, Case XII, p. 259).

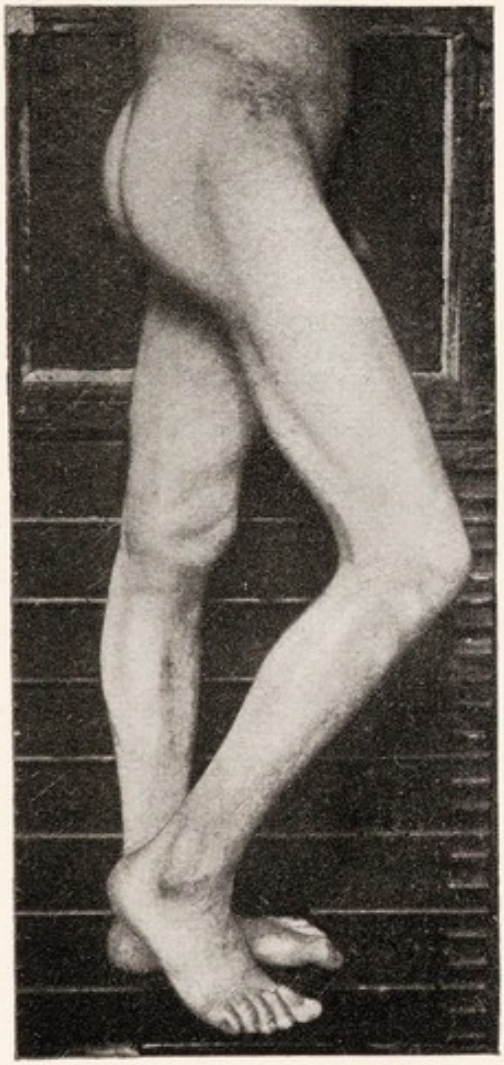
B. Same patient standing.

C. Contracture of the pelvi-trochanteric muscles with paresis of the foot and toes, following a shrapnel wound of the upper and outer part of the right thigh (September 1914). The right lower limb is in very pronounced external rotation; in a full-face skiagram the head of the femur appears in profile and completely hides the anatomical neck. Movements of internal rotation and of flexion of the thigh on the pelvis are slightly limited owing to the contracture and a slight fibrous retraction which was shown by examination under an anæsthetic. There is no lesion of the coxo-femoral joint.

The right knee jerk appears slightly stronger than the left in the waking state; during chloroform narcosis (122) an exaggeration of the tendon reflexes in the affected limb was found (September 1915), with right patellar clonus which could still be elicited an hour after complete recovery (*v.* Appendix, Case I, p. 254). We also found (May 1916) hypothermia and marked vaso-motor symptoms with reduction of the oscillations (4 in the affected limb as compared with 8 in the sound limb), considerable amyotrophy of the thigh (4 centimetres), mechanical hyperexcitability of the posterior tibial nerve, hypæsthesia of the affected foot with loss of cutaneous reflexes (the cutaneous reflex reappeared after warming) (145).

PLATE I





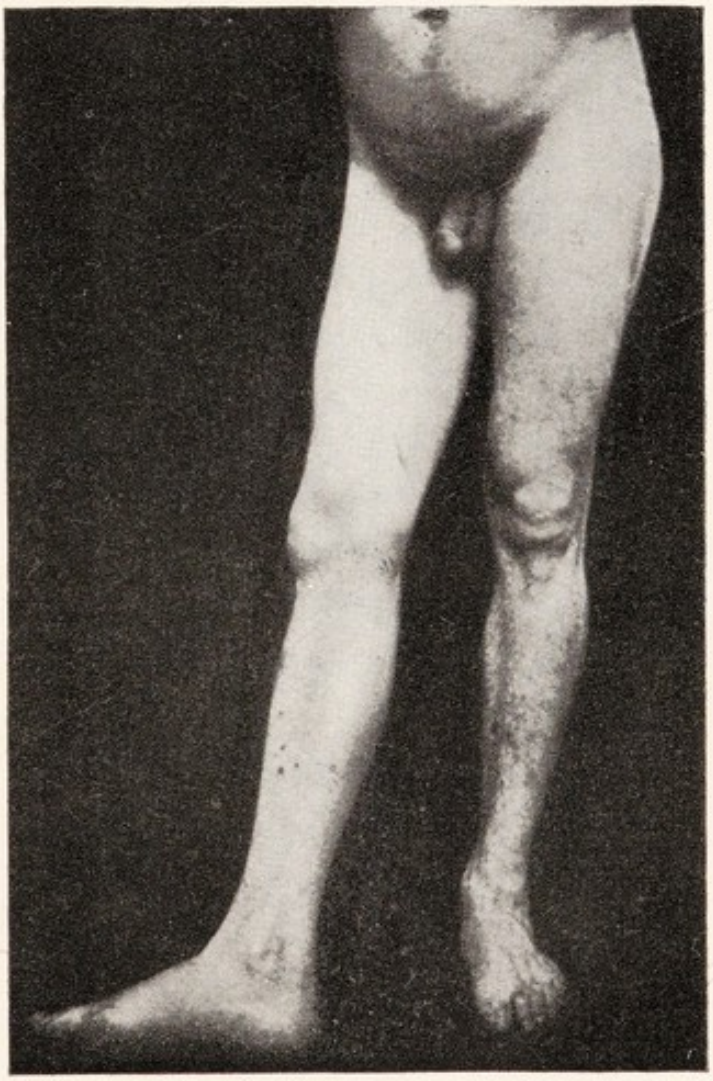
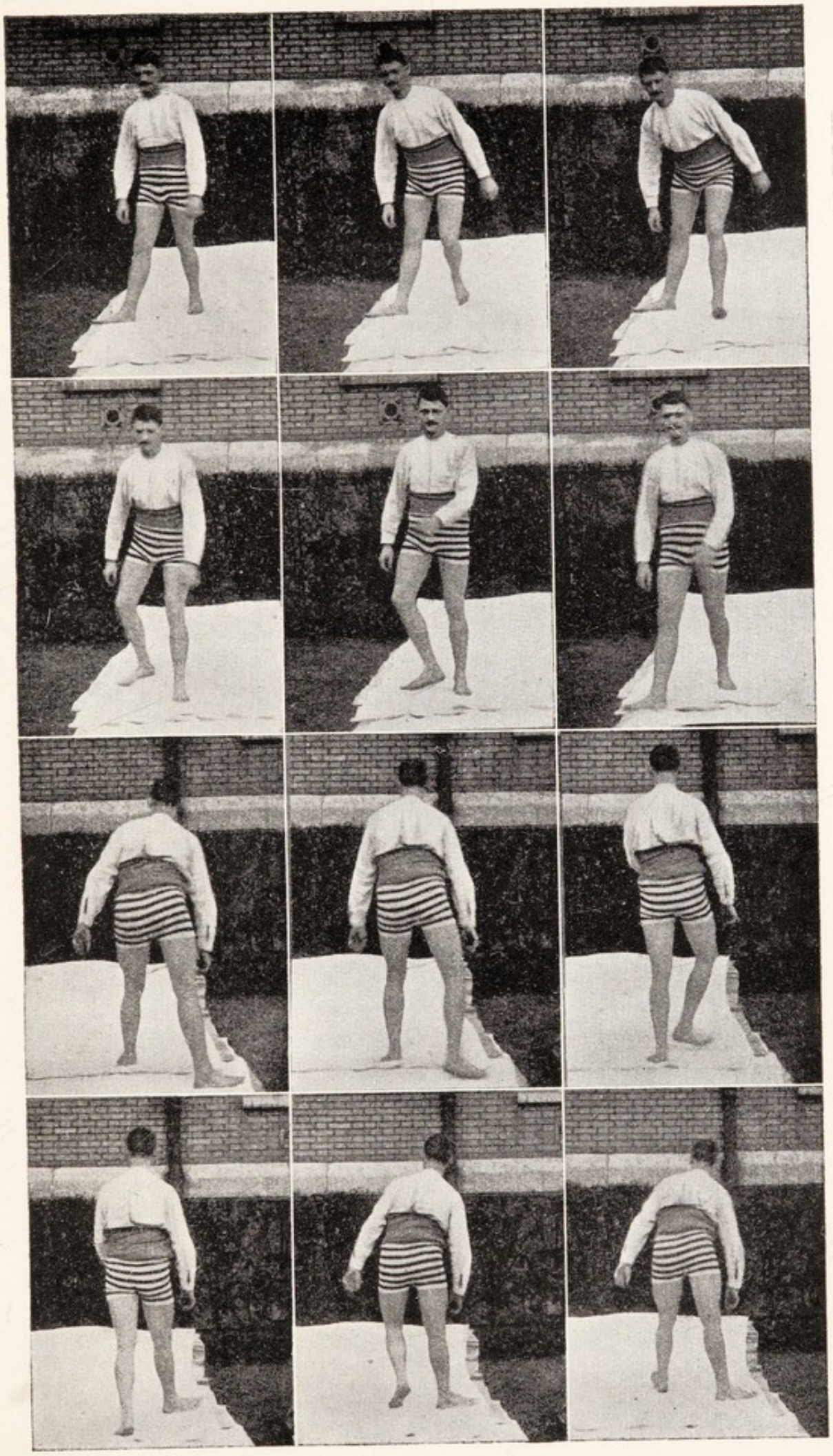


Plate II

Cinematograph film of reflex claudication.—This man developed contracture of the pelvi-trochanteric muscles with paresis of the foot and toes after a wound in the right thigh. He presented a pronounced and obstinate claudication of a very peculiar type, but we have found most of its essential characters in other claudications of the same kind. A study of the different phases of each step (as seen from in front and from behind) shows the following peculiarities. When the two feet are resting on the ground, they are widely separated from one another; the right lower limb is also in very marked external rotation. When the affected foot moves forward, it is not carried directly forwards like the sound foot, but describes an arc of a circle with an internal convexity; it is first brought forwards and inwards by a movement of flexion of the leg which is then extended and carried forwards and outwards. While describing this movement the foot hangs in a position of equino-varus and sweeps the ground with its tip and outer border. Lastly, when the sound foot is raised from the ground and moves forward, the trunk is bent strongly to the affected side, and performs a very pronounced movement of salutation.

This cinematograph film (Gaumont) was shown on the screen at the Doulens Neurological Congress (January 1916).



ditions a certain number of wounded men presenting symptoms of the same kind, and we have several times noted *during narcosis this peculiar exaggeration of the tendon reflexes in the affected limb.*

We were thus placed in possession of a new symptom, or, at any rate, of a method which enabled us to detect increased excitability of the tendon reflexes in cases in which such increase was doubtful under normal conditions.

In some of the patients the symptom which we have just described was absent, but others equally significant were found: *the contracture disappeared during deep anæsthesia only;* it was still present at a period when the conjunctival reflex was abolished, and stimulation by pricking the sound limb did not cause any reaction; the return of the contracture was simultaneous with that of the tendon reflexes, and sometimes preceded the first signs of returning consciousness by twenty to twenty-five minutes. Moreover, *the effort at reduction during complete anæsthesia and after disappearance of any conscious reaction produced a spasmodic movement* which exaggerated the vicious attitude; this was particularly the case in several instances of flexor contracture of the leg (126).

After making careful investigations into the changes in the reflexes and muscular tonus at different periods of chloroform narcosis, we directed our attention to the reflex nervous disorders following traumatism of the limbs, which were so often misinterpreted at the beginning of the war (125).

They showed that a close examination should be made before attributing nervous symptoms to hysterotraumatism, and that the absence of an exaggeration of the tendon reflexes in the waking state by no means justified such a diagnosis.

At the time when we were pursuing these researches numerous cases of difficult interpretation presented themselves, and these gave rise to a series of publications.

H. Meige, Mme. A. Benisty and Mlle. Lévy (127)

gave the name of "congealed hand" to a puzzling form of functional impotence, and also drew attention to the existence in these cases of a peculiar psychopathic state which became grafted on an initial organic condition. Claude (128) described side by side with hysterical phenomena "some similar manifestations which it is very difficult to classify," consisting of painful contractures which were localised and very persistent. Were they hysterical or reflex contractures? "We think," he writes, "that the contracture is of reflex origin, being caused by a nervous lesion or a sort of defensive movement, and that this attitude has subsequently become fixed and rendered permanent by a psychological mechanism resembling that of hysterical manifestations." Sicard (129) gives the name of "acro-contractures" or "acromyotonus" of the upper limb to contractures of the hand in various positions which resist all treatment, are aggravated by massage and electricity, and show only a slow and partial improvement as the result of very gentle procedures. "The pathogeny of such contractures," he writes, "remains obscure. . . . Hysteria is not concerned in their production." We may also mention the publications of Duvernay (124), dealing with post-traumatic "psychopathic and reflex contractures," which present the same characters; of Léri and Roger (123), and of Ducosté (197), on contractures following lesions of the peripheral nerves.

The impression derived from all these studies is that in a large number of centres of military neurology observers have been struck by the frequency of certain conditions, such as fixed attitudes and contractures which differ from the usual run of cases and which it has been impossible to classify.

Are they examples of hysterical manifestations, or are they phenomena of another kind? Such is the question which interests all these writers, and which they answer in different ways. It is quite obvious that they have no conclusive criteria to support their impression. Most of them have been surprised by the

persistency of the symptoms and their great resistance to psychotherapeutic measures. Although some for this reason reject the hypothesis of hysteria, not one of them compares these cases with the descriptions given by earlier writers.

The study of a patient presenting a type of paralysis hitherto undescribed gave a new direction to our researches. The case was met of a man suffering from flaccid paralysis of the hand and fingers following

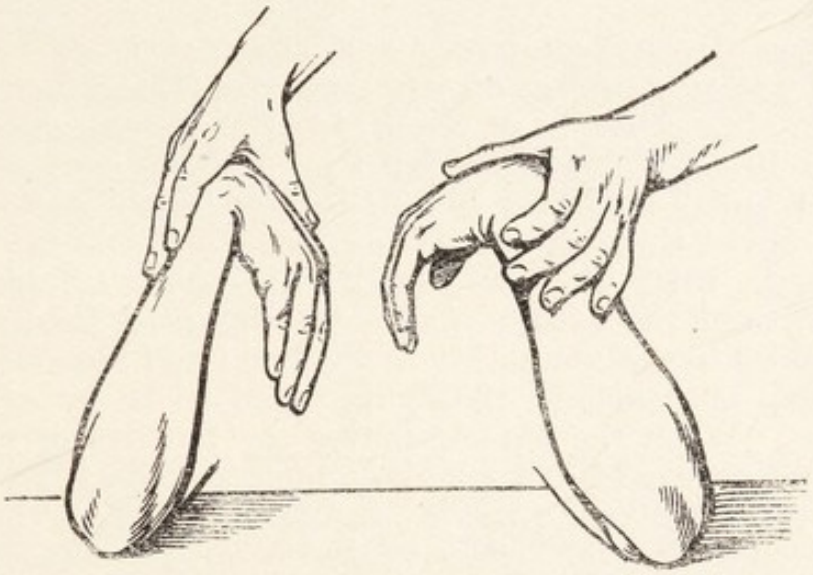


FIG. 4.—Hypotonus of the extensors of the hand following perforation of the hand by a bullet without lesion of the nerve trunks (*v.* Pl. IV, p. 118).

a bullet wound of the second dorsal interosseous space. Vaso-motor disorders and a pronounced hypothermia were found. There was a little diffuse and non-systematised atrophy of the muscles of the hand, forearm, and upper arm without R.D. The tendon reflexes on the affected side were preserved. The hypothesis of an organic affection of the centres or peripheral nerves had to be abandoned in the absence of any sign characteristic of such lesions. Were they, then, to be regarded as hysterical or simulated phenomena, as some had supposed ?

On subjecting the patient to a methodical examination, in the search for some sign which would help us

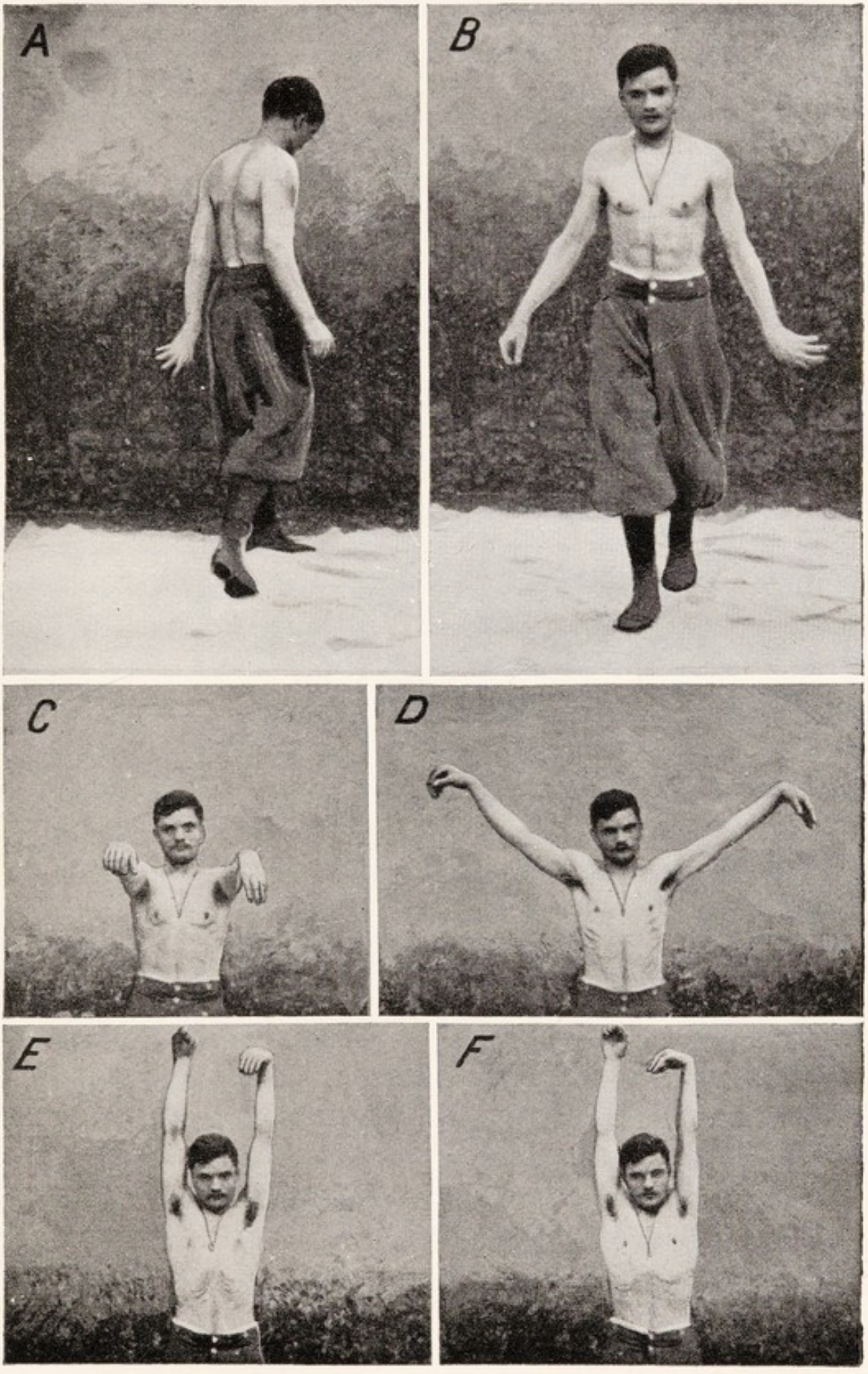
Plate III

Flaccid paralysis of the left hand and fingers with paresis of the movements of the forearm (131) which occurred five months after a wound of the second dorsal interosseous space (September 1914), and was preceded by a slight weakness of the hand. The bullet remained in the hand without perforating it, and was removed three months after the wound.

In January 1916 we also found vaso-motor symptoms and hypothermia and the existence of a very marked faradic, voltaic and mechanical hyperexcitability of the hand and forearm. Hypotonus is very marked and allows the hand to be hyperflexed on the forearm. When the patient moves the forearm or walks, the affected hand swings to and fro like a lifeless body, in every direction, as if it were obeying the laws of gravity only.

These peculiarities are clearly shown in the cinematograph pictures which we produce (Gaumont film shown at the Doulens Congress in January 1916). In May 1916 the condition of the patient who had been temporarily discharged and examined in his district by Porot (159) had not changed, and the signs mentioned above were still quite distinct.

PLATE III



to solve the problem, we were struck by the following symptoms : a remarkably intense *hypotonus* (especially of the wrist), which equalled if it did not actually exceed the hypotonus seen in paralysis following lesions of the deep nerves ; very marked *mechanical hyperexcitability* of the muscles of the hand and forearm, with *slowness of the muscular contraction*, and lastly *electrical hyperexcitability of the muscles with premature fusion of the faradic contractions* (131).

Objective signs which were independent of the will had thus been discovered, and consequently we felt convinced that these disorders were not due to hysteria.

On making a fresh examination of the patients whom we have already discussed, and in whom observation during anæsthesia had shown the undoubted existence of a disturbance of the spinal centres, we found the signs which we have just described, especially mechanical hyperexcitability with slowness of the contraction. They were also found in several patients who presented those peculiar types of contracture which had attracted the universal attention of neurologists (congealed hand, acro-contracture, and accoucheur's hand).

The existence of the mechanical hyperexcitability of muscles, described by us in this group of cases, has been confirmed by later observations made by Marie and Foix (132) and by Sicard (133).

On comparing those various groups of paralyses and contractures with one another, whose common attributes were that they were of traumatic origin and could not be attributed to an organic affection of the nervous system or to hysteria, we were led to establish a close connection between them. As some seemed undoubtedly to be due to a disturbance of the spinal centres, there were reasons for supposing that the others were of the same nature.

Lastly, we noticed that vaso-motor and thermal disorders usually occupied an important place in the symptomatology of all these cases, and that they were practically constant, although there might be differences

in their degree of intensity. We showed that the affected limb was abnormally sensitive to the influence of the atmospheric temperature, which implies a *local disturbance in the mechanism of vaso-motor and thermal control* (134).

Sphygmometric and oscillometric investigations, which were chiefly carried out in collaboration with Heitz (161), enabled us to detect the existence of a vascular spasm (135), which was specially marked towards the periphery. These phenomena had hitherto escaped attention.

We were also impressed by *the connection of vaso-motor and thermal disorders with disturbance of the mechanical excitability of muscles*, as shown by muscular hyperexcitability and slowness of the muscular contraction. These last modifications formed the object of a minute enquiry by means of the *graphic method* in collaboration with Hallion (153).

It is clear from the account which we have given that these various forms of contractures and paralyses, as to the nature of which there had at first been some doubt, are accompanied by objective signs of which we have endeavoured to estimate the value in our description. We have given them the name of "reflex" paralyses and contractures, because they resemble the amyotrophic or so-called reflex paralysis of which Charcot and Vulpian have given such an excellent description. Moreover, some of the phenomena which we have mentioned (observations during anæsthesia and character of the vaso-motor disturbances) supply new arguments in favour of the "reflex" pathogeny. In any case, our researches prove that there undoubtedly exists a *group of motor disorders of physiopathic nature*, which must be distinguished both from organic phenomena properly so called and from hysterical or pithiatic phenomena.

The pathological topic which we are studying formed the object of a general discussion at a special meeting of the Neurological Society on April 6, 1916, following

a report made by one of us dealing with the characters of so-called functional motor disorders. The neurologists present accepted the essential parts of our opinion, as is shown by the conclusions adopted unanimously in closing the discussion (140) :—

" *Regarding the matter exclusively from the standpoint of a medical board we have to distinguish among so-called functional motor disorders* (i. e. *motor disorders with none of the objective signs characteristic of organic affections of the brain, cord, or nerves, or of vascular lesions*)—

" 1. *Hysterical or pithiatic disorders properly so called.*

" 2. *Nervous disorders quite distinct from the preceding which are associated with real physiological disturbances of which the mechanism is still a matter of discussion, but which may be grouped with the reflex disorders observed after osteo-arthritic lesions.*"

Since the general discussion on nervous disorders of this kind at the Neurological Society, a certain number of articles have been published, which have confirmed our opinion, at any rate in its essential features. We will now give a short abstract of them.

In an article entitled " Reflex paralyses and reflex trophic disorders following wounds of the extremities; a contribution to the study of ascending neuralgia and neuritis," H. Gougerot and Albert Charpentier (151) express themselves as follows : " To sum up, from the first we have been impressed by the contrast between the localisation of the wound, with its apparently mild character and the importance, diffusion and ' ascent ' of the paralytic and very frequently trophic disorders; by the frequency of ascending pain, which is sometimes intolerable; by the distressing persistency of the pain, paralysis, and trophic disorders; their progressive aggravation many months after the wound; in short, by the gravity of the prognosis. . . . Such are the facts which the neurology of war has taught us; the recent publication of Babinski and Froment summarising their previous work (with which we were not acquainted) has induced us to publish these cases now, for they are similar to theirs. Not only do they

confirm them, but they add certain details, and illustrate the frequency of such cases."

After having discussed and dismissed the diagnosis of ascending neuritis (*v.* p. 180) H. Gougerot and A. Charpentier admit that these cases are examples of "a diffuse spinal and sympathetic reflex action."

"In our opinion," they add, "the pathogenic idea, as Babinski and Froment call it, matters little; the important thing is to be acquainted with these cases, the gravity of their prognosis, their obstinate character, and the frequent occurrence of ascending and reflex pain which make them resemble ascending neuritis and render the life of some wounded men so painful; in short, to realise that these patients are above all organic cases. In fact, many of them, as their wounds had been cured for two or three months, a year and sometimes more, had been considered as suffering from hysterical paralysis, and sometimes even as simulators."

Tinel (154), in a work entitled '*Wounds of Nerves*,' devotes a chapter to the study of so-called reflex contractures, though his opinion differs from ours as to their pathogeny. But he clearly distinguishes them from hysterical contractures as follows: "A large number of apparently paradoxical contractures are found, usually following slight traumatism, which one might be inclined to regard as mere hysterical contractures. But on close examination one finds the presence of a certain number of characters revealing the existence of an organic lesion, such as cyanosis, coldness, profuse sweating, trophic disorders of the skin and nails, fairly definitely systematised sensory troubles, and slight modifications of the electrical reactions and mechanical excitability of the muscles. These disorders have been carefully studied by Babinski and Froment, who have clearly distinguished them from mere functional contractures by the denomination of 'reflex contractures.'"

Porot (159), in an article devoted to "reflex manifestations (motor, vaso-motor and trophic) following disarticulation of the fingers," describes a series of cases closely resembling those which we have studied (134).

"We are simply dealing," he says, "with a special

case of motor, vaso-motor and trophic disorders of reflex character whose presence and persistence in the lower limbs are attracting increasing attention.

"The clinical reality and relative frequency of these disorders are no longer disputed nowadays. The description given of them in this journal by Babinski and Froment has shown us the principal symptoms of these reflex disorders which occupy an intermediate position between so-called hysterical manifestations and organic paralyses directly caused by affection of the peripheral nerves.

"We have been impressed by the relative frequency with which these reflex disorders occur in wounded men who merely had to undergo disarticulation or amputation of a finger.

"Out of a dozen cases of these reflex paralyses of the extremities which we had an opportunity of examining, we found four, or one-third of the cases, among men who had had one finger amputated. The initial wound had affected only one finger, which had to be disarticulated. There were no scars on the rest of the hand or on the foot, and the limb had not been wounded higher up.

"The clinical picture differed in each of these cases, and consisted in various combinations of motor, vaso-motor and trophic symptoms. All showed a mechanical and electrical hyperexcitability, and especially faradic hyperexcitability, which appeared to us to be the most constant feature."

A. Mézie (158), in a work entitled *Reflex Disorders and Cerebral Insufficiency*, also confirms our ideas both as regards symptomatology and pathogeny, but he adds "a physical or mental cerebral insufficiency" to the local factor.

In this connection we may remind our readers that Meige (127) had already emphasised the peculiar mental state of wounded soldiers suffering from the deformity which he described by the name of "the congealed hand." "One cannot help being impressed," he says, "by the general attitude of these patients. Silent and solitary, with anxious looks and few gestures, they appear to be perpetually on the alert. Their 'congealed hand' seems to be the one object which occupies their mind."

We do not dispute the possible co-existence of a some-

what abnormal psychical state with reflex nervous disorders. But, on the one hand, we have seen a large number of patients of this kind who appeared to us to be quite normal mentally, and, on the other hand, obsession, anxiety and irritability, when they do exist in such cases, appear to be of secondary importance. Patients suffering from reflex nervous disorders may have been forcibly impressed by the persistency of the symptoms, the discomfort attending them, the failure of the therapeutical methods hitherto employed, and perhaps by the suspicion with which they were too frequently regarded.

In the course of a recent communication to the Neurological Society Souques, Megevand, Naiditch and Rathaus (160) showed a patient with so-called reflex paralysis of the lower limb. The following is a summary of the case, for which we are indebted to the authors : " This patient, after a superficial wound of the instep, has become affected with a motor disturbance which shows the principal characters attributed by Babinski and Froment to this kind of paralysis, viz. paresis of the whole limb, exaggeration of the tendon reflexes, loss of the plantar cutaneous reflexes, diffuse amyotrophy, increase of the idio-muscular and galvanic excitability, decalcification of bone, diminution of the amplitude of the oscillations with Pachon's instrument, and considerable hypothermia (5–10° C.).

" The immersion of the two feet in hot water diminishes the electrical and idio-muscular hyperexcitability on the affected side, causes the plantar cutaneous reflexes to reappear, and raises the temperature of the affected foot to the level of the sound foot and sometimes above it.

" We investigated the point as to whether normal subjects had a difference of temperature in symmetrical regions on the two sides of the body, and found that very often there was a difference which usually amounted to some fractions of a degree, but might be as much as a whole degree centigrade.

" We found that walking even when prolonged for an hour did not raise the temperature of the affected foot, and even lowered it a little, contrary to what occurred in the sound foot.

"Without entering into the pathogeny of so-called reflex paralysis, we are of opinion that genuine cases of this kind showed a collection of signs which separate them from hysterical paralysis and bring them into a close relationship with organic paralysis."

In a review on "Reflex Paralyses," which appeared in October 1916, Mirallié (162) expressed himself as follows: "At the beginning of the war this morbid type was confounded with hysteria, and at first all these cases were regarded as functional paralysis *sine materia*. As the result, however, of a more careful examination of these cases, the peculiar course of the disease, its characteristic symptoms and its resistance to psychotherapy, neurologists were led to place them in a special class quite distinct from pithiatic phenomena. Our knowledge of the subject is principally due to the work of Babinski and Froment, Meige, Claude, and Sicard." Mirallié reviews the symptoms of these disorders, and discusses their pathogeny, which he regards as complex, and on which he refuses to make a definite statement. One point at least appears to him to be quite certain, and that is the most important one: "All neurologists," he writes, "agree with Babinski in separating this condition from hysteria."

In a critical review of "The Psycho-neuroses of War," G. Roussy and J. Lhermitte (*Annales de Médecine*, September to October 1916) devote a chapter to the differential diagnosis of psychopathic contractures and make the following remarks *à propos* of reflex contractures:—

"The differential diagnosis between *psycho-neuropathic contractures* and *reflex contractures* to which Babinski and Froment have recently drawn attention is infinitely more embarrassing. These writers have made a careful study of reflex paralyses and contractures, and their description justifies the complete separation of such cases from similar manifestations of a psycho-neuropathic nature."

Lastly, in his Report made at the meeting of representatives of neurological centres, which took place on December 5, 1916, Grasset, though he classified these motor disorders among the neuroses, formed them into a special group.

"On superficial examination," he says, "these cases merely seem to be neuroses pure and simple. But—and this is characteristic of cases of this kind—on thorough examination specialists discover in these neurotic patients a variable number of symptoms described by Babinski and Froment, which *cannot be produced by the patient's will*, and which may be called the *minor traumatic signs* of the neuroses and psycho-neuroses of the second group."

CHAPTER II

SYMPTOMATOLOGY

REFLEX nervous disorders develop after wounds or various injuries of the limbs, and sometimes after frost-bite. In the case of wounds caused by projectiles, the lesion may only involve the soft parts and leave the skeleton and joints intact. The condition is often seen in cases of transfixion of the forearm, head, leg and foot, and it is interesting to note that the nervous disturbance usually extends above the area on which the trauma has been inflicted. We may add that the intensity of the nervous disturbance bears no relation to the duration of the infection, the extent of the lesion and the scar, or to the severity of the pain which these may cause.

It is rather difficult to state the precise moment at which the symptoms develop. They may appear immediately after the wound (Claude, Gougerot and Charpentier), but often the patient does not notice them until the dressing or splint has been removed. In other cases it is not until several weeks after the wound that the patient finds the limb assuming a vicious attitude, which progressively increases in spite of his efforts to prevent it. Sometimes the disorder, which was at first a mere paresis, becomes suddenly aggravated as the result of fatigue. Most patients with traumatic reflex contracture or paralysis were sent at first to surgical units, where they stayed for a varying period and were afterwards transferred to neurological centres at the base. In those at the front, therefore, there has hardly been any opportunity of seeing a case.

At the beginning of the last chapter we gave a short account of the different elements of the syndrome in

question. We shall now discuss the subject in greater detail.

Contractures and Paralyses: Clinical Forms

Clinically, reflex motor disorders may adopt various forms, such as contracture, paralysis, hypotonus, paresis or mere weakness, and frequently a combination of pareses and contractures. But, whatever may be its form, the motor trouble is usually incomplete, partial and limited; it shows a tendency to predominate in one segment of a limb, especially at its extremity, and thereby differs from pithiatic paralysis or contracture, which is generally more extensive and often complete and in which all the segments of the limb are usually affected.

It is possible to isolate some striking clinical types from among these varieties. Two patients corresponding to the same type may be as exactly alike as are two individuals presenting the same form of myopathy.

Contractures and Paralyses of the Lower Limb

Amyotrophic paralysis of the quadriceps.—This is the classical form of reflex atrophy which generally follows a femoro-tibial arthritis, but it may also be observed after wounds of the thigh or in the region of the knee in the absence of any lesion of the joint or patellar tendon (*v.* Fig. 6). The atrophy is sometimes associated with an obstinate paralysis of the quadriceps, and may be accompanied by extreme hypotonus (*v.* Fig. 15); usually, but not invariably, the knee jerk is exaggerated.

Contracture of the pelvi-trochanteric muscles associated with paresis of the foot.—This variety of motor disturbance is almost always found after traumatism in the region of the hip. In the dorsal decubitus the lower limb is in a position of very pronounced external rotation; the outer border of the foot being in contact

with the surface of the bed, passive movements of the thigh are somewhat limited, especially movements of internal rotation, and pull the pelvis round more

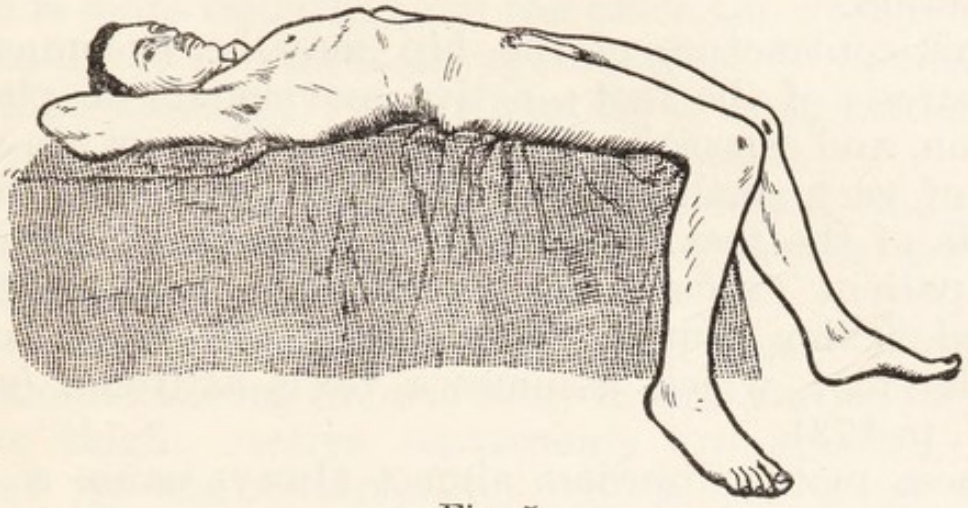


Fig. 5.

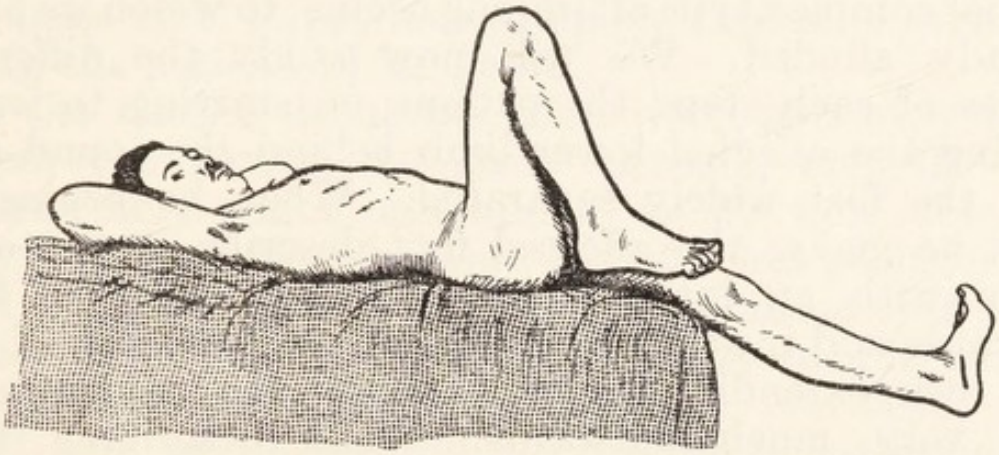


Fig. 6.

FIGS. 5 and 6.—AMYOTROPHIC PARALYSIS OF THE RIGHT QUADRICEPS ASSOCIATED WITH PARESIS OF THE FOOT, following a wound (November 4, 1914) of the outer aspect of the knee without lesions of the joint or patellar tendon. The reflex paralysis is accompanied (June 1916) by the following signs: pronounced and obstinate vaso-motor and thermal disorders with small ulcers of the foot, mechanical and faradic hyperexcitability of the quadriceps and muscles of the antero-external region of the leg, and hyperexcitability of the small muscles of the foot. The amyotrophy of the thigh is considerable, and the hypotonus is marked. The paralysis is very pronounced. When the patient is in the dorsal decubitus, with the legs hanging over the side of the bed (Fig. 5), and tries to extend them, he succeeds on the sound side only. In the affected limb (Fig. 6) the thigh is extended, but the leg, instead of being extended, becomes flexed.

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rapidly than those carried out in the sound limb. This stiffness is due to a contracture of the pelvi-trochanteric muscles with which may be associated some fibrous retraction.

This contracture of the hip may be accompanied by paresis of the foot; active movements of plantar flexion, and especially those of dorsal flexion, are weak and of very small extent; it is the same with movements of the toes. When the paresis is less marked, the patient executes fairly extensive movements of dorsal flexion, but he lifts chiefly the inner border of the foot, which assumes a varus attitude. (*v.* Pl. VIII, p. 172).

These motor disorders almost always cause a very pronounced and obstinate claudication; sometimes a special complex type of limping occurs, to which we have already alluded. We will now study the different stages of each step; the patient, on starting to walk, having the affected lower limb behind the sound one and the feet widely separated. When he begins to walk he makes the affected foot describe an arc of a circle with an internal convexity, bringing it first forwards and inwards by a movement of flexion of the leg; then, extending the leg, he carries the foot forwards and very much outwards. While describing this movement the foot is hanging in a position of equino-varus, the toes and outer border being drawn along the ground. Lastly, when the patient raises the sound foot from the ground, and carries it forwards, the trunk bends strongly to the affected side, executing a movement of salutation, and as the body is then supported on the affected leg, a movement of torsion of the foot takes place which accentuates the varus attitude (*v.* Pl. II, p. 98).

In this form of contracture the knee jerk is not always definitely exaggerated in the waking state, but chloroform narcosis usually reveals a latent exaggeration of the reflex. Vaso-motor symptoms and mechanical hyperexcitability are usually very marked in the leg and especially in the foot. It is not unusual

also to find hypæsthesia of the foot with absence of the cutaneous reflexes.

Flexion contracture of the leg.—This clinical type which is more frequent than the extension type is very common. It is almost always a sequel of wounds of the thigh and leg; it may also be a complication of paralysis due to lesions of the sciatic nerve.

In standing and walking the heel is raised, and only the front part of the foot rests upon the ground (*v.* Pl. I, p. 96).

In the dorsal decubitus, it is found that in addition to flexion of the leg there is some flexion and abduction of the thigh. Active movements are possible, but limited by the contracture. It is the same with passive movements, though these are more extensive. It is impossible to produce complete extension even by taking the patient off his guard.

In the ventral decubitus, even when it is very prolonged, the flexion deformity persists, and the leg presents only slight oscillations, as we were able to observe in patients who were kept in that position for more than an hour at a time. The same test was applied to a case of hysteria major in a state of hypnosis in which the same type of contracture had been produced, but the woman did not succeed in maintaining this attitude perfectly for so long: as the test continued and her fatigue increased, the leg executed more and more extensive oscillations towards the horizontal plane, and finally almost reached the surface of the bed. It may also be mentioned that in the case of reflex contracture the angle of flexion is not appreciably modified from one examination to another, even when there is an interval of several days between each observation.

Contractures and pareses of the foot. Club foot and claw toes.—Motor disorders confined to the foot and toes chiefly occur after wounds of the leg or foot. They assume various forms, such as *paresis of the extensors with equino-varus, claw toes from contracture of the flexors,* or a rarer type in which there is a coexistence

of *flaccid paralysis of the great toe with extension contracture of the other toes* (*v.* Pl. VIII, p. 172).

Sometimes the toes are drawn together like the fingers in the "accoucheur's hand."

In the paretic form extension of the great toe does not accompany dorsal flexion of the foot as in the normal condition; the toes are not extended in any stage of walking.

These motor disorders, especially the most frequent one, paresis of the flexors of the foot and toes, may be associated with the various types of contracture and paresis of the lower limb which we have previously described.

Contractures and Paralyses of the Upper Limb

Flexion and pronation contracture of the forearm with paresis of the extensors of the hand and contracture of the flexors.—This clinical type is frequently seen, either in a complete or incomplete form, after wounds of the upper arm and forearm. The hand with the fingers extended is flexed at a right angle on the forearm, which forms an acute angle with the upper arm and is in a position of pronation. The Z-shaped appearance, resulting from this combination of deformities, is very characteristic, the affected limb resembling the appearance of a dog's paws when it is "begging" (*v.* Pl. IV, p. 118). Contracture of the flexors of the hand is associated with paresis of the extensors, and the tendons of the flexor carpi radialis and palmaris longus stand out beneath the skin. This combination of contracture and paresis of the antagonists sometimes gives rise to subluxations. In one of our cases it was fairly easy to apply the palm of the hand to the anterior surface of the forearm (*v.* Fig. 7).

In conformity with the rule that in reflex paralysis and contractures the symptoms predominate at the extremity of the limb, in the form in question the

symptoms were more marked and persistent in the hand than in the forearm.

Lastly, we may note that these motor disorders often coexist in varying degrees with the different forms of contracture of the hand which we are going to study, especially the so-called accoucheur's hand.

Accoucheur's hand.—This form of contracture appears to be very frequent. It has been seen in every neurological centre following wounds of the forearm, hand and fingers (*v.* Pl. V, p. 120).

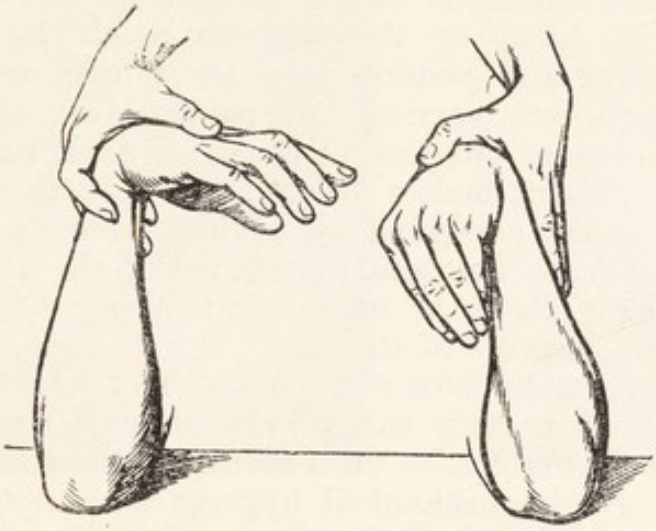


FIG. 7.—PARESIS OF THE EXTENSORS OF THE HAND ASSOCIATED WITH CONTRACTURE OF THE FLEXORS following perforation of the forearm by a bullet (August 1914). Subluxation of the wrist (April 1916) allowing the palm of the hand to be applied to the anterior surface of the forearm.

In this contracture the hand assumes a conical shape, and the fingers are arranged like the tiles of a roof, the ridge of the roof being represented by the middle finger alone or by the middle and ring fingers, which are either placed one above the other or both lying in the same plane. The index and little fingers which lie beneath the rest approach and sometimes even touch one another at their extremities, thus forming the sides of an equilateral triangle, the base of which is represented by the metacarpo-phalangeal joints. All the fingers are slightly flexed at the first and third phalanx, while the second phalanx is extended, sometimes even to excess, with a tendency

Plate IV

A. Contracture of the flexors of the hand and forearm with hypotonus of the extensors of the hand (attitude of dog begging) and accoucheur's hand. This man was wounded on August 22, 1914 (transfixion of arm at junction of upper and middle third); cicatrisation was rapid and did not take more than a fortnight. The deformity developed progressively after violent pain, affecting first the wrist and then the fingers; the patient tried, but in vain, to overcome it by raising his arm by means of splints. In October 1914 the elbow was bent to an angle of 45°, ever since then he has had systematic exercises, but improvement did not occur until November 1915.

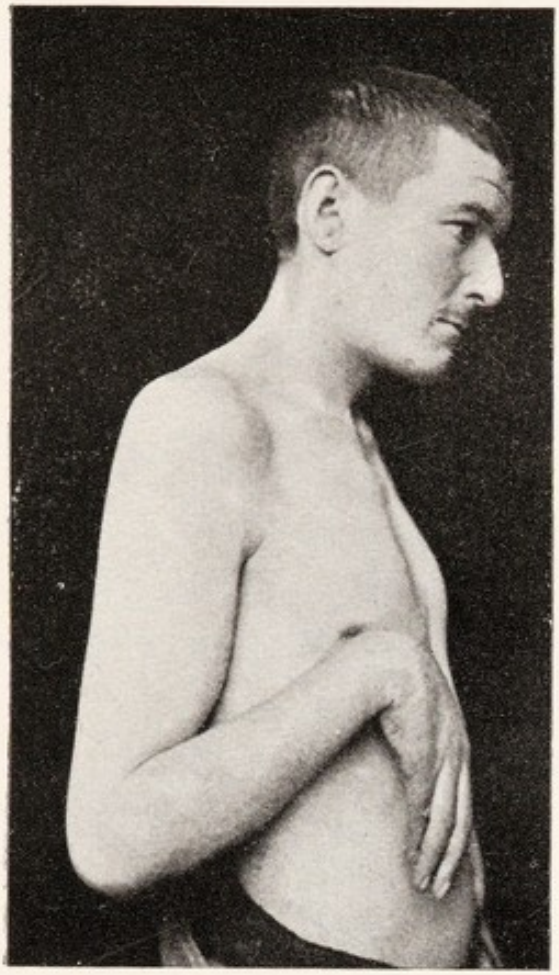
In March 1916 extension of the forearm on the upper arm and extension of the hand or the forearm reach 120°. Flexion of the last phalanges and abduction of the fingers are possible, but these movements are carried out slowly and accompanied by tremors. The fingers progressively resume their original attitude, as soon as the patient makes no effort to keep them apart. Cold is ill borne, as is also excessive heat, which causes pain and twitchings of the muscles. The tendon reflexes of the affected limb are somewhat brisk. There is mechanical hyperexcitability of the biceps and small muscles of the hand.

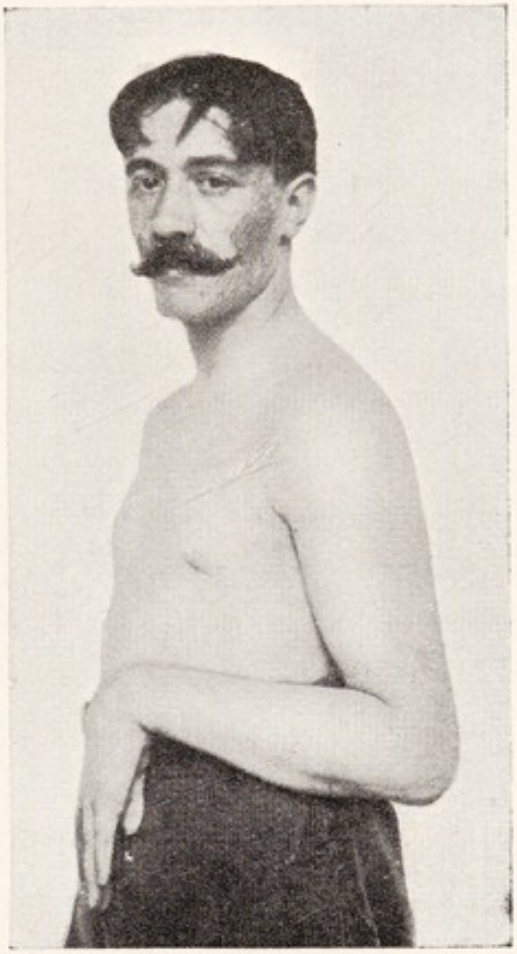
B. Contracture of the flexors of the hand and forearm with hypotonus of the extensors of the hand and fibro-tendinous retractions. — Vaso-motor symptoms and marked hypothermia. Slight mechanical hyperexcitability of the muscles of the hand. Atrophy of all the tissues of the fingers. The symptoms developed after wounds of the lower part of the left arm and hand followed by amputation of the index (May 1915). Loss of power is not complete, the paresis is most marked in the hand (August 1916).

C. Contracture of the flexors of the hand with hypotonus of the extensors and subluxation of the wrist.— This shows the deformity known as accoucheur's hand with crowding of the fingers. The phenomena developed progressively after perforation of the forearm by a bullet, at the junction of the lower and middle third, complicated by fracture of the ulna (August 1914). The wound suppurated for three weeks, and immobilisation in a plaster apparatus lasted twenty-five days.

The loss of power is not complete (April 1916), the patient being able to carry out slight movements of flexion of the wrist; the affected limb shows tremor during an effort. The hypotonus is so marked that the hand can be applied to the anterior surface of the forearm (*v.* Fig. 7, p. 117). There is also slight hypothermia of the hand, atrophy of the fingers and mechanical excitability of the biceps and supinator longus.

PLATE IV







to subluxation. The outline of each finger thus resembles that of a bill-headed cane.

The thumb is usually applied closely to the hand by its internal border; the first phalanx is most frequently strongly flexed; the last phalanx is extended or is even in a state of hyperextension, and its extremity fits into the groove formed by the other fingers. We may add that the little finger sometimes undergoes a movement of rotation inwards, so that the pulp of its last phalanx faces that of the thumb. The thenar and hypothenar eminences come close together, and sometimes enter into contact; the hand becomes hollowed out like a holy-water vessel, or shuts up like a book. Lastly, there is sometimes a certain degree of adduction or abduction of the hand.

These deformities are more or less marked in different cases; sometimes there is only a faint indication of them. We may meet with the typical accoucheur's hand, which is extremely frequent, or hypertonic conditions resembling it, and almost always reproducing some of the features which we have just described, such as the hollow hand, forced adduction of the thumb, overriding of the fingers, arrangement like the tiles of a roof, and position of the fingers like a bill-headed cane.

Which are the muscles whose contracture produces this deformity? There is every reason to suppose that the principal part is played by the adductor pollicis and interossei, especially the adductors or palmar interossei. These muscles are innervated by the ulnar, but it should be noted that the deformity is quite different from that resulting from lesions of this nerve.

This contracture has a special peculiarity apart from its form. An attempt to correct the vicious attitude succeeds easily; the hand when left to itself may retain its normal shape for a few minutes, but it gradually resumes its previous one, as if it had been compelled to by its muscular tonicity. This variety of contracture is distinguished from contractures

Plate V

A. Hypertonic condition with the deformity known as "accoucheur's hand."—Contracture of the hand following perforation of the middle of the left forearm by a bullet, complicated by fracture (February 1915). With the reflex motor disorders ("congealed hand," paresis and limitation of movements) was associated a lesion of the median nerve with R.D. of the muscles of the thenar eminence (March 1915). In October 1916 only a slight diminution of faradic excitability remains, but the reflex motor disorders have not yet undergone much change in spite of regular treatment (electricity, mobilisation and re-education).

B. Contracture of the hand, which appeared after perforation of the wrist with fracture of the os magnum (November 1914).—The ring and middle fingers override the little finger and index, which are in an attitude of forced adduction with their last phalanges in contact. The loss of power is not complete (June 1916); the patient can bring his fingers into the same plane by extending them, but they resume their original position as soon as he attempts to flex them; in the case of the middle finger, flexion of the last phalanx only is possible, the other phalanges remain extended (a similar motor dissociation cannot be produced on the normal side). Slight but obstinate vaso-motor symptoms and hypothermia. Mechanical hyperexcitability of the biceps and supinator longus.

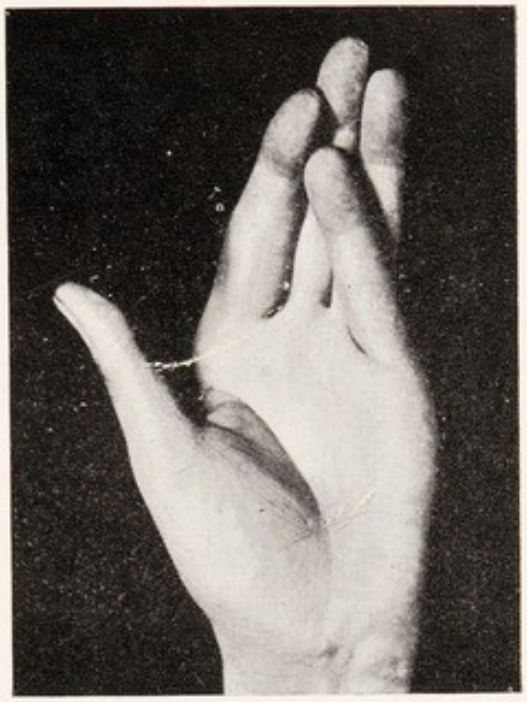
C. Contracture of the hand following a bullet wound of the forearm complicated by fracture of the ulna (August 1914), one of the most pronounced types of the "accoucheur's hand" deformity. The hand is, as it were, folded longitudinally, the thenar and hypothenar eminences enter into contact, the contracture of the adductor is very marked, the fingers override one another, and have the bill-headed cane appearance. The hypotonus of the flexors of the fingers is very pronounced and allows subluxation of the phalanges (*v.* Fig. 9, p. 149). There are vaso-motor and thermal disorders, and a very definite atrophy of all the tissues of the fingers (December 1915).

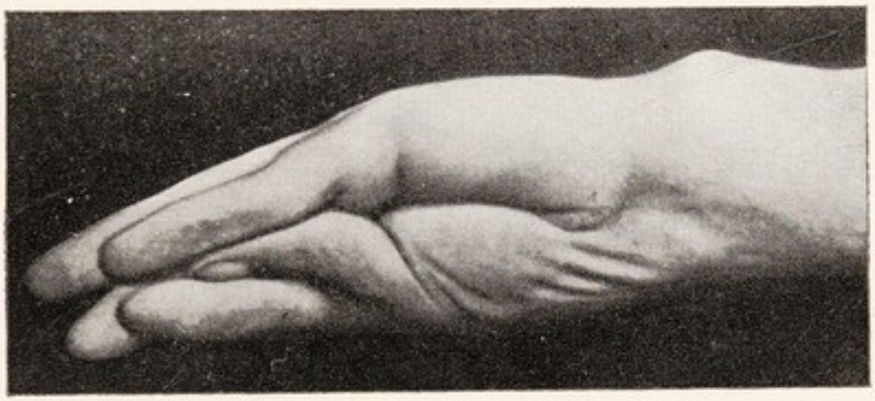
D. Same patient as A (dorsal surface of affected hand).

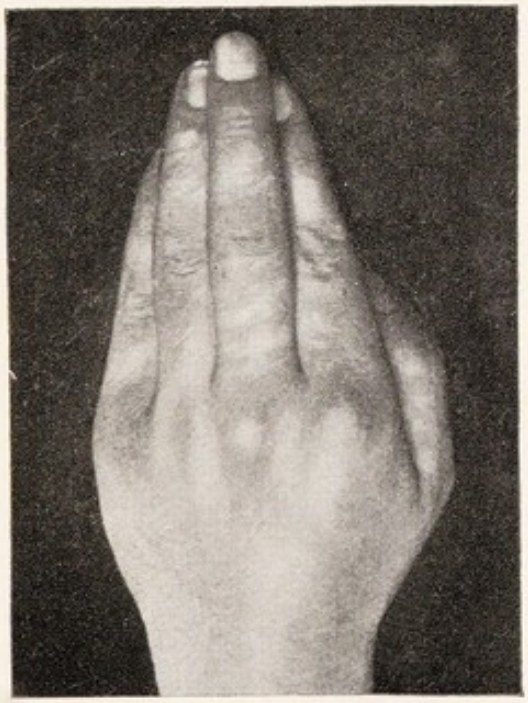
E. Contracture of the hand following a shell wound with fracture of the bones of the forearm (November 1914). The loss of power is not complete (March 1916), the patient can separate his fingers, but as soon as he makes no further effort to keep them apart, they assume slowly and progressively their original position. All the movements of the hand are easily carried out.

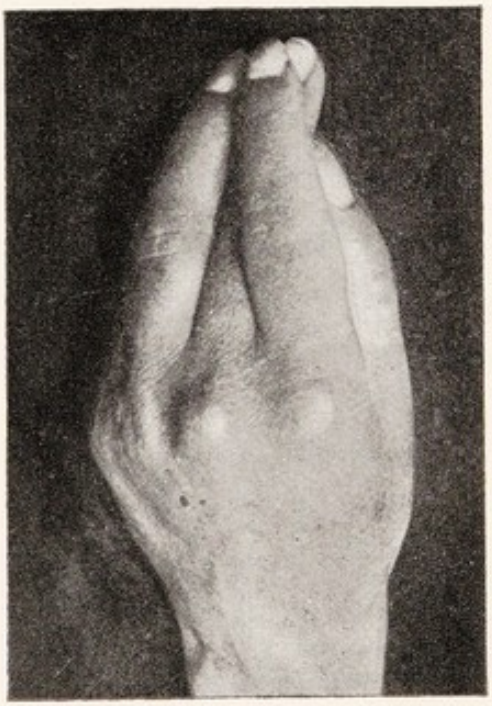
PLATE V











previously described and from contractures of the lower limb, which are usually very pronounced and rather difficult to reduce. In order to mark this distinction it may be justifiable to use the term "hypertonus," which has also been employed by Sicard, Meige, and P. Marie and Foix.

Contractures of the hand of various types.—Contracture of the hand may also give rise to other deformities, such as *hyperextension and abduction of the fingers combined with flexion of the wrist* or hand like a circumflex accent (*v.* Pl. VII, p. 166), *extension contracture of the fingers and hand*, and *clawhand with crowded fingers* (the index and ring fingers lying on the middle finger) (*v.* Pl. VI, p. 158).

Hypotonic paralyses or pareses of the hand and fingers.—Simple paresis of the hand and fingers is not rare. Complete paralysis appears to be exceptional. In such cases there is a contrast between the absolute or almost absolute loss of power in the extremity and the relative freedom of the movements of the forearm on the upper arm and of the upper arm on the shoulder. The most striking feature in this clinical type is the extreme flaccidity of the hand, which swings to and fro during walking in a lifeless manner, even when the arm remains still and is kept close to the side. In other words, hypotonus in such cases is very pronounced (*v.* Pl. III, p. 102).

The deformities caused by reflex contractures of the upper limb show a striking clinical resemblance to *tetany*, apart from the paroxysmal character of this affection.

Some of the terms recently employed emphasise this resemblance of the symptoms, acro-contracture being synonymous with "contracture of the extremities," an expression formerly used to designate tetany. In like manner, the term "accoucheur's hand" was employed by Trousseau to indicate the form presented by the hand, of which he gave such a remarkable description: "In the upper limbs the thumb is forcibly and violently adducted, the fingers

are pressed close together and semi-flexed over the thumb, the moment of flexion taking place, as a rule, only at the metacarpo-phalangeal joint; the palm then being made hollow by the approximation of its outer and inner borders, the hand assumes the shape of a cone or rather the shape given it by the accoucheur when he introduces it into the vagina." Does not this present a striking resemblance to the types of contracture which we have just studied?

The following passage relating to tetany is taken from Dejerine's work (64): "In his study of infantile tetany Escherich described extension and separation of the fingers, their arrangement like the tiles of a roof, with forced adduction as in arthritis deformans, the "scribe's hand" position, the frequent pronation of the hand with flexion to the ulnar border, the thumb inverted, and the fingers extended at the metacarpo-phalangeal joints and flexed at the distal joints. Then, if the contracture extends to the whole of the upper limb, the patient assumes an attitude resembling that of a dog on its hind legs (Escherich), the arms being kept close to the body, the forearms flexed and the hands pronated."

After reading these descriptions a glance at the annexed figures is sufficient to show that the deformities produced by reflex contractures exactly correspond to those of tetany.

Vaso-motor and Thermal Disorders

In the majority of cases vaso-motor and thermal disorders are very definite, especially in cold weather; this is a point which we would emphasise at once.[1]

The phenomena do not correspond to a well-defined nerve territory. They may occupy the whole of the

[1] This study of reflex vaso-motor and thermal disorders, including the tables on pp. 262 *et seq.*, has been chiefly taken from a recent work carried out in collaboration with J. Heitz ("Vaso-motor and Thermal Disorders in Reflex Paralyses or Contractures," Babinski, Froment and Heitz, *Annales de Médecine*, October 1916).

affected limb, but they predominate at the extremities in which they frequently persist. The affected hand or foot is cyanosed, mottled or of a uniform salmon-red tint. The slightest pressure causes a local ischæmia, and the white spot thus produced is slow in disappearing. This disturbance of the coloration of the skin is clearly shown in comparing it with that of the sound side. In the lower limb, the asymmetry in the coloration is more pronounced when the patient is standing than when he is lying down.

In addition to the change in colour, a slightly infiltrated appearance of the skin is fairly frequently met with, especially on the dorsal surface of the hand, which presents a "succulent" appearance.

Sometimes even there is a real œdema which pits on pressure, especially in the lower limb. The œdema may be localised in the dorsum of the foot, or in exceptional cases extend up to the knee. We may add that the consistency of this œdema is generally hard, and that the pitting on pressure is slight.

Hypothermia definitely perceptible to the touch and sometimes very pronounced is associated with the vasomotor disorders. The difference in temperature between the affected limb and the sound limb is as much as 8° or 8·5° C. in the most marked cases.[1] As a rule the hypothermia is most pronounced at the extremity (fingers, toes, hand or foot), and becomes progressively less from the extremity to the root of the limb. It is generally still found to be distinct at a level at which the skin has resumed its normal coloration. We may add that the hypothermia always passes appreciably beyond the level of the wound, *e. g.*, it may be perceptible at the knee and sometimes even on the thigh with a wound of the foot, or be found at the shoulder after perforation of the wrist. It may vary within certain limits from day to day, or even from one moment to another, according to the external temperature, or according as the patient has been

[1] The local and superficial temperature was taken with Mlle. Grunspan's thermo-electric pyrometer (210).

living in a warm room or not. After a short immersion in water at 100·4° F. or 104° F., the affected limb sometimes becomes as hot and even hotter than the sound limb; the white area produced by pressure of the finger on the back of the affected hand or foot instead of disappearing more slowly, fades quite as rapidly, and even more so, than on the affected side. Return to the previous temperature is usually more rapid in the sound limb.

The local temperature may also undergo further modifications due to other influences, *e.g.* exercise and electrical treatment. The rapid changes due to these causes have led some observers into error by making them suppose that certain cases had been cured, whereas there was only a temporary improvement.

As a matter of fact, when the patient is removed from the action of heat, the thermo-asymmetry usually returns quickly, and the hypothermia reappears in the affected limb, which is to a certain extent *heterothermal.*

What do we learn from examination of the vessels? Palpation sometimes shows *weakness of arterial pulsation* in the affected area. This phenomenon is particularly marked in the dorsalis pedis, the pulsation of which may not be perceptible, while it is normal on the opposite side.

The idea of an arterial lesion, such as compression or partial obliteration, may then suggest itself, but this impression is contradicted by the precise information afforded by the sphygmomanometer. Potain showed long ago that the arterial pressure could not be estimated by merely feeling the pulse.

Two methods were available for measuring the systolic pressure in our patients, viz. the oscillometric method of Marey and Pachon, and the method of Riva-Rocci and Vaquez.

We had to give up the former method. As is well known, it is based on the study of the oscillations caused by compression of the artery by an armlet distended with air.

Pachon regards as indicating the systolic pressure the point at which the oscillations, after being reduced to a minimum by strong compression, begin to increase definitely as the result of decompression.

We shall see later that in a limb affected with reflex disorders, the oscillations are almost always of reduced amplitude, and the difference between the two sides is sometimes very considerable; under these conditions it was very difficult to determine the exact moment at which the modification indicated by Pachon occurred.

The same objection did not apply to the method of Riva-Rocci and Vaquez, which is based on reappearance of the pulse below the armlet when the pressure is being gradually reduced. This was the method which we adopted in all our cases for measuring the arterial pressure, placing the armlet in the middle of the upper arm in the case of the upper limb, and immediately above the malleoli in the case of the lower limb. The systolic pressure is indicated in the former case by the return of the radial pulse, and in the latter by the return of the pulse in the dorsalis pedis or posterior tibial artery.

The figures which will be found in the tables in the Appendix (*v.* p. 262 *et seq.*) show that in the upper limb the systolic pressure is the same on the two sides, and that any difference between the two does not exceed 1 cm. Hg., as may be seen normally in some individuals. In the lower limb the investigation of the pulse in the dorsalis pedis or posterior tibial is a little more difficult; even in some normal subjects it may be difficult to feel on the two sides. When the calibre of the artery is narrowed, as frequently occurs in reflex paralysis, it is sometimes impossible to feel the return of the pulsations in the affected limb and consequently to measure the systolic pressure. After immersion in hot water, the arterial pulsations become much more definite, and the pressure in symmetrical arteries is then found to be equal (Babinski and Heitz).

The diastolic pressure was measured with Pachon's

oscillometer by reading the number corresponding to the last greatest oscillations in the course of decompression. It is not modified in reflex paralyses.[1]

We endeavoured to determine the *amplitude of the greatest oscillations* in our patients in the arm (brachial artery), thigh (femoral artery), wrist and instep. (A comparison of the figures indicated by the pointer of the manometer and that of the oscillometer shows that the greatest oscillations correspond to a pressure of 1 to 2 centimetres higher than the diastolic pressure.)

The greatest oscillations represent the greatest expansion possible in the case of a large artery, and the greatest expansion of the combined arterial trunks and branches, when the cuff is placed near the extremity. To measure them we noted the highest and lowest figures reached by the oscillation of the pointer on the scale of Pachon's apparatus, *e. g.*, 3° and 12°. Then we subtracted 3 from 12 = 9, which we multiplied by two (on account of the secondary line which divides each of these degrees on the scale of the oscillometer), which gives a total of 18 divisions covered by the pointer as the result of arterial pressure.

We may note, first of all, that individuals who have no lesions of the limbs or any paralysis do not show any important difference between one side and the other in the amplitude of their oscillations (Heitz). There may, however, be some asymmetry. But it is not very marked, and is generally more pronounced at the root of the limb than at the extremity. At least, this is the result of the observations which we have made hitherto and are still pursuing.

[1] Our method of procedure was as follows: Recklinghausen's cuff, adopted by Vaquez, measuring 12 cm. in width, was the only one used, and was attached to Pachon's oscillometer. The systolic pressure was taken, both in the upper and lower limb, by Riva-Rocci's method, and then without removing the cuff the diastolic pressure was taken in the same artery. We also took the maximum amplitudes of the oscillations, and with the same cuff took the same measurements of other arteries (femoral and radial), whenever it seemed necessary.

The following are some figures taken from *normal subjects*. In the brachial and femoral — 14° : 14°; 16° : 14°; 26° : 23°; 26° : 26°; 18° : 17°; 20° : 16°. In the radial and tibials in the same individuals—5° : 4°; 4° : 3°; 8° : 10°; 8° : 12°; 5° : 5°; 8° : 6°.

In wounded patients suffering from *reflex nervous disorders* the difference between the pressures on the two sides is much more pronounced, at least at the extremity of the limb. Thus in the brachial and femoral we found—7° (affected side) : 14° (sound side); 11° : 14°; 12° : 14°; 14° : 16°; 14° : 17°; 16° : 18°; 10° : 18°; 18° : 20°; 18° : 21°; 14° : 20°; 20° : 22°; 14° : 26°. In the radial and tibials we found—0·5° (affected side) : 6° (sound side); 1° : 5°; 1° : 7°; 1° : 8°; 1° : 12°; 2° : 6°; 2° : 9°; 2·5° : 10°; 4° : 8°; 6° : 12°; 7° : 14°. We have purposely chosen instances in which the symptoms were most marked.

The oscillations observed in the affected limb are frequently in the proportion of 1 to 2 or 1 to 4 in relation to those of the sound limb; in exceptional cases they may be in the proportion of 1 to 8 or even 1 to 12.

As a rule, then, there is a diminution of amplitude in the oscillations on the affected side, and this diminution is often considerable. But, if it occasionally happens that the difference does not exceed that which may be observed normally, it is always on the affected side that the lowest figure is found, and the difference is always greater towards the extremity of the limb.

This was just what we saw in the case of hypothermia, and it can readily be ascertained that the reduction in the oscillations goes hand in hand with the chilling of the skin; it is, therefore, like the latter, much more pronounced during the winter months. It was at this period of the year that we found the radial or tibial oscillations on the affected side sink to 0·5° or 1°, whereas on the sound side we found 4°, 6° and even 8°; it is at this time also that the reduction may become very appreciable even in the brachial or femoral.

On a hot day, on the contrary, it will often be possible not to meet with any local hypothermia, and to find that the oscillations have the same amplitude on the two sides.

For the purpose of studying the disturbance of the peripheral circulation in the fingers and toes we had recourse to Gaertner's tonometer, which was formerly employed for measuring the blood-pressure, but soon fell out of use when it was found that it measured the arterio-capillary tension only, which is too liable to undergo variations from different causes.

The following technique is employed in these investigations : a distensible rubber ring, 1 to 2 cm. wide, of which the internal pressure can be measured by a manometer, is applied to the finger. The last joint is rendered bloodless by tying a rubber band round it, the ring is distended to its maximum, and then the compression is gradually diminished until the blood returns to the finger, as is shown by the change in the colour of the tissues, which become pink again.

As a rule, the figure obtained by this process is either equal to that of the systolic pressure (Riva-Rocci-Vaquez method), or more frequently lower by a few centimetres; it is calculated that it roughly corresponds to the systolic pressure in the collateral arteries of the fingers (L. Gallavardin) (207).

The results which we obtained by this process agree with those which we derived from an examination of the oscillations; the figure obtained by Gaertner's apparatus is constantly lower in the fingers and toes on the affected side, it even seems that the fall of the arterio-capillary tension is more pronounced than the reduction of the oscillations at the wrist or malleoli. We found, in fact, the following figures—0 (affected side) : 3 (sound side); 0 : 9; 4 : 7; 5 : 10; 6 : 12; 9 : 15.

During the cold weather we fairly often observed that the blood failed to return, even when the pointer of the tonometer was at 0; a fact which indicated an extremely intense vaso-constriction. We may add

that the degree of the fall varied from one case to another, and even from one day to another in the same individual, under the influence of variations of temperature or any other cause which might act on the circulation of small vessels.

The vascular troubles observed in reflex paresis and contractures, increase, as we have said, under the influence of cold, and decrease and even disappear after immersion in hot water. The amplitude of the oscillations increases considerably in the affected limb as the result of heat; it tends to be equal to the amplitude of the oscillations on the sound side, and exceptionally it actually exceeds them. In this connection, it is important to state that a local cold bath, at least one of short duration, as in the test which we use with our patients, does not normally cause considerable modifications in the amplitude of the oscillations (*v.* Appendix, p. 284).

All these phenomena, which we have studied in some detail, indicate *a profound disturbance of the vaso-motor and thermal mechanism.*

We may note incidentally that *examination of the blood* taken from the finger on the affected side and compared with that of the finger on the sound side showed that it was *a little less rich in red cells* (20,000 to 50,000 red cells less per cubic millimetre in the most marked cases) and *hæmoglobin* (colorimetric method), and that the hæmoglobin was *less reduced* (spectroscopic method). These differences may diminish after warming. But our investigations as to this last point have not been sufficiently numerous to justify any conclusions.

CHAPTER III

SYMPTOMATOLOGY (*continued*)

Mechanical Hyperexcitability of the Muscles. Slowness of the Muscular Contraction

Mechanical hyperexcitability of the muscles is in our opinion a very important sign, and was one of the first to strike us in the course of our investigations. It is best marked in the paralytic or paretic forms, but it is also found in the hypertonic varieties. The phenomenon is most commonly seen and is most definite in the small muscles of the extremities, but it is also found in the muscles of the leg and forearm and in the quadriceps. Even a slight percussion of the muscles causes a movement of great amplitude, which is often slow and sustained.

This mechanical hyperexcitability enables us to act upon each individual muscle separately with as much precision as with an electrical stimulus, and to obtain in a state of purity, so to speak, the movement corresponding to each. This percussion of various points of the thenar eminence may not unfrequently cause successive contraction of the abductor pollicis (extension of the first phalanx of the thumb and its opposition to the index), flexor brevis pollicis (opposition to the little finger), and adductor pollicis (flexion and adduction of the first phalanx of the thumb). Percussion of the hypothenar eminence produces a movement of abduction of the little finger with flexion of the first phalanx, extension of the last two, and a tendency to opposition to the thumb. Abduction of the index frequently associated with adduction of the thumb, like a crab's claw, is obtained by percussion of

the first interosseous space. Gentle percussion with a small reflex hammer, or merely with the handle of an ordinary hammer, can thus enable one to obtain the whole scale of movement, just as if one were testing successively the keys of a piano. When the phenomenon is well marked, it is very characteristic. As a rule, in the normal condition, it is possible to obtain only a faint rapid movement of feeble amplitude. It should also be noted that owing to individual differences mechanical hyperexcitability has most value when it is unilateral.

The contraction so obtained must be distinguished from a reflex movement; it occurs when the body of the muscle is struck, and does not take place when percussion is made on the tendons or bony surfaces. The expression "muscular reflex" is ambiguous, as there is no justification for supposing the existence of a reflex arc. There is every reason, on the contrary, for regarding this phenomenon as related to idio-muscular contraction; in cases in which it is ill developed mechanical hyperexcitability is shown by a sort of vermicular contraction without change of position in the corresponding segment.

The comparative study of the mechanical hyperexcitability of the muscles of the foot and exaggeration of the osso-tendinous reflexes, such as is often observed in organic hemiplegia or spinal paraplegia, enables one to distinguish between these two phenomena.

In the case of exaggeration of the tendon reflexes, on whatever part of the foot the percussion is made, whether the dorsum, plantar aspect, inner border, muscular surface, or, best of all, the bony surface, the movement of the toes is appreciably the same; the first phalanx is flexed, the rest are extended, and a slight movement of abduction occurs.

In mechanical hyperexcitability of the muscles, on the contrary, movement of the toes only takes place if the percussion is made on the muscles; it varies according to the nature of the muscle affected, which responds to the mechanical stimulus by a contraction

of the same form if not of the same intensity as that which would result from an electrical stimulation of the same point. Percussion of the postero-external part of the foot (extensor brevis digitorum) causes mere extension of the toes; of the anterior part of the metatarsus (interossei), flexion of the first phalanx combined with extension of the other phalanges and abduction of the toes; percussion of the internal border of the foot (adductor hallucis) causes adduction of the great toe, of the external border (abductor minimi digiti), abduction of the little toe, and of the sole near the arch of the foot (flexor brevis digitorum), flexion of all the phalanges. Percussion of the bony surfaces, such as the heel or the toes, is not followed by any movement.

Mechanical hyperexcitability of muscles is closely connected with hypothermia. When ill marked or doubtful, immersion of two symmetrical limbs for a few minutes in very cold water is often sufficient to make it obvious. The excitability in that case is often very considerably increased on the affected side in the muscles of the extremity, whereas on the sound side it is not appreciably modified as a rule; sometimes, however, we thought that in such patients the chilling of the sound limb increased the mechanical excitability more than in normal individuals, but the difference between the two sides was always very appreciable. The cold water test, therefore, can be used for diagnosis.

We may note in passing that the modifications of the muscular contractility produced by chilling are in every way comparable to those seen in the frog which has been plunged into iced water. The process in that case is doubtless more violent, and the chilling much more intense, but the result is similar. Slight percussion of the gastrocnemius which normally does not cause a definite contraction produces a slow, sustained and very ample extension of the frog's foot, a movement which disappears rapidly after immersion in warm water. This mechanical hyperexcitability often corresponds to a pronounced but transitory paretic state.

In wounded men suffering from reflex nervous disorders, after immersion of the affected limb in hot water, or after diathermy, the muscular contraction caused by percussion changes in character. It ceases to be prolonged, and becomes rapid and ill sustained. It may also show a considerable diminution; the asymmetry may even become hardly appreciable after the application of heat. It should be noted, however, that this diminution of muscular contractility is produced by a moderate rise of temperature only. Excessive heat may produce an exaggeration of the excitability of the muscles, which then respond to mechanical stimuli by extensive but very rapid contractions.

Some writers have held that in wounds of the limbs the slowness of the contraction indicated the existence of a nerve lesion, and that it was equivalent to the reaction of degeneration.

" Practitioners," wrote Pitres (206) in a recent report, " who have not at hand the electrical apparatus which is only to be found in a specialist's consulting-room or an electrical laboratory, can replace to a certain extent electrical diagnosis by mechanical diagnosis. As long as the contraction on percussion is rapid, they may be certain that the muscle is but little affected; when it becomes slow they may be sure that there is R.D."

We do not share this opinion. When there is a profound disturbance of the vaso-motor and thermal mechanism, and when the external temperature is low, the contraction in such cases is often remarkably slow; in fact, it is as slow as in many cases of definite reaction of degeneration. In order to establish a closer and more scientific parallel between these two classes of cases, we had recourse to the graphic method with the valuable collaboration of our colleague Dr. Hallion. The following is an account of our investigations (153).

Slowness of the Muscular Contraction obtained by Percussion in Reflex Contractures and Paralyses. Study by the Graphic Method

Technique.—The patient's forearm and hand are bandaged to a wooden splint, padded with wool, leaving free and uncovered either the thenar eminence and thumb or the hypothenar eminence and little finger, according to the case. The patient is seated, with the forearm resting on a table; a cushion forming an inclined plane is arranged so as to keep the hand elevated.

The movement to be studied is taken up by a Marey's collecting tambour and transmitted by a rubber tube to a recording tambour, which registers it on a revolving cylinder.

In a first series of experiments we made the cylinder revolve at top speed. But we found on examining the tracings that the prolonged contractions lasted too long to be recorded completely in one revolution of the cylinder. So to obtain a complete record of those contractions which terminated very gradually we decided to make a fresh series of examinations in three of our cases, in which we reduced the rate of the cylinder and gave the recording lever a greater length, so as to make the descending part of the curve more prominent, with the result that the tracings were reduced in breadth but increased in height. Lastly, we fastened the splint holding the limb to the table instead of merely using the hand to steady it.

The collecting tambour was provided with a system of joints, so as to follow the movements of the finger explored. The latter was connected with the lever of the drum by means of a rubber ring.

When everything was ready, one of us made sure of the immobility of the limb to be explored with one hand and with the other performed percussion according to the ordinary clinical method.

Each tracing was accompanied by a time-marking record.

We made several series of tests in succession on the same subject, varying the experimental conditions, and on several occasions made a comparative examination of the sound side and affected side under identical conditions.

In each case we examined the limb first at the atmospheric temperature, and then after treatment with hot or cold water. The application of cold was particularly necessary under the circumstances. It should be noted that all the tracings were taken between May 26 and June 27. The temperature of the atmosphere at the time of the experiments was between 62·6° and 63·4° F. This detail may appear to be of secondary importance, but it cannot be neglected in an interpretation of the tracings relating to patients with reflex paralysis. Mechanical hyperexcitability and slowness of the contraction caused by percussion are particularly well marked in such cases when the external temperature is very low. These phenomena were very pronounced in two patients of this class during the winter, but became considerably less marked as the external temperature rose. It should also be noted that these patients had been undergoing treatment by diathermy. The experiments were carried out at the Collège de France in the laboratory of Prof. François-Frank, who kindly lent us the necessary apparatus.

Reading of the tracings.—The time-marking record appears on each tracing. Some of our figures show the beats of a metronome beating 200 a minute. In others, each of the main subdivisions of time marked by projections on a horizontal line represents $\frac{2}{10}$ sec. The time is measured from the percussion of the muscle, which very closely precedes the contraction. The tenths of a second which correspond approximately to the end of the contraction are accompanied by a figure; thus the number 0·3 indicates $\frac{3}{10}$ sec. from the beginning of the contraction.

In several figures the letters *a*, *b*, and *c* represent : *a* the beginning of the curve, *b* the point it which the descent becomes very feeble, and *c* the point at which the descent is definitely completed.

Interpretations of the tracings.—Our sole purpose has been

to determine the differences in the duration of the movement produced by the muscular contraction which was caused by percussion.

In the tracings the precise movement of percussion is clearly indicated; the tracing, which had hitherto been horizontal, becomes suddenly curved, and thus reveals the disturbance passively conveyed by the blow; a depression of the recording instrument is observed, sometimes preceded by a slight rise. Then after $\frac{3}{100}$ sec. the lever rises again to indicate the muscular contraction which has occurred.

We will not consider here the amplitude of the curve of contraction. It depends, it is true, on the amplitude of the movement caused by the muscular contraction, and, from this point of view, its comparative study might be of interest; but to justify any formal conclusions the intensity of the percussion would have to be measured. One would also have to be certain that no extraneous movement such as a slight displacement of the limb under examination had influenced in any way the height of the curve.

Lastly, our method of examination may possibly have modified to some extent the form of the movements. The finger, in fact, was connected with the lever of an exploring tambour. When the lever was disturbed from its position of equilibrium, it exercised on the finger an elastic traction, which in the first place limited the extent of movement during the stages of contraction, and secondly tended to restore the finger more rapidly to its state of rest during the stage of relaxation. The obvious result of this is that the total duration of the movement, as shown in our tracings, is perhaps slightly inferior to the normal. The cinematograph method alone could remedy any objection of this kind.

The end of the movement produced is marked by the return of the finger to its original position. The tracing should then resume the level which it had at first; if this did not always take place, the reason was that the fixation of the limb was not perfect enough to enable it to keep exactly its initial position.

The sign which definitely marked the end of the move-

ment produced was the return of the tracing to the horizontal. As this return was gradual, the precise moment at which it occurred could not be fixed with absolutely mathematical exactness, especially under experimental conditions such as ours. But the variations in the duration, which were inherent in the influences which we were proposing to study, proved to be so considerable that any possible error in estimation became practically negligible.

Conclusions.—We examined the reaction of muscles in three different states and under variable conditions of the external temperature. Our results were as follows— :

1. In the *normal muscle* the motor reaction varied, but was always very weak, so that the curves obtained were too ill-developed for purposes of examination; thermal influences, at least to the extent employed by us, did not cause any considerable change. Even if the curve tends to become slightly elongated as the result of the application of cold, the diminution of amplitude accompanying this change makes it almost always difficult to estimate.

2. In cases of *reflex paresis and contracture* the muscles exposed to the temperature of the atmosphere responded by a prolonged contraction; this phenomenon diminished after heat had been applied, but considerably increased after a previous chilling of the hand examined.[1]

[1] In this connection we will remind the reader that the influence of cold on the form and duration of the muscular contraction caused by electrical stimulation has been established for a very long time. An account of this question will be found in the very interesting article of Maurice Mendelssohn (229) on the study of electrical diagnosis. Grund has shown that the essential characters of the partial reaction of degeneration (slowness of the contraction and predominance of the anode over the cathode) can be produced *normally* by cold and then be caused to disappear by heat.

With this we may compare the slowness of the contraction caused by mechanical stimulation, observed by us in *patients suffering from reflex paresis or contracture.* But it should be mentioned that in the patients in question *the artificial application of cold is only a means of making evident the abnormal state of the muscular contractility in ill-developed cases.* A slight chilling of short duration without any apparent action on the muscles of the sound side is enough to render evident the mechanical hyperexcitability of the

3. In muscles presenting the *reaction of degeneration*, at the temperature of the atmosphere, the contraction has been as long as in the previous cases, and after the action of heat the slowness became less marked. But after the application of cold, the amplitude of the contraction became too weak for it to be analysed.

4. One last word in conclusion. The term " atmospheric temperature " obviously lacks precision. In our experiments we had a moderate summer temperature. A low external temperature would clearly supply our artificial conditions for chilling.

After this description of the circumstances connected with our experiments we will reproduce some of the curves, and give a short account of them.

FIRST SERIES OF EXPERIMENTS

(*Tracings I–V*)

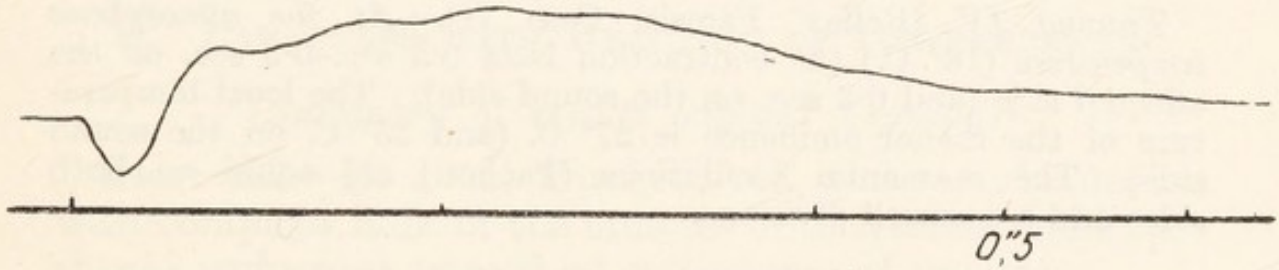
Records of the movements of the thumb and little finger caused by percussion of the thenar and hypothenar eminences, at the atmospheric temperature, after application of heat or cold. The tracings of the contractures of the thumb muscles only are shown, those of the little finger being exactly alike.

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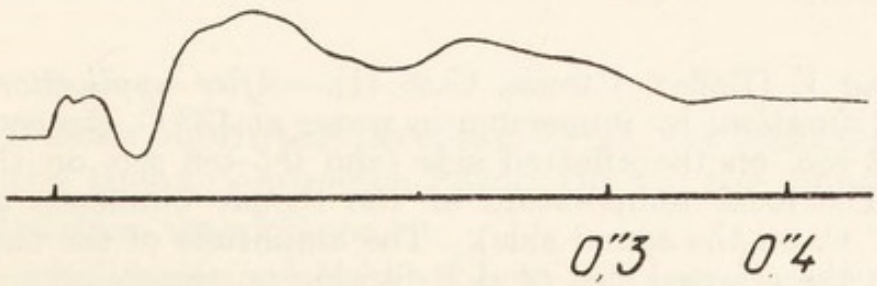
muscles and to make the muscular contraction on the affected side considerably slower. Besides, in definite cases of reflex nervous disorders, mechanical hyperexcitability is usually present. As regards the slowness of the muscular contraction, it appears spontaneously in the affected limb in winter, and sometimes even in hot weather, when the two sides are under identical conditions and without it being necessary to have recourse to the artificial application of cold. Mechanical hyperexcitability of muscle and slowness of the contraction are therefore associated, to a considerable extent at least, with the natural hypothermia which appears to result from reflex vaso-constriction following the lesion. We are dealing therefore not with a physiological but with a pathological reaction.

A. Reflex Contractures and Pareses

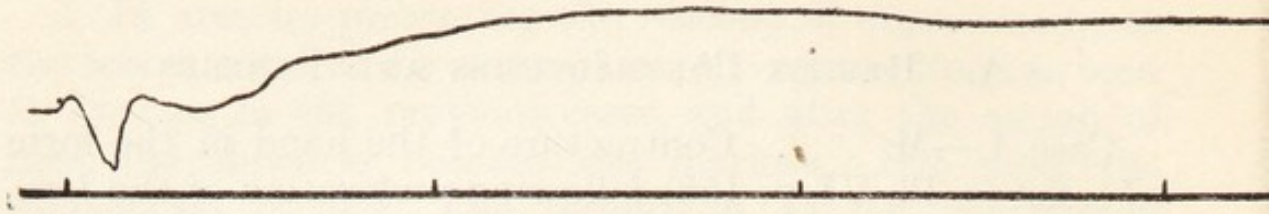
Case I.—M. . . . Contracture of the hand in the form of a fist (*v.* Pl. VI, p. 158) following perforation of the forearm (December 1914) with disturbance of electrical reactions. Intense hypothermia and vaso-motor disorders with considerable diminution of the amplitude of the oscillations (*v.* Table I, Case II, p. 262). The mechanical hyperexcitability of the muscles of the hand is always present, but the slowness of the contraction is most evident when the external temperature is cold. At the time of the experiment (June 1916) the contraction on the affected side lasted 0·6 sec. at the temperature of the atmosphere (18° C.), 0·4 sec. after application of heat, and 1·4 sec. after application of cold (Tracings I, II, and III).



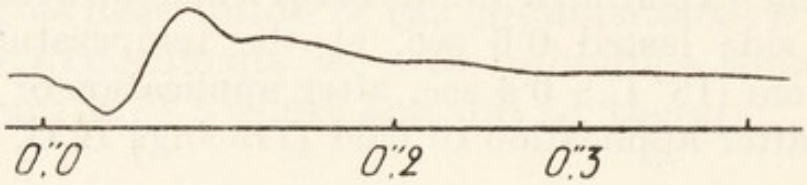
Tracing I (Reflex Contracture, Case I).—*At the atmospheric temperature* (18° C.) the contraction lasts from 0·5 sec.–0·6 sec. on the affected side (and 0·4 sec. on the sound side). The local temperature of the thenar eminence is 15° C. (and 23° C. on the sound side). The maximum oscillations (Pachon) measure 0·25–0·50 division (and 3 divisions on the normal side).



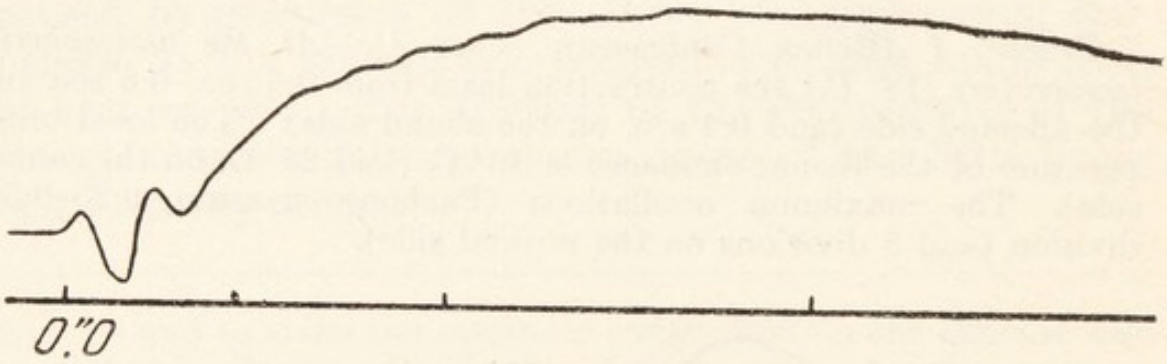
Tracing II (Reflex Contracture, Case I).—*After application of heat* (*of short duration*) by immersion of the two hands in water at 44° C. the contraction lasts from 0·3 sec.–0·4 sec. on the affected side (and 0·3 sec. on the sound side). The local temperature of the thenar eminence is 28° C. (and 27° C. on the sound side).



Tracing III (Reflex Contracture, Case I).—*After application of cold* (*of short duration*) by immersion in water at 12° C. the contraction lasts 1·4 sec. (it is difficult to measure the exact duration of the contraction on the sound side, in which the amplitude diminishes considerably under the action of cold; it appears to last from 0·2–0·3 sec. only. The local temperature of the thenar eminence in the wounded limb is 12° C. (and 14° C. in the normal limb).

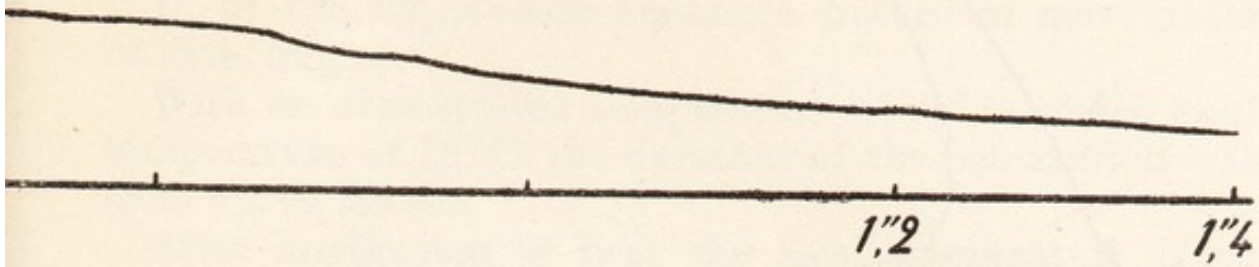


Tracing IV (Reflex Paresis, Case II).—*At the atmospheric temperature* (18° C.) the contraction lasts 0·2 sec.–0·3 sec. on the affected side (and 0·2 sec. on the sound side). The local temperature of the thenar eminence is 27° C. (and 25° C. on the sound side). The maximum oscillations (Pachon) are equal on both sides and measure 3 divisions.



Tracing V (Reflex Paresis, Case II).—*After application of cold* (*of short duration*) by immersion in water at 13° C. the contraction lasts 1·2 sec. on the affected side (and 0·5–0·6 sec. on the sound side). The local temperature of the thenar eminence is 14° C. (and 15° C. on the sound side). The amplitude of the oscillations is *nil* on the affected side (and 1 division on the sound side).

Case II.—T. . . . Paresis of the hand and fingers following a wound of the posterior surface of the forearm without obvious disturbance of the electrical reactions. Local

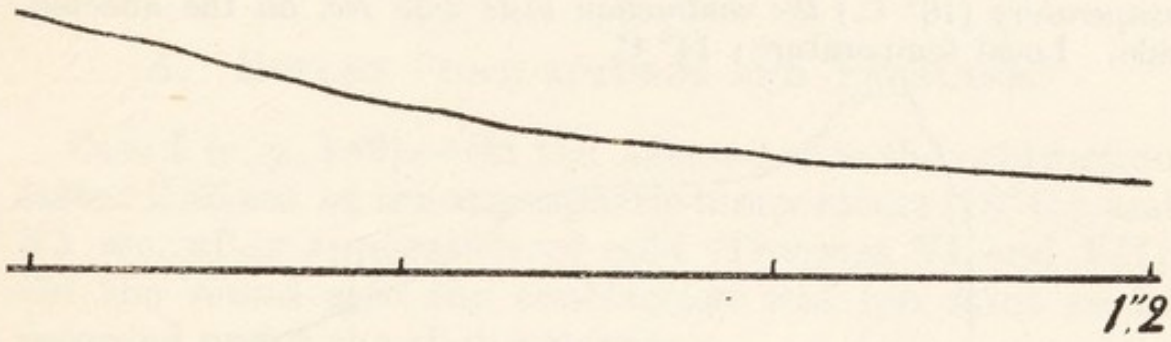


hypothermia and marked and obvious vaso-motor phenomena. Mechanical hyperexcitability of the muscles of the hand and slowness of the contraction very marked during the winter season. At the time of the experiment (June 1916) the contraction of the affected side lasted 0·2 sec.–0·3 sec. at the temperature of the atmosphere (18° C.), and 1·2 sec. after a short application of cold (Tracings IV and V).

B. Paralyses with Reaction of Degeneration

(*Summary of results without Tracings*)

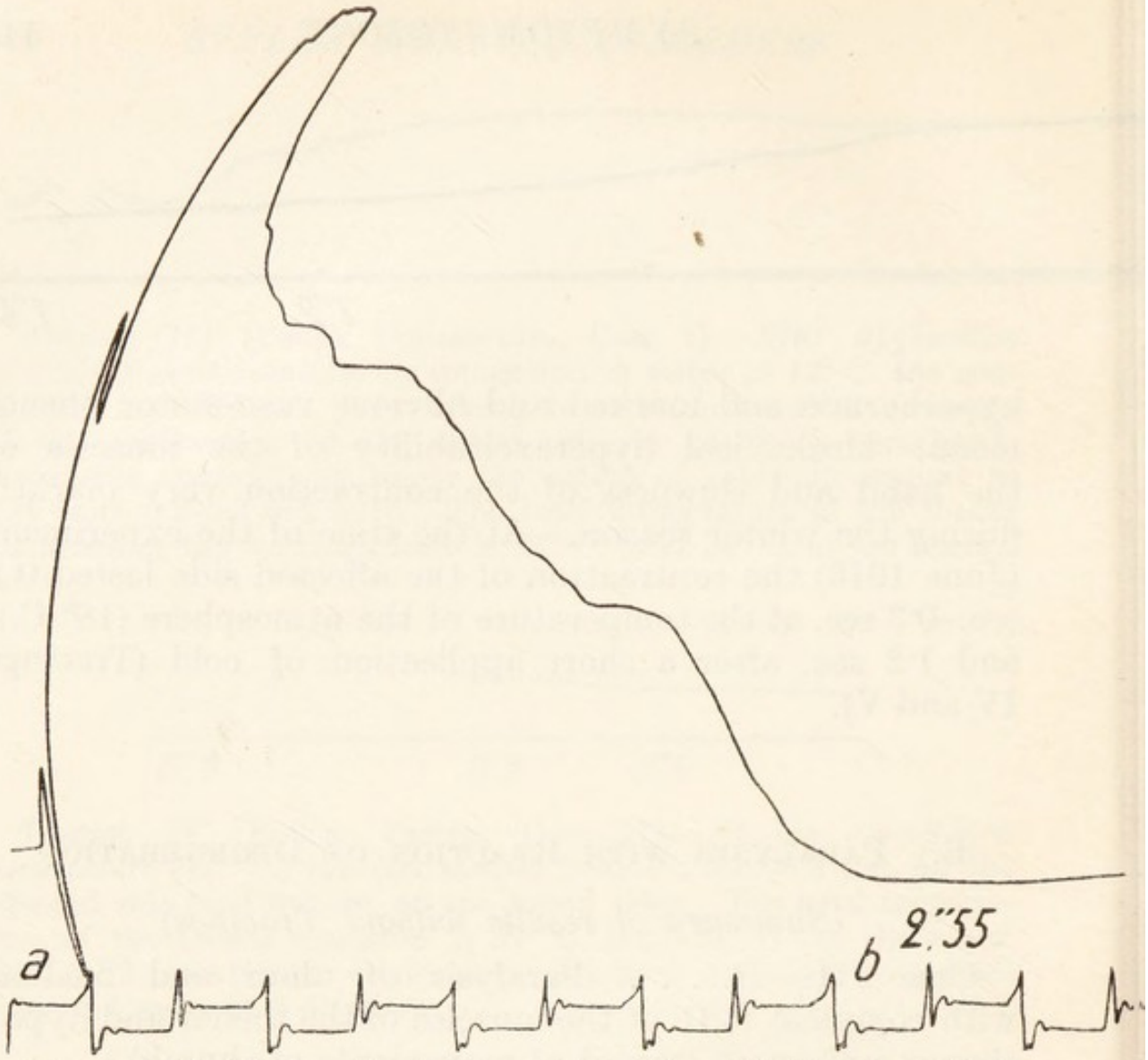
Case III.—D. . . . Paralysis of ulnar and median with complete R.D. of the muscles of the thenar and hypothenar eminences (record of movements of thumb).



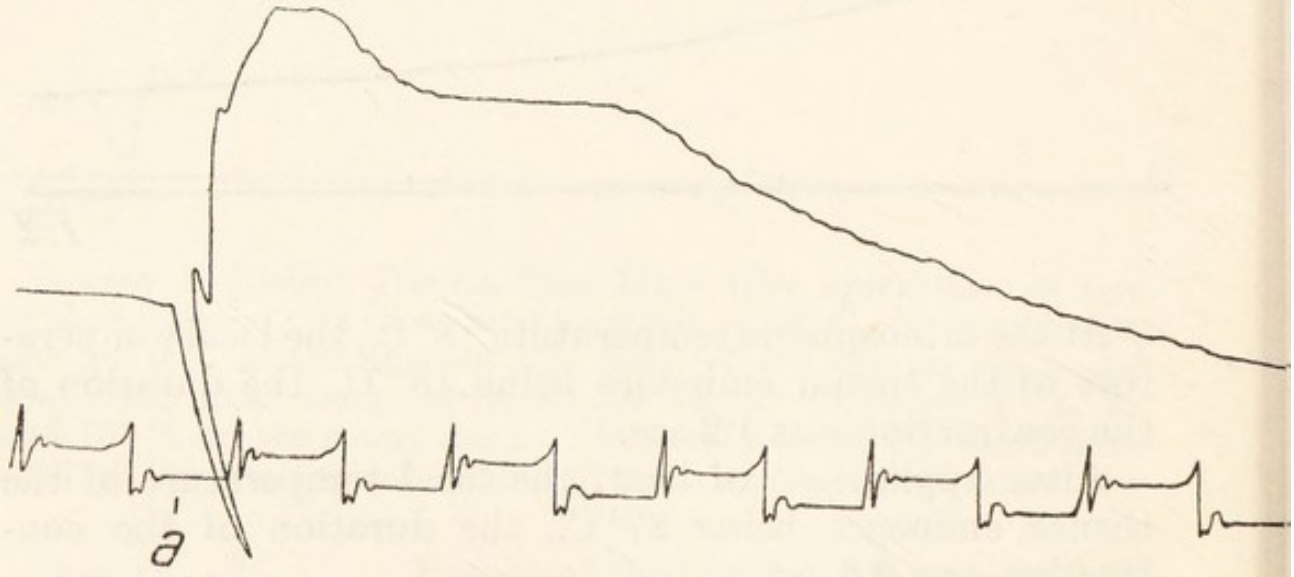
At the atmospheric temperature 18° C., the local temperature of the thenar eminence being 18° C., the duration of the contraction was 1·2 sec.

After application of heat, the local temperature of the thenar eminence being 27° C., the duration of the contraction was 0·6 sec.

Case IV.—B. . . . Paralysis of ulnar nerve with marked



Tracing VI (Reflex Contracture, Case I).—*At the atmospheric temperature* (18° C.) *the contraction lasts* 2·55 *sec.* on the affected side. Local temperature: 14° C.



Tracing VII (Reflex Contracture, Case I).—*After application of cold* (*of short duration*) by immersion in water at 12° C. the contraction lasts 5·1 sec. on the affected side. Local temperature: 9° C.

R.D. of the hypothenar eminence (record of movements of little finger).

With an atmospheric temperature of 18° C. and a local temperature of 18° C. the duration of the contraction was from 1·2 to 1·3 sec.

After application of heat the local temperature being 27° C., the duration of the contraction was from 0·6 to 0·8 sec.

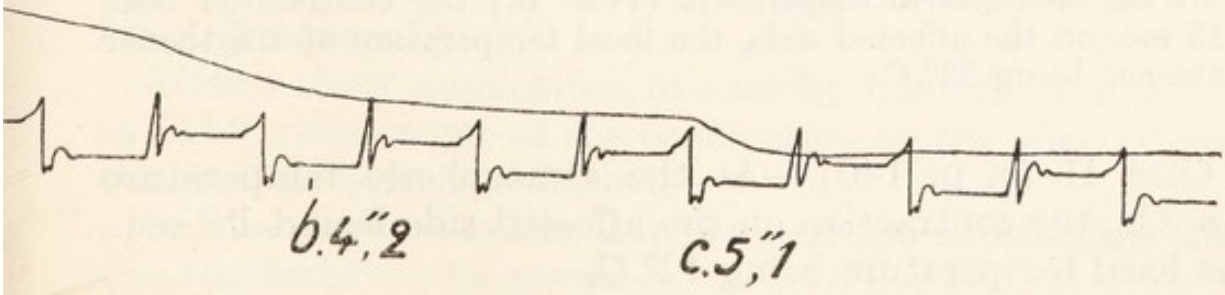
SECOND SERIES OF EXPERIMENTS

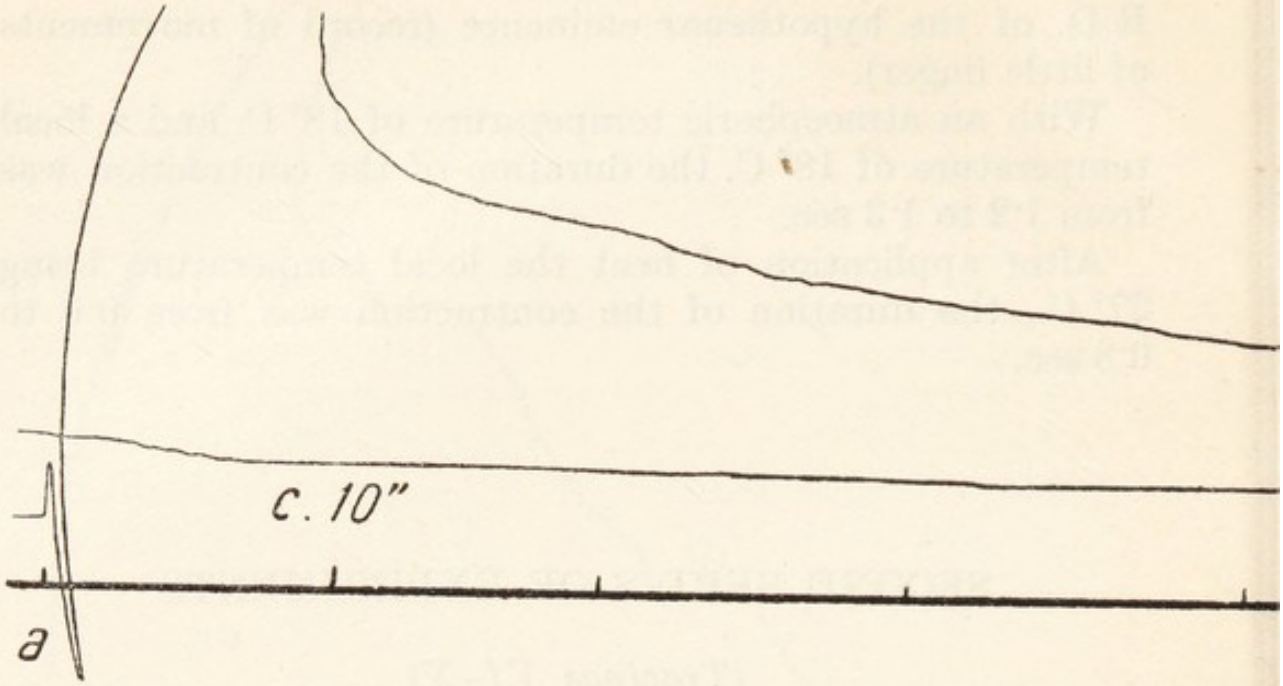
(*Tracings VI–X*)

The speed of the cylinder was reduced and the length of the recording lever increased to make the descending phases of the curve more pronounced and to facilitate a more accurate measurement of the duration of the prolonged contractions. (The terminal part of the curve which ended very gradually was not shown in the tracings of the first series of experiments.)

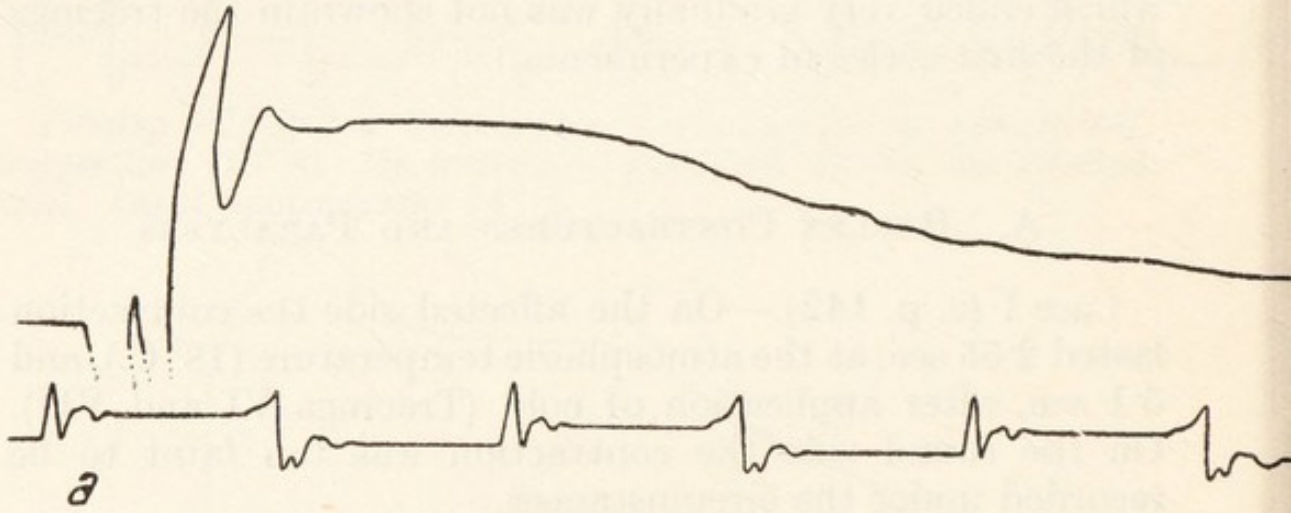
A. Reflex Contractures and Paralyses

Case I (*v.* p. 142).—On the affected side the contraction lasted 2·55 sec. at the atmospheric temperature (18° C.), and 5·1 sec. after application of cold (Tracings VI and VII). On the sound side the contraction was too faint to be recorded under the circumstances.





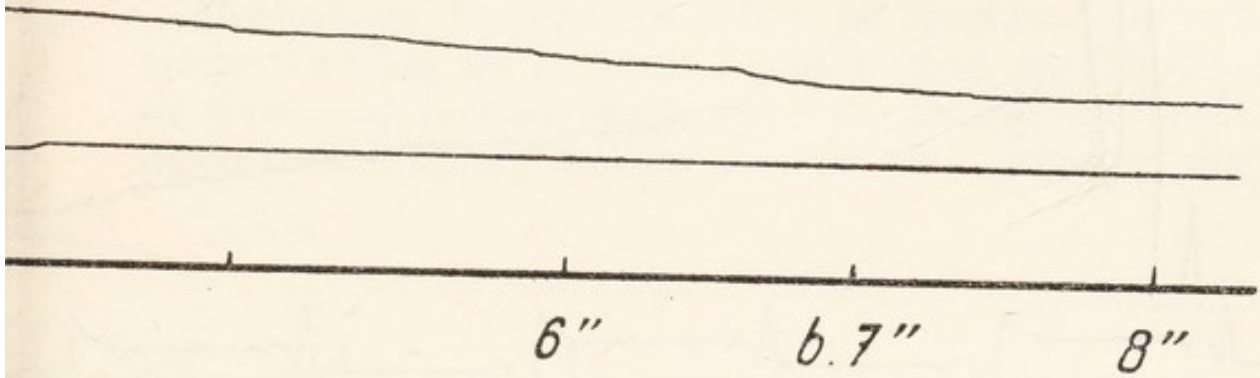
Tracing VIII (Reflex Paresis, Case II).—*After application of cold* (*of short duration*) to the two hands in water at 12° C. the contraction on the affected side lasts 10 sec., the temperature of the thenar eminence being 12° C. On the sound side the contraction after application of cold is of too weak amplitude to be recorded.



Tracing IX (Paralysis with Reaction of Degeneration, Case III). —*At the atmospheric temperature* (17·5° C.) the contraction lasts 3·15 sec. on the affected side, the local temperature of the thenar eminence being 23° C.

Case II (*v.* p. 140).—At the atmospheric temperature (18° C.), the contraction on the affected side lasted 1·8 sec., the local temperature being 12° C.

After application of cold (Tracing VIII) the contraction lasted 10 sec. Note that this tracing is on a different scale from the others. Each of its divisions corresponds to 1 sec., whereas in the other tracings of the same series of experiments it corresponds to 0·3 sec., and in the tracings of the first series to 0·2 sec.

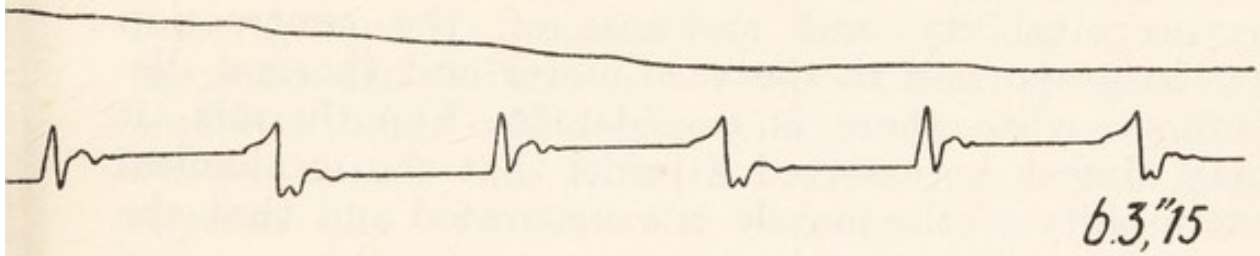


B. Paralyses with Reaction of Degeneration

(Tracings IX and X)

Case III.—B. . . . Paralysis of ulnar nerve with marked R.D. of hypothenar eminence (record of movements of little finger).

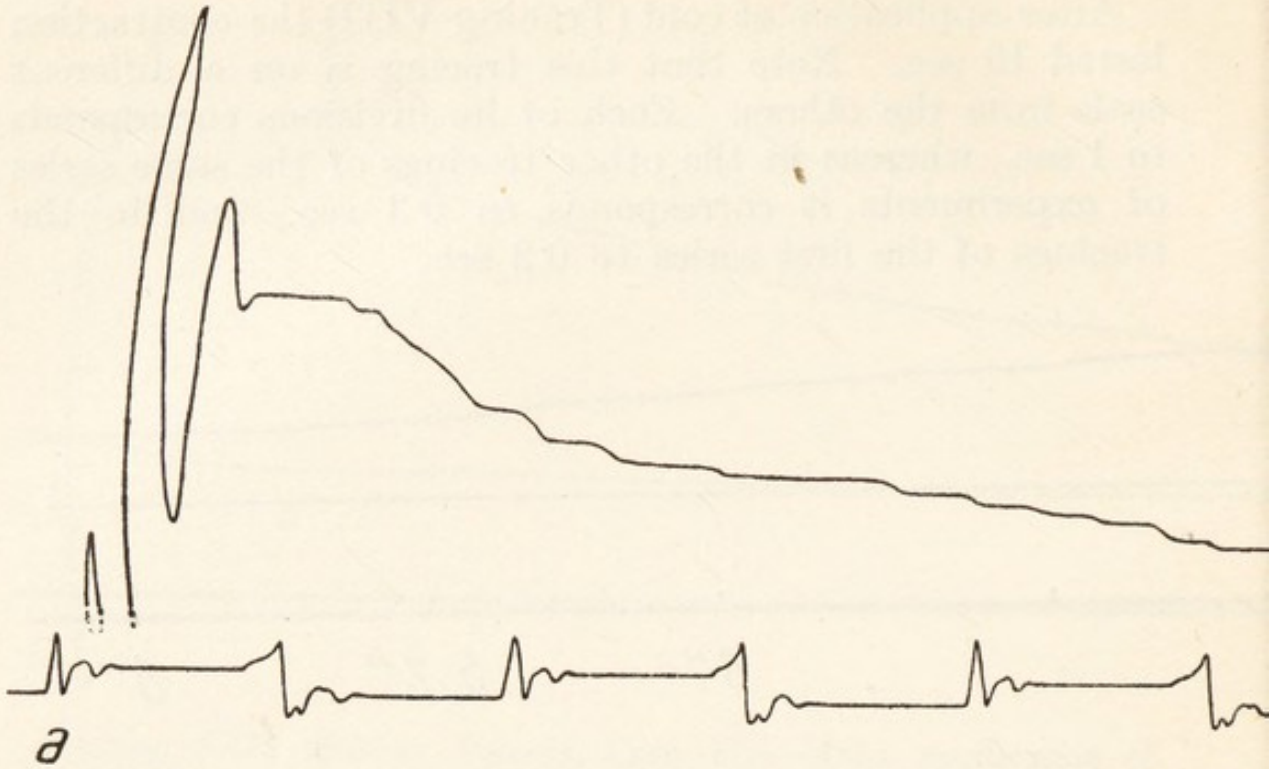
At the atmospheric temperature the contraction on the affected side lasted 3·15 sec. (Tracing IX).



After application of heat the contraction lasted 2·4–3 sec. (Tracing X).

After a short application of cold by immersion in water at 12° C., the extent of the contraction on the affected side was too feeble to be recorded.

On the sound side the amplitude of the contraction was also too feeble to be recorded.



Tracing X (Paralysis with Reaction of Degeneration, Case III). —*After application of heat* by immersion of the two hands in water at 44° C., the contraction lasts 2·4 sec. on the affected side.

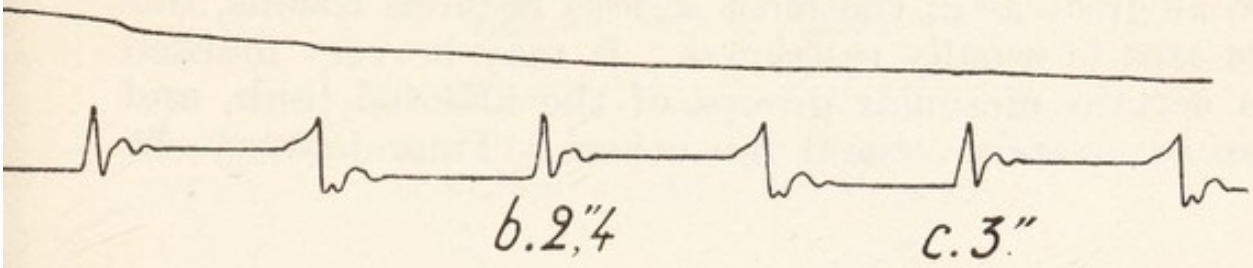
The graphic method, therefore, confirms the result of numerous clinical investigations; it shows that the slowness of the muscular contraction caused by percussion may be as marked in reflex contractures and pareses as in many cases of paralysis with reaction of degeneration. The intensity of the muscular hyperexcitability and slowness of the contraction are in proportion to the vaso-motor and thermal disorders; when there is considerable hypothermia, it may almost be asserted a priori that the mechanical excitability of the muscle is exaggerated and that the muscular contraction is slow.

But what relation is there between vaso-motor and thermal disorders, on the one hand, and disturbances of voluntary movement on the other? There is undoubtedly a connection between the two classes of phenomena; characteristic vaso-motor disorders do not necessarily involve, it is true, a profound disturbance of the motor functions, but they are accompanied by some impairment of energy. We will add

that some reflex motor disorders are not accompanied by any vaso-motor or thermal disorders.

Electrical and Mechanical Excitability of Nerves

Mechanical hyperexcitability of muscles has often corresponding to it some quantitative modifications in electrical contractility, such as *faradic and voltaic hyperexcitability of muscles*, or, on the contrary, slight



hypoexcitability and sometimes *premature fusion of contractions. There is never any reaction of degeneration.*

The following is a description of premature fusion of contractions which is easy to demonstrate when it is unilateral, and is more readily detected by touch than by sight. When one applies to the muscle the two electrodes of a volta-faradic apparatus and holds the handles between the fingers, if the number of interruptions is progressively increased, at a certain moment the vibrations corresponding to the contractions cease completely on the affected side, while on the sound side with the same number of interruptions the vibrations still continue to be felt. This occurrence is the consequence of the slowness of the muscular contractions on the affected side (182).

We may add that *mechanical hyperexcitability of the nerve trunks* may be occasionally observed. Percussion of the ulnar nerve in the space between the olecranon and internal condyle causes a characteristic movement of adduction of the thumb with flexion of the first phalanx (adductor pollicis), combined with a movement of flexion of the fourth and fifth fingers

at the first phalanx (interossei). Percussion of the posterior tibial nerve causes a movement of flexion of the toes.

Mechanical hyperexcitability of the nerves appears like muscular hyperexcitability to be closely associated with vaso-motor disorders and hypothermia; the application of heat may temporarily reduce or abolish it.

Muscular Hypotonus

Hypotonus is sometimes very pronounced and may be as great as in the most serious nervous lesions, but its area is usually restricted. It may be very marked in certain muscular groups of the affected limb, and be completely absent in others. Thus it may be

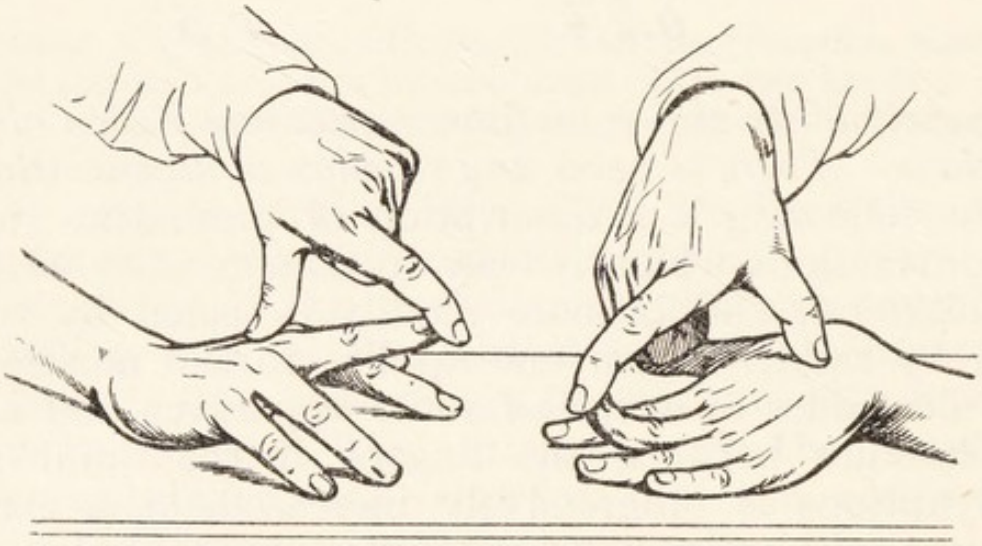


Fig. 8.—Hypotonus of the flexors of the fingers in a case of contracture of the flexors of the hand with hyperextension of the fingers (*v.* Pl. VII, p. 166).

possible to obtain by passive movements in various cases a hyperflexion of the hand forming a very acute angle with the forearm (*v.* Figs. 4 and 10), hyperextension of the fingers in an arc of a circle (*v.* Figs. 8 and 9), hyperflexion of the thigh (leg extended) far beyond a right angle (*v.* Fig. 12), and hyperflexion of the leg combined with hyperflexion of the thigh, a complex movement in which the thigh is brought close to the abdominal wall and the heel to the gluteal region

(*v.* Figs. 13 and 15). Owing, however, to individual variations in tonicity, no attention should be paid to hypotonus unless it is definitely asymmetrical.

When it is very well developed, it may even be



FIG. 9.—HYPOTONUS OF THE FLEXORS OF THE FINGERS in a case of accoucheur's hand (*v.* Pl. V, p. 120).



FIG. 10.—HYPOTONUS OF THE EXTENSORS associated with contracture of the flexors of the hand (*v.* Pl. IV, p. 118).

seen in the patient's movements. If he raises his arm suddenly or is walking, the affected hand swings passively in every direction as if it did not belong to him and was simply controlled by the laws of physics.

Lastly, when hypotonus of certain muscle groups

is associated with contracture of their antagonists, which is a frequent occurrence, it may give rise to actual subluxations.

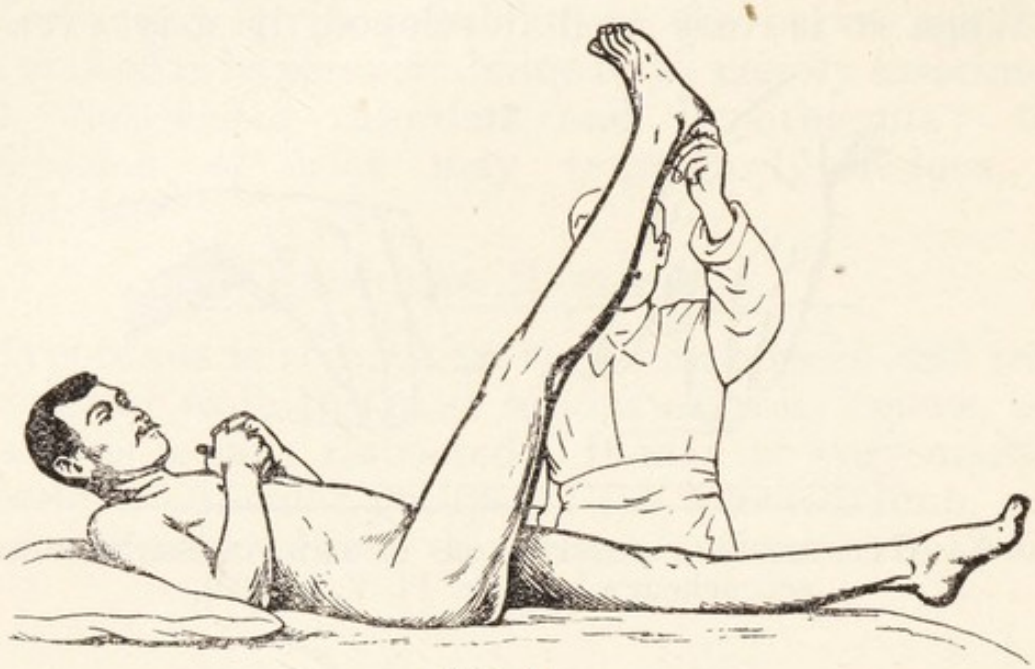


Fig. 11.



Fig. 12.

FIGS. 11 and 12.—HYPOTONUS OF THE EXTENSORS OF THE HIPS ON THE PELVIS in a case of contracture of the foot and quadriceps with fibro-tendinous retractions after a wound of the thigh by a shell fragment (September 1914), followed by prolonged suppuration. Marked vaso-motor symptoms. Exaggeration of the ankle jerk (July 1916). Persistence of the contracture and exaggeration of the tendon reflexes in the affected foot during chloroform narcosis (*v.* Appendix, Case XIII, p. 260).

Compare the amplitude of the passive movement produced on the affected side (Fig. 12) with that on the sound side (Fig. 11).

Fig. 13.

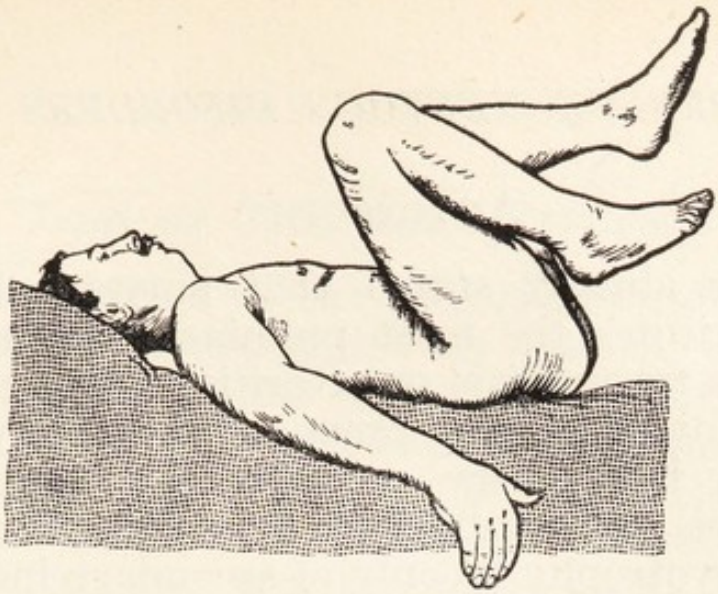




Fig. 14.

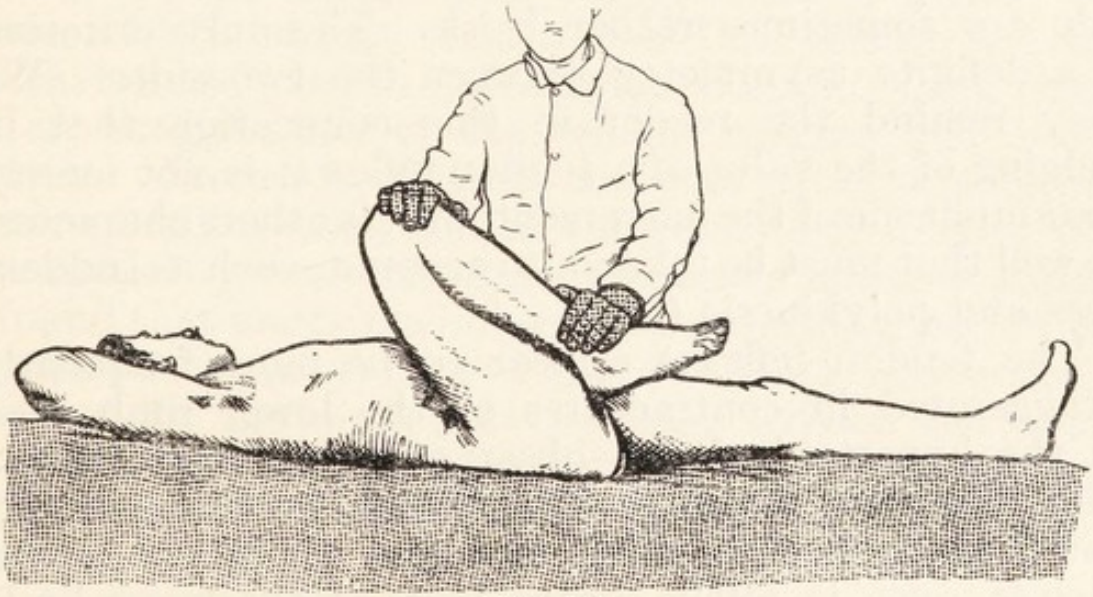


Fig. 15.

FIGS. 13, 14 and 15.—HYPOTONUS OF THE RIGHT QUADRICEPS in a case of reflex paresis of the muscles of the leg and foot following a shrapnel wound of the thigh (September 1914). Marked vaso-motor symptoms and hypothermia. Mechanical hyper-excitability of the muscles of the foot and leg without obvious disturbance of the electrical reactions (September 1916).

Amyotrophy

We have already stated that amyotrophy sometimes constitutes the most prominent feature of the case. Thus traumatism or arthritis affecting the knee may be followed by very pronounced atrophy without the paresis being very pronounced. On the other hand, paresis and contracture may be well developed and the amyotrophy be only of secondary importance.

The following figures show the degree of diminution in the size of the muscles. The circumference of the affected leg is 3 to 6 centimetres smaller than that of the sound leg.

In the thigh the difference is frequently 3 to 5 centimetres and sometimes 7 or 8 centimetres.

In the upper part of the forearm it may be 2 to 3 centimetres, and in the upper arm 3 to 4 centimetres.

Exaggeration of the Tendon Reflexes

Exaggeration of the tendon reflexes, when it undoubtedly exists, is a sign of great value. It may be difficult to determine, for the reflexes on the sound side are sometimes rather brisk. The only criterion is a definite asymmetry between the two sides. We may remind the reader in this connection that in judging of the value of a tendon reflex it is not merely the amplitude of the movement, but its others characters as well that must be taken into account, such as suddenness and polykinesis (179).

The tendon reflexes appear to be more frequently exaggerated in contractures of the lower limb than in the hypertonic forms observed in the upper limb. This difference resembles that which we have already noted in connection with muscular rigidity. Nevertheless, even in reflex contractures of the lower limb, exaggeration of the tendon reflexes is often open to doubt, and may be entirely absent. Sometimes it is latent only, and can then be made evident by chloroform narcosis (*v.* pp. 157 and 226).

Loss of Cutaneous Reflexes

In the cases which we have observed sensory disorders were generally accompanied by loss of the plantar cutaneous reflex. After immersion in hot water the cutaneous reflex reappeared for a time, and was then identical with the reflex on the sound side. This experiment has been performed several times in numerous patients, and the same result has always been obtained.

These disorders, therefore, should be grouped with the remarkable modifications seen under the influence of heat in the mechanical excitability of nerves and muscles, and the diminution in amplitude of the oscillations.

This is therefore a characteristic peculiar to reflex nervous disorders (145).

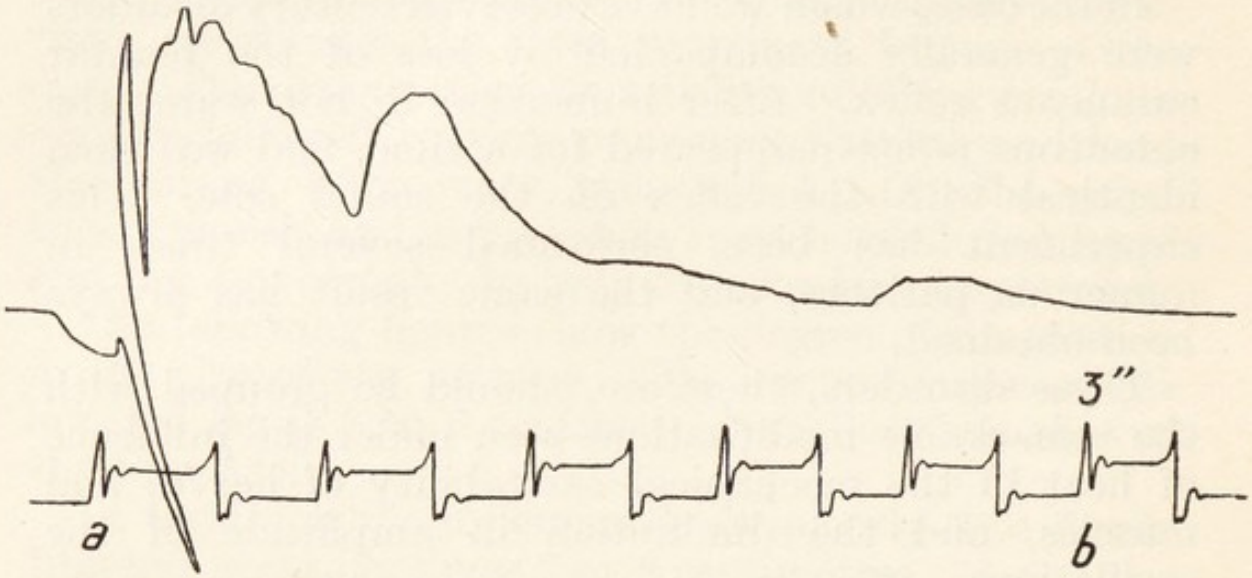
There is every reason for supposing that the loss of the cutaneous reflexes is due to a circulatory disturbance, and in this connection we will quote some remarks made by one of us relating to changes in the cutaneous reflexes after compression by Esmarch's band—

"It is well known that compression of a limb by Esmarch's band may cause a loss of the tendon reflexes in that limb, even in pathological cases in which there is an exaggeration of the tendon reflexes and ankle clonus. From experiments made on patients suffering from paralysis with contracture due to lesions of the pyramidal system and presenting an extensor response, I found that under the influence of a similar constriction applied to the lower limb changes were also occasionally present in the cutaneous reflexes. When the compression has been sufficiently prolonged, the toes no longer respond to stimulation of the sole, but remain motionless" (178).

Tremor

The affected limb is frequently subject to tremor (P. Marie and Foix); we found that this symptom was most pronounced during the hot weather, when the

limb had been artificially warmed, or when the patient exerted himself.



Tracing XI (Reflex Contracture, *v.* Case I, p. 143). Undulations on the tracing of the movement of the thumb caused by percussion of the muscles of the thenar eminence at the atmospheric temperature. The undulations are more marked still after application of heat.

In the course of our investigations with the graphic method we noted on the tracings certain waves corresponding to the mechanical muscular contraction. After application of heat the existence of very definite secondary muscular contractions was also found for a time.

These tracings, it may be said in passing, appear to have some resemblance to those illustrating muscles under the action of veratrine as described by Mlle. Joteyko in her book (212).

Sensory Disturbances

Patients with reflex contractures occasionally complain of painful sensations; the pains are either spontaneous or caused by pressure on the nerve trunks. Vulpian drew attention to them long ago, and they have been mentioned again by Gougerot and Charpentier (136), Guillain and Barré (138), and Tinel (154).

In several cases of reflex paralysis or paresis of the

lower limb, we have observed hypæsthesia with a more or less segmentary distribution. It was most marked on the sole, less developed on the dorsal aspect of the foot, and least of all on the lower two-thirds of the leg. These sensory changes were present with all forms of stimulation, including touch, pain and heat. Disturbance in the sense of position was also noted. The sensory disorders sometimes diminished after immersion of the part in hot water.

In some cases of acromyotonus Sicard (157) observed deep anæsthesia of the hand and forearm. He was struck by the absence of any reaction to violent stimuli applied to the affected areas; faradisation by a coil with fine wire, injection of 95 per cent. alcohol into the subcutaneous tissue or muscles, and even an operation without an anæsthetic, local or general, did not cause any sign of pain, any vaso-motor change in the face or acceleration of the pulse. "What are we to conclude from these cases?" writes Sicard. "Either we must suppose that these patients are determined not to betray themselves in the course of these tests, and possess an extraordinary will power, though for my part I refuse to believe in the existence of so much moral energy in the face of such physical pain; or we must consider that this is an example of hysterical phenomena, and that hysteria alone is capable of producing a *real* superficial and deep anæsthesia, though this does not agree with the teaching of Dr. Babinski, and with our own experience at La Salpêtrière. Our hysterical patients in the 'Clinique Charcot,' with a typical hemi-anæsthesia or an anæsthesia of a segmentary type, could never undergo an operation with the knife on their insensitive limb without a local or general anæsthetic.

"Or, lastly, the hypothesis must be accepted—and we concur in this view—that in cases which have undergone such tests, the anæsthesia is real, independent of the patient's will, and does not obey the rules of pithiatism. Such phenomena must be regarded as possessing a real autonomy, and may be explained by

the reflex pathogeny suggested by Drs. Babinski and Froment."

Secretory and Trophic Disorders

Disorders of secretion.—It is not uncommon to find that the skin is damp, especially at the extremity of the affected limb; sometimes it is even slightly macerated (*v.* Pl. VI, p. 158).

We saw a very pronounced example of hypersecretion of sweat in a captain who presented characteristic reflex disorders after perforation of the lower part of the forearm. This officer also told us that the secretory disorders which appeared on the affected side shortly after the wound involved the sound hand four months later. We several times had the opportunity of seeing beads of sweat appear on both his hands under the influence of various causes (164).

Trophic disorders.—A general atrophy may be found, especially when the lesion is situated on the hand, and this can be clearly seen in the tapering fingers. A comparison of the skiagrams of the two hands shows *decalcification of the skeleton*, which has been observed after traumatism of the limbs by a large number of writers. It is best seen in the extremities. In the X-ray plate the skeleton of the affected hand appears to be more distinct and the outline of the bony trabeculæ clearer and more delicate, while the epiphyses and joint surfaces are less distinct than on the sound side. The same appearances are to be found, but in a less degree, in the bones of the forearm.

There is almost always a certain degree of *fibro-tendinous* or *muscular retractions*. According to the position of the contracture these may be seen in the joints of the fingers, wrist, elbow, hip, foot and ankle, but they are most marked in the finger-joints, which are frequently enlarged and painful like those of chronic rheumatism. They develop rapidly, and explain to a certain extent the limitation and difficulty in the movements of the joints. Although they are hardly

ever completely absent in reflex contractures and pareses, their intensity varies. On the other hand, they are exceptional in cases of hysterical or pithiatic paralysis or contracture. If the contrary has sometimes been asserted, this is doubtless due to the frequent confusions which have hitherto been made, or to the failure to recognise the existence of hystero-organic or hystero-reflex associations.

It may be noted that *hypertrichosis*, which formed the subject of an interesting study by Villaret may be observed not only in neuritis but also in reflex contractures and pareses. We may remind our readers that it is absent in purely hysterical contractures and paralyses.

As a rule the nails also show some changes in patients with reflex disorders, their growth being less rapid than on the sound side.

Examination during Chloroform Narcosis

We have already mentioned the characteristic signs which were revealed by examination of reflex contractures under chloroform, viz. *exaggeration of the tendon reflexes* in the affected limb, *spasm* caused by any attempt to correct the vicious attitude, and *persistence of the contracture to an advanced stage of chloroform narcosis* (*v.* p. 97). The summary of our principal observations relating to this question will be found below (*v.* Appendix, pp. 253 *et seq.*); we will merely state here that all these cases except one were examples of contracture of the lower limb. The exception was an instance of an "accoucheur's hand," in which the contracture did not persist until an advanced stage of the narcosis, but disappeared at the beginning. But the ulnar pronator reflex, which was almost normal during the waking state, was definitely exaggerated on the affected side.

We have already described to the best of our ability the way in which the reflex nervous disorders which we have studied appear and become established. It is impossible to give an exact account of their further

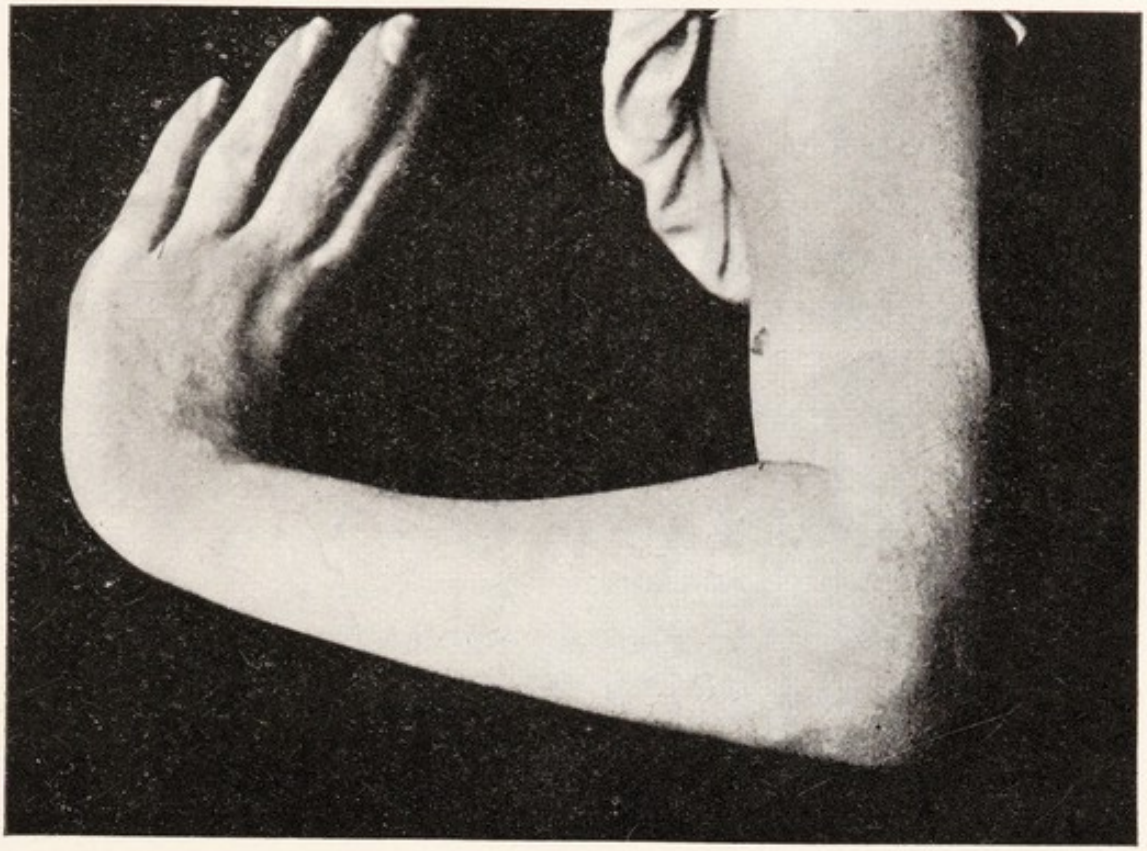
Plate VI

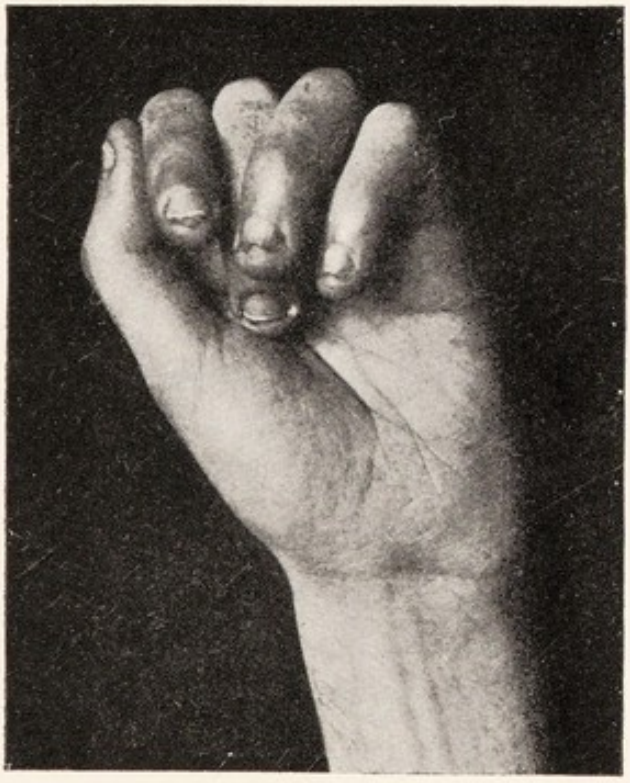
A. Contracture of the extensors of the hand and fingers with hypotonus of the flexors following a wound of the forearm complicated by fracture of the radius. Vaso-motor symptoms with œdema of the hand. Hyperidrosis and macerated appearance of the skin. Marked trophic troubles (general atrophy of the fingers, decalcification of the skeleton, trophic changes of the nails, and amyotrophy), very marked mechanical hyperexcitability of the muscles of the hand, radial muscles and extensors of the fingers, and also of the ulnar nerve (January 1916).

B. Contracture of the flexors of the fingers with overriding of the fingers following a perforation of the forearm by a bullet (December 1914), which appeared immediately after the wound and persisted unmodified since (February–October 1916). Very marked and obstinate vaso-motor phenomena (diminution of the amplitude of the oscillations) and thermal disorders. Faradic, voltaic and especially mechanical hyperexcitability of the muscles of the hand and forearm. Very pronounced slowness of the contraction during the winter or after a short application of moderate cold, which had no effect on the sound side (*v.* Tracings III and VII, pp. 140 and 142). Tremors and muscular twitchings during hot weather.

C. Accoucheur's hand with extensive contracture of the forearm following a wound of the arm (August 1915), complicated by diffuse cellulitis. Vaso-motor symptoms and hypothermia. Hand mottled and succulent. Mechanical hyperexcitability of muscles. Exaggeration of ulnar pronator reflex on the affected side with unilateral clonus during chloroform narcosis (*v.* Appendix, Case X, p. 259).

PLATE VI







development, as the cases under our observation are of too recent a date.

All that we can say with certainty is that these disorders when left to themselves may remain stationary for a very long time without undergoing any appreciable modification, just as if they were permanent. It should be mentioned in this connection that Charcot and Vulpian were impressed long ago by the obstinate character of reflex amyotrophies caused by slight lesions which had long since disappeared.

We have often observed a progressive improvement in contracture and paresis as a result of the various modes of treatment which we shall describe later. But putting aside the hysterical element which may be associated with them to a greater or less extent, reflex disorders are slow in showing any change. In the most favourable cases, including those in which there was apparent recovery, we have always seen persisting hitherto a state of weakness characterised by reduction of muscular power and the impossibility of prolonged physical effort. This is a point which must be considered by medical boards. There is no reason for supposing that a return to normal cannot be finally obtained.

CHAPTER IV

PATHOGENY OF THE SO-CALLED REFLEX NERVOUS DISORDERS

Vulpian and Charcot endeavoured to establish the pathogeny of these disorders, which even then appeared to them to form a well-defined group of nervous manifestations. After rejecting the hypothesis of a lesion of the nerve centres they discussed the question as to whether these phenomena, and especially the amyotrophy which had particularly impressed them, could not be attributed merely to immobilisation. "In dealing with the mechanism," writes Vulpian, "of muscular atrophy associated with lesions of the joints, John Hunter had propounded an hypothesis which has merely an historical interest (effect of sympathy) . . . but the celebrated English surgeon rejects the opinion previously held, which attributed the atrophy to inertia of the limb, by observing that in cases of unilateral arthritis the muscles of the sound leg do not atrophy, although they are also at rest. This objection is of little value, since it is based on an observation which is not strictly accurate. It is well known that in arthritis of the knee, for instance, though the corresponding limb keeps almost motionless, the other limb carries out more or less extensive and repeated movements.

"But a more powerful objection could have been derived from the fact that the limb affected by arthritis is not always condemned to absolute rest. Even the muscles undergoing atrophy sometimes carry out more or less extensive movements."

Charcot has several times insisted on the impossibility

of explaining amyotrophy of articular origin by immobilisation. In his treatment of the subject in his Tuesday lectures (1888–9) he makes the following remarks: "This was obviously a case of paralysis, and the amyotrophy which followed as a result of the articular affection appeared very rapidly, since in six weeks' time it was considerable. Under such circumstances it is obviously not worth while discussing the theory which would attribute amyotrophy of this kind to the influence of prolonged muscular inactivity, the complete duration of which was not more than four or five days. Nor can it be admitted that these amyotrophies are the result of a propagation of an inflammatory process to the muscles, for the arthritis in our case was very slight; besides, it would be very difficult to explain so rapid an extension of an inflammatory process throughout the limb with a marked predominance in the anterior muscles of the thigh.

"I have long since adopted and maintained Vulpian's theory, which appears to me to be the only one suitable for the explanation of all the cases which I have just described. This theory, as you know, is that the centripetal articular nerves which have been irritated at their peripheral extremity by the affection of the joint transmit the irritation to the spinal grey substance, or more precisely to the large nerve cells in the anterior cornua, with the effect that amyotrophy results. A German doctor recently taxed me with 'mysticism' for supporting this theory. I must say that I am puzzled by such an accusation, for I fail to see what mysticism there can be in a theory founded on anatomical and physiological analogies.

"The pathogeny according to which amyotrophy in these cases is the result of inaction is not the only one which has been opposed to the reflex pathogeny, for some authors have suggested the hypothesis of an ascending neuritis. As the result of experimental researches by Hayem (117), who had produced on some animals changes in the cells of the anterior cornua

by wounds of the nerves, Vulpian himself had at first wondered if these nervous disorders might not be due to similar lesions. But he showed that one could not hastily apply all the results of experimental work to clinical medicine, and also that this ascending neuritis never occurred in some animal species (the dog, in particular), although it was possible to reproduce in them all the phenomena in question."

"In almost all the cases," he added, "for which we are seeking an explanation we are not dealing with direct and more or less violent lesions of the nerve trunks, but with irritation affecting the nerve filaments or even the extremities of the nerves (in arthritis, for example); so that the conditions are quite different from those under which Dr. Hayem made the experiments which he has published. Lastly, it must not be forgotten that Dr. Valtat examined the nerves in animals which showed muscular atrophy after experimental arthritis and found them perfectly normal. Therefore, until there is a direct proof of the existence of an ascending neuritis in man, in cases of muscular atrophy produced by peripheral lesions (arthritis, wounds, etc.), I think we may continue to attribute this atrophy to a change in the grey subtance of the spinal cord following a special irritation arising at the site of the lesion, and acting on the spinal centre by the agency of the centripetal nerves.

"Although I dispute the hypothesis of ascending neuritis as a general theory for the so-called reflex muscular atrophy, I do not hesitate to admit the real existence of this neuritis and its consequences in certain special cases."

Thus we find that Charcot and Vulpian finally support the theory of nervous disorders of reflex origin. But what is the exact meaning to be given to this term? "A musculo-motor reflex action," says Vulpian, "necessarily requires the co-operation of three factors at least (apart from the starting-point of the stimulus and the effect produced), viz. (1) A centripetal nerve which conveys the stimulus to a nerve centre. (2) A

nerve centre which receives this stimulus and transforms it into a motor impulse. (3) A centrifugal nerve which conveys this motor impulse to the periphery."

Are these three factors to be found in cases of so-called reflex muscular atrophy? The impulse produced by the peripheral lesion is certainly transmitted to the grey substance, and appears to affect it to a certain extent. But Vulpian, who was considering simple amyotrophy and amyotrophic paralysis only, and regarded exaggeration of the tendon reflexes as exceptional, considered that he had a right to assert that the centrifugal impulse was absent. We should thus be dealing with a sort of inhibitory action due to the peripheral stimulus and affecting the motor and trophic functions or the trophic function exclusively.

Charcot showed that not only amyotrophy and paresis but also contracture and exaggeration of the tendon reflexes, which he regarded as the rule, bore a close resemblance to a reflex action. "Affections of the joints," he writes, "when they involve the spinal centre, sometimes excite the nerve cells which give rise to muscular contracture, or, on the contrary, depress them and so produce amyotrophic paralysis. . . . It should be added that these two varieties of disturbance of the spinal centres may be combined in the same subject." "Even in cases of amyotrophic paralysis," adds Charcot, "to judge at least by the cases which I have shown you, the preliminary stage of muscular contracture, viz. exaggeration of the reflexes, is to a certain extent combined with the amyotrophy. . . . These two groups of phenomena represent, so to speak, the extreme poles of the same morbid process."

Exaggeration of the tendon reflexes and contracture testify to the existence of the centrifugal impulse which Vulpian required to identify the so-called reflex disorders with reflex phenomena properly so called.

However that may be, both in cases of flaccid paralysis with amyotrophy and of contracture with exaggeration of the tendon reflexes, the existence of a disturbance of the spinal centres following a peripheral

irritation was admitted unhesitatingly by Charcot and Vulpian.

The results of our researches confirm the views of these writers and furnish new arguments in support of their theory.

Exaggeration of the tendon reflexes which Charcot had shown to be so frequent in these cases is even more common than might be supposed, since *examination during narcosis* (*v.* pp. 157 and 226) reveals it in some cases in which it is latent in the waking state.

Sometimes, even when there is an absence of any exaggeration of the reflexes, stimulation of the spinal centres and the centrifugal impulse are revealed by the spasms produced during chloroform narcosis.

But can we explain by a reflex action all the phenomena which form part of the syndrome under discussion and especially the vaso-motor and thermal disorders? This is a question which we shall now proceed to discuss.

We have long been impressed by the importance of the vaso-motor and thermal disorders of which we have endeavoured to give an accurate clinical description, and which indicate a disturbance of the *sympathetic* system. In an interesting study of the pathology of the sympathetic system, H. Meige and Mme. A. Benisty emphasised the part which it seemed to play in the production of the nervous manifestations with which we are concerned.

What is the nature of this disorder? Is it a paralysis? This view does not seem to agree with the facts observed. Ever since Claude Bernard's memorable experiment it has been known that section of the cervical sympathetic is followed by vaso-dilatation with rises of the local temperature and intra-arterial pressure. There is every reason to believe that a destructive lesion of the sympathetic tracts in the limbs may cause phenomena of the same kind.

We may note in this connection that laceration of the sympathetic plexus surrounding the brachial artery which has been carried out for therapeutic purposes in

patients suffering from causalgia (Leriche's operation), has been followed by pronounced vaso-dilatation with increase of 2–4 cm. in the arterial pressure and rise of the skin temperature. These phenomena which appeared one hour after the recovery of the patient from the anæsthetic were still perceptible a week later (Heitz).

Now, in the cases with which we are concerned, we are dealing with vaso-constriction, as is proved by the result of our oscillometric observations. There is, therefore, a stimulation of the sympathetic. But how is this stimulation produced ? Two hypotheses may be suggested : that of a neuritis of the sympathetic, or that of a reflex disorder involving the sympathetic paths.

It might be supposed, in the first place, that the wound has caused an irritative inflammatory process either in the sympathetic filaments accompanying the nerves of the cerebro-spinal system or in the peri-arterial plexuses which form the most important centri-fugal sympathetic tracts. It is possible that this is so in some cases, but this mechanism must be at least exceptional. Indeed, as we have seen in the paralysis and contractures which we are studying there are no grounds for supposing a lesion of the nerve trunks. As regards the arteries, sphygmometric examinations show that they are intact, and it is difficult to imagine a lesion of the periarterial sheath under such circum-stances. An even more important argument, perhaps, is that the vaso-motor and thermal disturbance may extend above the lesion and reach, for example, the arm above the elbow, and even the shoulder in a case of lesion of the hand. Sometimes the other arm as well shows some vaso-motor changes and disturbance of sweat secretion.[1]

[1] The occurrence in the corresponding sound limb of nervous changes which had at first been localised in the wounded limb was particularly evident in an officer whom we recently showed at the Neurological Society (164), and whose case we briefly described above (*v.* p. 156). In the course of the subsequent discussion Jean

Plate VII

A. Contracture of the flexors of the hand with hyperextension of the last three fingers, following a bullet wound of the forearm at the junction of the middle and lower thirds, with fracture of the radius. The loss of motor power is not complete, the patient has always been able to carry out some slight movements of abduction and flexion of the fingers, but as soon as he makes no further effort to straighten them, the hand resumes its ordinary attitude. The condition has not shown any considerable change for a year (November 1916). Very marked vaso-motor symptoms and hypothermia. Succulent appearance of hand. Mechanical hyperexcitability of the small muscles of the hand with slowness of the muscular contraction.

B. Contracture of the flexors of the hand with hyperextension of the first two phalanges and flexion of the last, after a shell wound of the back of the hand at the second metacarpo-phalangeal joint followed by prolonged suppuration. The contracture of the flexors of the hand progressively increased five or six months after the wound.

The loss of power is not complete: extension of the wrist, adduction and abduction of the fingers and flexion of the last phalanges are still possible, but the movements are carried out feebly. The mobility of the thumb is unaffected. Hypothermia and vaso-motor symptoms are very marked; in the forearm the oscillations are weaker than on the sound side. Slight mechanical hyperexcitability of the muscles of the hand increasing considerably after application of moderate cold, which does not modify the muscular excitability of the other arm.

C. Contracture of the flexors of the hand with hyperextension of the fingers, following a wound of the shoulder with fracture of the head of the humerus (the arm was immobilised in a sling for a month). The flexion contracture of the hand was, associated with a contracture of the forearm, which did not appear until four months after the wound, and was preceded by paresis of the arm. Hypotonus of the flexors of the fingers is very marked, giving rise to a subluxation of the phalanges (*v.* Fig. 8, p. 148).

General atrophy of the fingers and mechanical hyperexcitability of the small muscles of the hand noted June 1916.

PLATE VII







All these phenomena are difficult to reconcile with the hypothesis which we have just discussed, and fit in better with a mechanism of a reflex character. In further support of this idea we may invoke the changeable character of these phenomena, which are liable to alter from one moment to another, hyperthermia succeeding hypothermia, and the amplitude of the oscillations measured by the sphygmometer being greater on the side of the injury, where it had been much weaker a few minutes previously.

The source of this reflex stimulus can only be looked for in the irritation of centripetal filaments coming from the seat of the trauma. It is difficult to know whether these centripetal fibres belong to the cerebro-spinal or sympathetic system, and the question is of little importance considering the close relations between these two systems. On the other hand, the centrifugal path of the reflex, as regards the vaso-motor and thermal phenomena, is certainly provided by the sympathetic.

It is interesting to compare our cases with the old experiments of François-Franck. Owing to the striking resemblance between clinical and laboratory observations a fairly full account of these researches may be given (198).

Camus made the following remarks: "At the last meeting of the Neurological Society I said that the phenomena described by the name of reflex paralyses and contractures did not in the great majority of cases obey the laws of reflexes (law of symmetry, irradiation and generalisation). . . . The cases shown to-day by Drs. Babinski and Froment illustrate my objection: the phenomena on the one hand were first unilateral and then bilateral (law of symmetry); on the other hand they are more pronounced on the stimulated than on the other side, in conformity with what is seen in experiments. One must be guarded, however, in comparing this clinical picture with experimental observations; in the latter, indeed, the phenomena appear at once as the result of variations in the intensity of the stimulation. In the clinical cases, on the contrary, the passage of the symptoms to the limbs of the opposite side required two or three months, which indicates, without doubt, a much more complex process than that which occurs, for instance, in the decapitated frog."

Action of cold on the vessels. François-Franck's experiments.—" In a first series of experiments the hand was plunged into a jar containing water at 18° C. As the jar was placed in a large vessel, a tap could be opened when required and made to pour at once a large quantity of very cold water on the jar, and consequently cause a considerable reduction in the temperature of its contents.

" Under these conditions constriction of the vessels of the hand was somewhat late in its appearance on account of the relative slowness of the fall of the temperature of the fluid in which the hand was placed, but there was an obvious diminution in size which became more pronounced as the chilling of the water increased. A fall of three or four degrees was enough to produce a very marked effect.

" I obtained similar but more decided results by chilling the water containing the hand in a different manner. . . .

" In order to investigate further the probable mechanism of the phenomenon, I carried out an experiment on the skin of the forearm instead of on the hand. I applied a large piece of ice to the skin on the antero-internal aspect of the elbow, while the lower part of the forearm and hand was plunged into the apparatus and a record was taken. . . .

" It was some little time before the vessels contracted; they remained contracted for a few seconds, and then gradually became dilated.

" Is not this the usual course of the phenomena of movement caused by a stimulus to the nerves ? *A latent interval, a period of increase, and a period of decline or relaxation.*

" Let us now examine the probable course of this nervous action.

" The ice was applied to an area in which the collection of brachial nerves and vessels is very superficial. It might be supposed that the vascular nerve fibres accompanying the brachial artery and those contained in the median, internal cutaneous and ulnar nerves might be directly affected owing to their proximity to the point of application of the ice.

" In order to verify this hypothesis I resumed the experiment by applying the ice to the outer and posterior surface

of this region. The same effect was produced in spite of the thickness of the tissue separating the ice from the main body of vessels and nerves.

"I had, therefore, to think of the possibility of a reflex influence whose starting-point was in the *cutaneous nerve filaments* of the region on which the ice was applied, whose point of reflexion was in *the spinal nerve centres*, and whose destination was the *vascular nerves* of the limb under experiment.

"There does not appear to me to be any doubt about the reality of these reflexes from the afferent nerves to the vascular nerves, if one confines one's attention to the effect of the vascular constriction, as shown by the diminution in the size of the left hand, when the right is submitted for a moment to the action of cold. There is no disputing the fact, and it is only its interpretation which is open to discussion, but, as I will endeavour to prove, the vascular reflex accounts for the phenomena, and as this mechanism has been proved in the case of the crossed effect, it appears to me that it ought to be admitted in that of the direct effect. . . .

. . . . . .

"This explanation, which had already been suggested by Brown-Séquard and Tholozan, has been adopted by physiologists, who have repeated their experiments with success. But one must consider (1) whether the anatomical data allow this interpretation of our results; (2) whether the different stages of the phenomena agree with the well-known experimental results of reflex actions.

"1. The vascular nerves of the upper limb leave the spinal cord between the third and seventh dorsal roots, pass up the sympathetic chain, and then become distributed among the mixed nerves of the brachial plexus and the nerve filaments surrounding the large arterial trunks at the root of the limb.

"If, therefore, the vascular nerves of the upper limb arise from the cord at the same time as the ordinary motor nerves, it is easy to understand that a peripheral stimulus passing up to the region of the spinal centres from which they arise may be reflected along these vascular nerves as

well as along the roots of the nerves destined for the striated muscles.

"2. The different stages of the experiment entirely agree with the hypothesis of a reflex action."

Apart from their duration, the experimental facts related by François-Franck are almost entirely the same as our clinical observations. The duration of the vascular spasm in our cases is at first sight surprising. But it should be noted that the vascular spasm is not constant, and that favourable external influences rapidly cause a relaxation or even a more or less prolonged cessation of the spasm of the vessel wall.

We have now to examine the *consequences of this decline in the activity of the circulation on the working of the muscular system.* Our clinical study has shown that the vaso-motor and thermal disturbances are responsible, in great part at least, for the mechanical hyperexcitability of the muscles and the slowness of the muscular contraction. Do these results agree with what physiology teaches us? Marey has shown that the muscular contraction diminishes in length and increases in amplitude as the result of heat, and on the contrary increases in length and diminishes in amplitude under the influence of cold and anæmia.

It appears at first sight as if there was a certain contradiction between the clinical cases which we are studying and the results of experiments, since with a hypothermia of 8° C. as indicated by the pyrometer in the temperature of the affected side as compared with that of the sound side, even a slight mechanical stimulus causes a contraction of muscle, not only slow and prolonged, but even of great amplitude.

As a matter of fact the muscle then behaves as in the first stages of intoxication by veratrine, one of the muscle poisons which has been best studied by physiologists who have found certain resemblances between its mode of action and that of autogenous poisons. "With small doses of veratrine, or at the beginning of the action of larger doses," writes Mlle. Joteyko

(212), " the first effect of the drug is to increase the muscular excitability. Carvallo and Weiss state that the contractions may be six times as high as normally."

Fatigue is followed by " a preliminary stage in which the contractions increase in extent and duration." They continue to increase in duration, while they diminish progressively in extent.

From this it follows that the amplitude of the muscular contractions in our clinical cases is not physiologically paradoxical. It is only the intensity and duration of the amplitude that are somewhat surprising, but this can be explained by the persistence of the vaso-motor and thermal disturbance.

Considering the very complex mechanism of heat regulation in organisms which are homoiothermic, or to use C. Richet's expression " strongly exothermic," the disturbance of muscular excitability should have a tendency not only to persist but even to increase under the accumulating influence of a series of causes when the atmospheric temperature is not favourable to those organisms.

" The perfection of movement," writes Richet (241), " is doubtless connected with a certain rise of temperature which is necessary to produce rapid and complete chemical action. Moreover, by a sort of marvellous cycle the intensity of the chemical reaction entails a more rapid production of heat. There is a sort of automatic adjustment, which regulates the rapidity and precision of movements (connected with a high temperature) by the very movement which raises the temperature."

The superiority of homoiothermic animals, which makes them independent of the surrounding temperature, finds an inevitable counterpart in the delicacy of their constitution. " The existence of very strongly exothermic animals," adds Richet, " is undoubtedly more fragile and more exposed to attacks of all kinds than that of cold-blooded creatures. The tissues are more eager for oxygen and materials of repair, and are therefore liable to die more readily. . . . Vigour and

Plate VIII

A. Flaccid paresis of the great toe with extension contracture of the other toes, following a bullet wound of the left ankle without fracture (September 1914). The contracture of the toes was associated with a contracture of the foot at a right angle. The contractures of the foot and toes do not disappear until an advanced stage of chloroform narcosis, and reappear at the same time as the tendon reflexes long before the return of consciousness (*v.* Appendix, Case XI, p. 259). We have had the opportunity of seeing two other wounded men with the same rare contracture.

B. Paresis of the dorsi-flexors of the left foot and extensors and flexors of the toes, following a wound of the gluteal region without a lesion of the sciatic nerve. Claudication of the same type as that shown in Pl. II, p. 98.

When the patient tries to carry out a movement of dorsi-flexion of the foot, he can only raise the inner border of the foot which assumes a varus position. The movement of extension of the toes which is associated with dorsi-flexion of the sound foot does not occur on the affected side. The left knee jerk is brisker than the right; the left ankle jerk on the other hand appears weak, its movements being slow and of small amplitude. Exercise and artificial heating of the foot increase the amplitude to some extent and also improve its mobility.

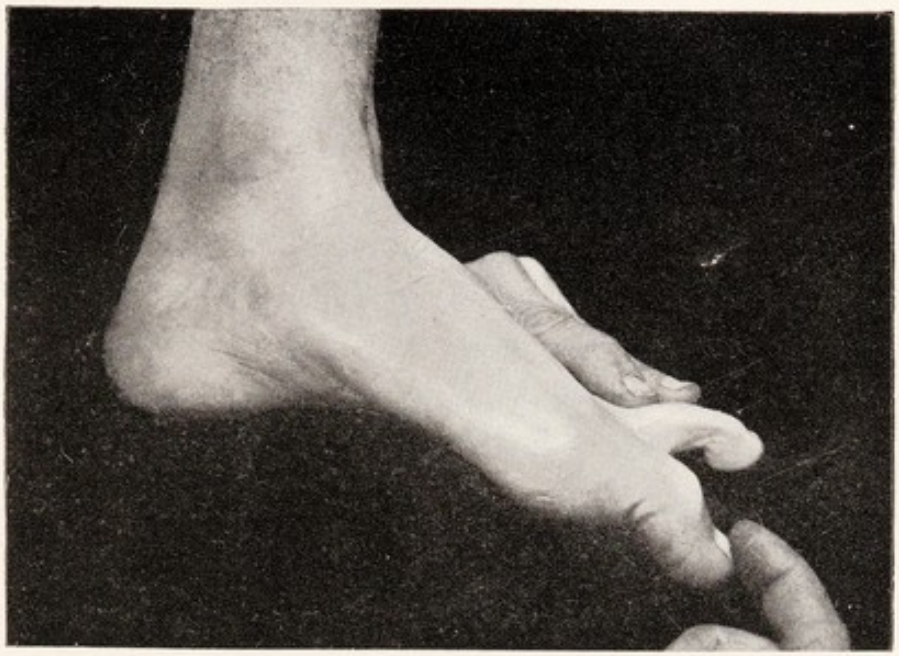
Marked hypothermia and vaso-motor symptoms. Very pronounced mechanical hyperexcitability of the muscles of the foot and antero-external group of the leg.

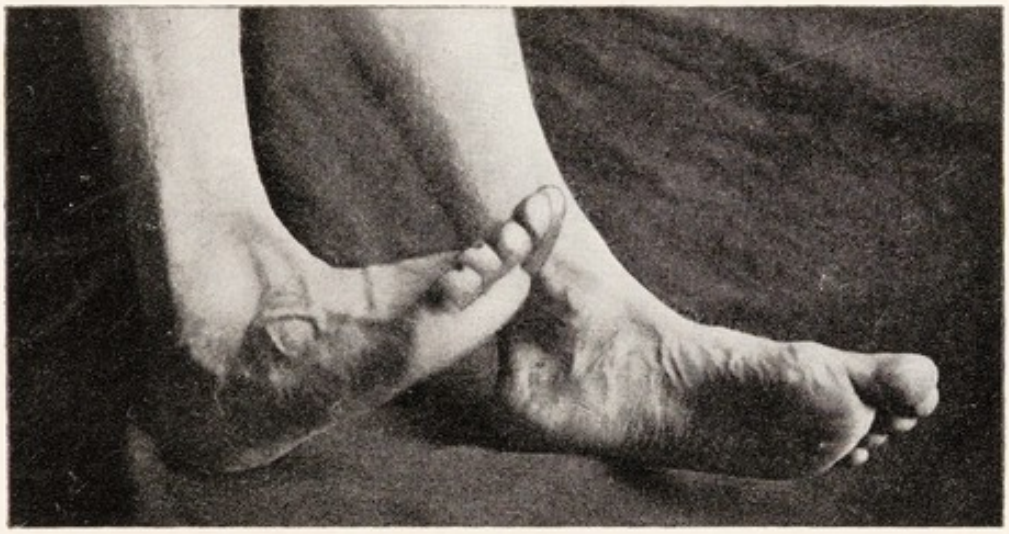
C. Paresis of the dorsi-flexors of the right foot and extensors and flexors of the small toes, following shrapnel wound of the dorsum of the foot and leg complicated by fracture of the tibia (September 1915). The wound of the leg took five months to cicatrise, and the patient wore a walking apparatus for three months.

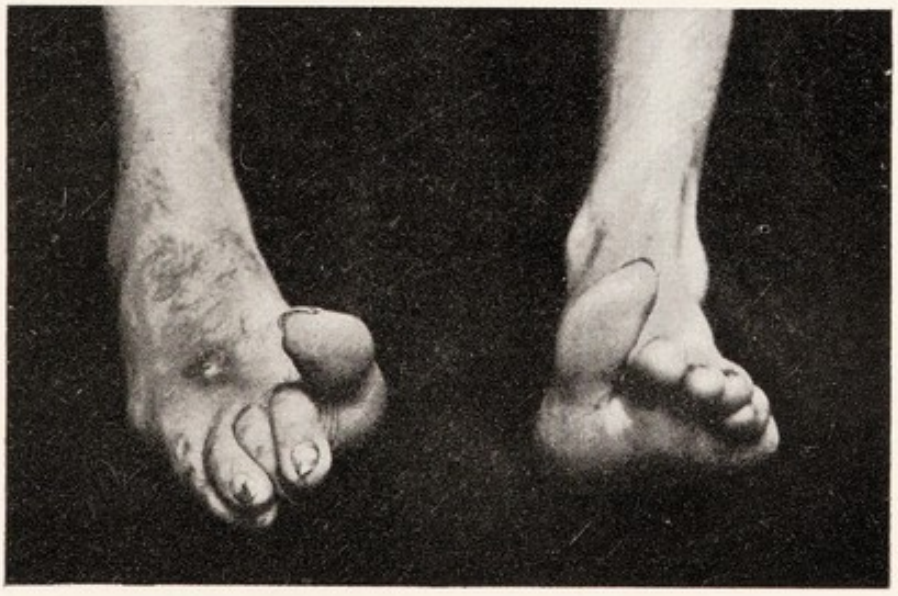
In April 1916 the loss of power is not complete, the movements of the great toe are preserved, the dorsi-flexion of the foot is chiefly carried out by the anterior tibial muscle, and is accompanied by a movement of adduction of the foot, which assumes a varus attitude; during this movement the outer toes remain flexed. Marked atrophy (five centimetres in the leg and seven centimetres in the thigh); hypothermia; mechanical hyperexcitability of the muscles of the foot, leg and quadriceps; crowding of the toes resembling the arrangement of the fingers so frequently seen in accoucheur's hand.

In June 1916 dorsi-flexion of the foot is carried out better, and the outer toes can be extended. The patient has been treated by diathermia and movements.

PLATE VIII







perfection in an organ are contradictory qualities, and we ought perhaps to regard those organs as the most marvellous which by reason of their progressive complexity have become susceptible to the least disturbing influences."

These physiological principles help to explain the clinical facts to which we have drawn attention, especially the persistence of reflex paralyses and contractures. They even serve perhaps to throw some light on hypotonus, as it is a fact that under the influence of cold and fatigue muscle fibres lose their elasticity and become lengthened (Boudet) (190).

We may also mention the observation of Schiff, who found in the frog after hibernation a state of latent contracture probably due to the stimulation of the muscles by the products of muscular katabolism. Possibly some forms of reflex contracture or hypertonus have a phenomenon of this kind as their immediate cause.

To sum up, the "reflex" pathogeny appears to us to explain all the peculiarities of the syndrome which we have described. Among the symptoms which constitute it, some, such as exaggeration of the tendon reflexes and vascular spasm are the direct result of a reflex action, while others, such as mechanical hyperexcitability of the muscles and slowness of their contraction, appear to be only an indirect consequence.

Lastly, it is possible that the motor disorders may depend, either as Charcot had supposed on a state of excitement or stupor of the spinal motor centres, or on disturbance due to sympathetic vaso-motor phenomena which are themselves of reflex origin.

The former mechanism doubtless explains the contractures with obvious or latent exaggeration of the tendon reflexes, such as some flexion contractures of the leg on the thigh or some contractures of the flexors of the forearm. The latter mechanism seems to account for those paretic or hypertonic states which are frequently seen to predominate in the extremities and to be accompanied by very marked vaso-motor disturb-

ance. Both mechanisms, however, often seem to be co-operating simultaneously, which accounts for the frequent association of symptoms found in both groups, *e. g.* in cases of contracture of the pelvi-trochanteric muscles with a paretic state of the foot.

But in spite of the value of the arguments in favour of a reflex pathogeny, some neurologists refuse to accept it, and in explanation of the facts to which they consent to give a certain individuality, they bring forward again the old interpretations which were so judiciously criticised by Vulpian and Charcot long ago. As in the past, some writers (Camus, Claude, Sollier, A. Thomas (140)) regard immobilisation as the cause of these symptoms, while others (Guillain and Barré (141)), attribute it to an ascending or radiating neuritis. It is a strange thing, it may be said in passing, that the problems, whose solution appears to be so simple, should still be under discussion, after having been advanced three-quarters of a century ago.

According to some, then, *immobilisation* should be incriminated; mere inactivity, they think, resulting from an hysterical paralysis or contracture can cause the various symptoms which they have described. This opinion seems to us to be erroneous. We do not dispute the fact that the immobilisation of a limb may cause a slight degree of local hypothermia, as thermo-asymmetry may be made to appear by making one arm move and leaving the other at rest. It is also justifiable to suppose that immobilisation is, to a certain extent, able to maintain and aggravate the vaso-motor and thermal symptoms which depend on reflex nervous disturbance, a fact which explains the therapeutic results obtained in some cases by active or passive exercises. What we deny is that the immobility by itself resulting from a purely hysterical contracture or paralysis is able to create definite vaso-motor and thermal disturbance, as well as all the other symptoms which we have described. Our opinion is not the outcome of an a priori theory, but is based on the

observation of a large number of hysterical contractures and paralyses, some of which are of very old standing.

In order, however, that the point should be settled scientifically once and for all, we invited all the neurologists at the Neurological Society on May 4, 1916, to make a collective investigation, definitely stating the conditions required to avoid confusion.

It was advisable, we declared, to make an enquiry similar to those which one of us recently instituted as to the disturbances of the tendon reflexes and pupillary reflexes, as well as to œdema, and especially blue œdema.

Only the pure cases were to be discussed, *i. e.*, those in which immobilisation was not associated with any other factor. No notice was to be taken of hysterical paralysis associated with a lesion (wound or arthritis) of the affected limb, for there would be no means of distinguishing what was due to immobilisation from what was due to reflex nervous disturbance. It would be illogical to use such cases for trying to prove that immobilisation was able to produce the syndrome in question. Every case was also to be rejected in which immobilisation was the result of an affection of the central nervous system, as such lesions were able to produce disorders of the vaso-motor and thermal mechanism and consequently all the nervous manifestations due to this cause. There would, therefore, be no justification for attributing such disorders to immobilisation. We may observe, however, that we examined from this point of view several persons suffering from organic paralysis who had been immobilised and bedridden for several years, but did not succeed in finding the slightest trace of vaso-motor and thermal troubles or of mechanical hyperexcitability of the nerves and muscles.

Further, no case could be considered in which the immobilisation was the result of a lesion to a nerve, even if the symptoms attributed to inactivity had been observed in an area with a different nerve supply. It is a well-known fact that in such cases nervous symptoms may be observed outside the area of the affected

nerve, *e. g.* the knee jerk may be exaggerated in sciatic neuritis, as one of us has shown (181).

Lastly, all cases of immobilisation in a plaster apparatus would have to be eliminated, as this is liable to cause compression and more or less persistent disturbances of nutrition and circulation.

It should be noted, however, that the femur may be recalcified in hip disease when the joint-lesion has healed in spite of immobilisation in plaster. A recent work by Ménard contains a series of skiagrams which have been taken in cases throughout their treatment by immobilisation, and which are very instructive in this respect. We will quote from it the following remarks on muscular atrophy in hip disease, and on the dystrophic influence of immobilisation to which in Ménard's opinion an excessive importance was frequently attached (228)—

"The muscles of all the segments of the lower limb undergo atrophy. This atrophy which was already obvious at the commencement of the affection increases as the tuberculous disease of the hip progresses. It has been said that the atrophy is increased by excessive prolongation of strict immobilisation. The fact is certain, but is of secondary importance. There is no doubt that the persistence of the joint lesion is the principal and essential if not the exclusive cause of muscular atrophy. The atrophy disappears more or less rapidly if the hip disease ends in recovery."

We will remind the reader that Charcot and Vulpian in combating the theory of immobilisation had urged that the so-called reflex atrophy may develop very shortly after traumatism.

The same may also be said of vaso-motor and reflex troubles : quite recently we saw an officer with a wound in the foot only a fortnight old without any lesion of the nerves or arteries who already showed very marked hypothermia of the foot and leg with hypæsthesia and considerable diminution of the cutaneous plantar reflex, though he had kept on his feet all the time.

Our views are supported by the observations of

Clovis Vincent (163), which recently formed the subject of a communication entitled "The prognosis of reflex nervous disorders. Persistence or increase of vaso-motor troubles and amyotrophy in spite of active and prolonged exercise of the affected limb." We are indebted to the writer for the following abstract of this work—

"The following is a short account of two cases which we had the opportunity of observing. The first case was that of a man who had been wounded in the foot without much injury to the bone. He came to consult me for the first time in July 1915, complaining of pain in the foot and walking on crutches. On examination the left calf was smaller than the right, the difference being four centimetres. The tendon reflexes were not affected, and there was no disturbance of the electrical reactions. There did not appear to be any relation between the disordered gait and the organic condition. Many of the symptoms appeared to be of a pithiatic nature. In fact, the treatment which I adopted soon enabled him to give up his crutches and walk by himself, with a slight limp, it is true. He was transferred to the auxiliary service.

"The pain gradually got worse and the limping increased. The patient was unable to carry out any duties, and was sent to the neurological centre at Montpellier, whence he was transferred to the neurological centre at Tours in September 1916. It should be noted that he had never been laid up, and that he had not ceased to walk daily with only one stick. When I saw him again the disturbance of his gait was very pronounced, and he declared that he was suffering considerably. The difference between the two calves was eight centimetres, and the thigh was atrophied, though it was not so in July 1915. There was mechanical hyperexcitability of the gastrocnemii. The right foot was much colder than the left.

"Thus, in July 1915 the pithiatic phenomena were as pronounced as the reflex ones, whereas in July 1916 the reflex phenomena were practically the only ones present, and necessitated his discharge from the army.

" In the second case in which the patient's daily exercise was under our own supervision, and was for a long time particularly applied to the affected limb, in spite of eight months' efforts, the muscular atrophy and vaso-motor troubles showed no obvious improvement.

" The case was that of a young man who received a superficial wound of the left knee in August 1914. In August 1915 I found the following symptoms : amyotrophy of the left calf, the circumference of which was 2·5 centimetres less than that of the right, the left ankle jerk weak and sluggish, premature fusion of the faradic contraction in the left gastrocnemius, and cyanosis and hypothermia of the affected foot, which was paretic, the voluntary movements being weak and limited, with slight flexion contracture of the leg on the thigh.

" For the eight months following this examination the patient was given an intensive re-education at the neurological centre at Tours. For two hours every day he was exercised in walking, running and hopping on the left lower limb. In September 1916, after twelve months' training, I found a certain improvement in the symptoms, the leg was now completely extended on the thigh, and the movements of the affected foot were almost normal, but the amyotrophy, and vaso-motor and electrical disturbances persisted without any change. The man recognised that his condition had improved, and had even undergone a complete transformation, but he could not walk more than four or five kilometres without much fatigue.

" I could quote many more examples of this kind. It must be admitted that whatever view be held as to the mechanism of these phenomena, whenever the so-called reflex symptoms have developed (I have in mind especially the vaso-motor troubles and muscular atrophy), exercise, however intense and prolonged it may be, cannot disperse or even improve them. Sometimes they actually become worse in spite of active exercise daily.

" I do not mean to say that men with reflex troubles should not undergo exercises and training. But one should know what results to expect. If the reflex troubles are slight and the hysterical phenomena associated with them

are severe, a successful result may be obtained, and in some cases the man may be able to return to duty. If, on the contrary, the reflex troubles are severe, no result will be obtained, however persistent one may be in training and re-educating these men, and they will have to be discharged from the service.

" Every week I have soldiers with severe reflex disorders sent to my service at Tours for re-education. I can do nothing for them, any more than any other doctor. Whenever I can do any good, the reason is that the associated hysterical phenomena are much more pronounced than the organic."

To sum up, from cases observed hitherto one is justified in concluding that traumatism may be followed by the appearance of vaso-motor and thermal disorders which may attain a high degree of intensity, and be accompanied by neuro-muscular and mechanical excitability as well as by hypotonus. It may be asserted that these troubles are liable to develop without there having been any immobilisation properly so called at any time. On the other hand, there is no conclusive case to justify the assertion that immobilisation by itself, such as may result from a pure and non-traumatic hysterical paralysis, can give rise to phenomena of this kind.

The second hypothesis which attributes the symptoms under consideration to an *ascending neuritis* has not been supported by any new argument, and the refutations of Charcot and Vulpian still hold good.

Pain along the course of the nerves, which was described by earlier writers, and on which Guillain bases his diagnosis does not by any means constitute a proof of neuritis : it may often, indeed, be very slight or entirely absent.

The hypothesis of an ascending neuritis—an affection imperfectly defined—is hardly suitable for nervous disorders which, in the first place, do not properly speaking take an ascending course, and, secondly, are not strictly confined at any period of their development

to a peripheral nerve area. To justify such a diagnosis, it would be logically necessary for the disorders to be primarily localised in one of the terminal branches of a nerve and to extend progressively to the collateral branches situated at higher levels.

Such is also the opinion recently expressed by Gougerot and Charpentier (136): "Ascending neuralgia and especially ascending neuritis corresponding to the text-book description, appear to be rare (we have not met with a single case of proved ascending neuritis), whereas reflex paralysis and trophic disorders accompanied by ascending neuralgia are frequent. Although at first, owing to the want of a better term and our ignorance of recent observations, we were inclined, like other medical men, to label several of these reflex disorders ascending neuritis, the two classes of phenomena are quite distinct, and we are inclined to think that a certain number of cases formerly diagnosed as 'ascending neuralgia and neuritis' were really instances of the recently described cases of reflex disorders."

Sicard writes in the same strain (149): "It is interesting to note that in a considerable number of persons whom we have examined suffering from various wounds of the peripheral nerves, *we were unable to find a single case of ascending neuritis.*

"This observation tallies with the conclusions which we expressed some time ago in a report on ascending neuritis, in which we protested against the prevalent conception of this syndrome."

This pathogeny can apply at most to only a very small number of cases. But to accept it in any given case, in the absence of characteristic clinical signs of neuritis, such as reaction of degeneration or loss of the tendon reflexes, it would be necessary to have proofs based on anatomical examinations. Obviously it would not be enough to find nerve fibres showing pathological changes in the affected area, for their existence is a matter of course, but it would be necessary to find undoubted lesions in the nerve trunks to explain the symptoms observed.

It is also to be noted that the exaggeration of the tendon reflexes, which is fairly common in reflex nervous disorders, is opposed to the hypothesis of a neuritis, an affection in which the tendon reflexes are generally diminished or abolished. If a neuritis can cause exaggeration of the tendon reflexes in the area of the damaged nerves, which is by no means proved, it occurs in very exceptional cases only.

One last remark before concluding this study in pathogeny. Some of the clinical forms described in the chapter on "Symptomatology" by the name of congealed hand, accoucheur's hand, or acro-contracture present, as we have seen, a striking analogy with the types of contracture observed in attacks of *tetany*.

We may also add that, as in reflex contractures and paralysis, cases of tetany have been seen with increase in the mechanical excitability of motor nerves (Chvostek's phenomenon), increase in the electrical excitability of nerves (Erb's phenomenon), changes in the tendon reflexes, which are sometimes weakened and sometimes abolished, vaso-motor disorders and muscular atrophy.

These resemblances between the so-called reflex contractures and the contractures of tetany, which are unanimously regarded as due to a stimulation of the nerve centres by a poison impregnating them, constitute a fresh argument against the conception that the so-called reflex nervous disorders are due to mere immobilisation. They tend also to show that these contractures are not the direct consequence of peripheral lesions produced by traumatism, but that they imply a disturbance of the nerve centres, and this is, after all, the principal idea implied by the "reflex" pathogeny.

Lastly, we may note that there is no need to oppose the "reflex" pathogeny to the "sympathetic" pathogeny, as some have done. On the contrary, they harmonise with one another very well, the vaso-constriction being the result of a reflex action exercised through the sympathetic system.

It is not surprising that symptoms of a reflex character should result from a peripheral lesion which causes disturbance in the spinal centres and in the sympathetic system simultaneously. To understand this it is sufficient to quote the following passage from François-Franck's lectures—

"The vascular nerves of the upper limb leave the cord between the third and seventh dorsal roots, pass up by the sympathetic chain, and then become distributed among the mixed nerves of the brachial plexus and the nerve filaments surrounding the large arterial trunks at the root of the limb. If, then, the vascular nerves of the upper limb come from the spinal cord at the same time as the ordinary motor nerves, it is easy to understand how a peripheral stimulus passing up to the region of the spinal centres from which they emanate may be reflected along these vascular nerves as well as along the roots of those nerves destined for the striated muscles."

PART III

PITHIATISM AND REFLEX NERVOUS DISORDERS

CHAPTER I

DIAGNOSIS

Hysteria has been and still is so frequently confounded with reflex nervous disorders, that we have thought it advisable to collect in one part of the book everything relating to the diagnosis of these two groups of nervous manifestations; the difference between them will thus be more clearly illustrated.

The first section will be devoted to the diagnosis of hysteria and organic affections of the nervous system, but we shall deal with only a part of the problems relating to this question. Hysteria undoubtedly may be mistaken for any of the affections of the nervous system, since it is capable of imitating them all. But in consideration of the restricted scope of this work we will devote ourselves to the study of the clinical problems raised by the different types of paralysis and contracture so frequently found in the neurology of war. We have already had occasion to describe the diagnostic features of a convulsive attack (*v.* p. 50), mutism (*v.* p. 79), deafness (p. 74), and hysterical pseudo-sciatica (p. 56), to mention only the most frequent pithiatic phenomena. In the following section we shall set forth the differential diagnosis between reflex nervous disorders and organic affections of the nervous system. We shall then do the same with

hysteria and reflex nervous disorders. Lastly, we shall show how hysteria can be distinguished from simulation, but we shall first deal with those morbid phenomena which are so important in neurology and especially in the neurology of war.

The Diagnosis of Hysterical Paralysis and Organic Paralysis

Some hysterical manifestations are quite characteristic, e. g., *hysteria major*, *rhythmic chorea*, and *mutism*. No nervous disturbance due to an organic affection resembles them; they can therefore be recognised at first sight. It is also the same with *certain types of systematised paralysis*. For a paralysis to be placed in this group it is not necessary for some of the motor functions of the limb to be completely abolished, and the others to be completely preserved. All that is required is that there should be a considerable difference in the activity in the same group of muscles according to the movements which it has to perform.

Such a variety of paralysis cannot invariably be regarded as hysterical in nature. It seems that cerebral lesions may cause changes in the movements of the eyeball analogous to the paralysis which we are considering. As regards the limbs, the so-called functional spasms, which are very resistant to treatment and have absolutely nothing to do with hysteria, are also motor disorders which only affect certain acts. It is none the less true that no functional spasm or any organic affection reproduces any of the following types of systematic paralysis, which are characteristic of hysteria. Take, for instance, the case of a wounded man whose inability to stand upright or to walk is in contrast with the more or less complete freedom of the movements of the lower limbs when lying down. There is no doubt that this is an example of *hysterical astasia-abasia*. The diagnosis of pithiatism can also be made at once when an almost complete inability to carry out voluntarily in bed the elementary movements of

flexion and extension of the toes, foot, and leg co-exists with the ability to stand upright and walk a few steps. A facial paralysis, which is shown only in the unilateral movements of one of the buccal commissures (the acts of whistling or blowing being normal), also bears the stamp of an hysterical manifestation.

The *variability* of a contracture or paralysis may also be of significance in certain circumstances. Hysterical paralyses and contractures are sometimes modified in their intensity and form not only from one day to another, but even from one moment to another. These variations can easily be shown by certain tests. If an attempt be made to overcome a purely hysterical contracture, it will be found that the resistance is intermittent; in the course of the attempt the patient gives way, then recovers, and finally either diminishes or increases his contracture. Here is another patient with an hysterical flexion contracture of the last three fingers resembling a clawhand, due to a lesion of the ulnar nerve. If he is blindfolded to prevent him determining the exact position of his fingers, and he is then ordered to perform repeated, symmetrical and exactly synchronous movements with his hands, it will be found that the amplitude and form of the movements carried out by the contractured fingers vary considerably from one moment to another, an occurrence which does not take place in a patient with organic contracture.

Transitory disappearance is still more characteristic. Take, for instance, two cases, one with organic hemiplegia, and the other with hysterical hemiplegia, both of whom appear to be incapable of carrying out any movement whatever in the different segments of the paralysed upper limb. Try the following experiment: seize the paralysed arm, raise it and then leave it to itself, repeat this operation several times in succession, and at the same time attempt to distract the patient's attention from what you are doing by your questions. You will find that in the first patient the paralysed arm will drop down at once like a lifeless object as soon

as you have let it go, and this phenomenon will recur whenever you repeat the attempt. In the hysterical patient you will generally find the same thing in most of your experiments, but it may occasionally happen that the raised limb keeps the position you have given it for some time after you have let it go. The paralysis will have temporarily disappeared. This characteristic, which is always absent in organic hemiplegia, is of the utmost importance from the diagnostic point of view.

The following test affords a further illustration. Support the paralysed limb with the hand and raise it to a certain height; the inert limb, in obedience to the laws of gravity, will give the hand on which it rests a feeling of weight, and will produce a static effort which will always be the same in the case of the patient with organic hemiplegia, while on the contrary in hysteria it will be liable to variations, and may even completely disappear for some time (25).

It is also the same with pure hysterical contractures, which we have always regarded as essentially intermittent. If a sudden examination is made of a limb affected with this sort of contracture, and which had formerly resisted every effort to overcome it, the vicious attitude is sometimes reduced without using any force. This test requires a certain rapidity and abruptness, so that the patient has no time to collect himself: a sudden attack, so to speak, is made upon him. For this reason our friends are in the habit of giving the name of "the sign of the panther" to the correction of the vicious attitude obtained by this method. It may even be possible to see the contractured tendons and muscles stand out under the skin, when we come near the patient, as if he were on his guard, and then to notice that they relax as soon as we go away or another limb is chosen for examination.

All these intrinsic characters give hysterical contractures and paralyses an individuality which enable them to be recognised with almost complete certainty, but

it is not always possible to find them. What other means are available for establishing a diagnosis of hysteria in their absence ?

In the course of this work we have repeatedly shown that owing to the frequent association of hysteria and organic disease it was impossible to attach much importance to the presence or absence of stigmata. We will not return to this question, which has already been sufficiently discussed (*v.* p. 48).

In our opinion it is impossible to be guided by the existence of an *interval* between the occurrence of the trauma and the appearance of the nervous symptoms. There are, in fact, organic nervous symptoms which do not develop until some time after the trauma which caused them. This is frequently the case in hæmatomyelia, due to a shell explosion—a wounded man being able to walk to the aid post four or five hundred yards away, but as soon as he gets there he will be struck down by paraplegia and be unable to move from the stretcher. The interval is not always so short; in a case of hæmatomyelia of the same origin, motor symptoms consisting in quadriplegia did not appear till three days after the trauma, and were at first preceded by a simple asthenic condition, which allowed the patient to join up with his company (Léri, Froment and Mahar (222)).

Thus the hysterical nature of a phenomenon cannot be established by the prodromal circumstances, the existence of an interval, or even by neuropathic antecedents. At most they help to form a presumption which is often misleading. To avoid mistakes it seems best not to attach much importance to them.

In dealing with a nervous disorder which does not possess those characteristic features which justify its being attributed at once to hysteria, the diagnosis can be made only by exclusion. It can be established only by negative characters, or *the absence of the objective signs which characterise organic or physiopathic affections of the nervous system*, and whose value has been definitely settled.

It should be stated, however, that though the presence of such signs may enable one to establish with certainty the organic nature of a paralysis or contracture, their absence does not allow us to assert categorically that it is a case of hysteria, though such a diagnosis is very probable. There are, indeed, good reasons for supposing that in addition to the objective signs which we know there are others unknown to us at present, the discovery of which will one day enable us to separate from hysteria those conditions at present attributed to it.

In discussing the problems in diagnosis which occur most frequently in medical practice, we will describe the objective signs which have been in part discovered or recommended by one of us (61), and enable a distinction to be made between organic and hysterical paralysis.

Organic Hemiplegia and Hysterical Hemiplegia

We have drawn up a table of the motor symptoms, distinguishing organic hemiplegia from hysterical hemiplegia (25).

Organic hemiplegia.	*Hysterical hemiplegia.*
1. The paralysis is limited to one side of the body.	1. The paralysis is not always limited to one side of the body. This particularly applies to paralysis of the face, in which the symptoms are generally bilateral.
2. The paralysis is *not systematic*, e. g., if unilateral movements of the face are very much weakened, this weakness appears quite as distinctly on the hemiplegic side during the execution of	2. *The paralysis is sometimes systematic.* It is almost always so in the face, *e. g.*, unilateral movements of the face may be completely abolished, while the muscles on the hemiplegic side act nor-

synergic bilateral movements.

3. The paralysis affects the conscious and voluntary movements as much as the unconscious or subconscious voluntary movements, giving rise to the *platysma sign* (more energetic contraction of the platysma on the sound side in the act of opening the mouth or bending the head in opposition to the resistance which the observer makes to this movement), *combined flexion of the thigh and trunk*, and in walking the *absence of active swinging of the arm*, as contrasted with the exaggeration of passive swinging (the limb swaying to and fro like a lifeless object when the patient suddenly turns round).

4. The tongue is usually slightly deviated to the side of the paralysis.

5. There is, chiefly at the onset, muscular hypotonus, which may be shown in the face by obliteration of the naso-labial fold and the lower-

mally during the execution of synergic bilateral movements.

3. The unconscious or subconscious voluntary movements are not affected; with the result that there is an absence of the platysma sign, and of combined flexion of the thigh and trunk; active swinging of the arm may be absent, but there is no exaggeration of the passive movement.

4. The tongue is sometimes slightly deviated to the side of the paralysis, but the deviation may be very pronounced or be directed to the opposite side to the paralysis.

5. There is no muscular hypotonus. When there is facial asymmetry, it will be found to be due not to muscular hypotonus, but to spasm; the sign of ex-

SIGNS OF ORGANIC HEMIPLEGIA

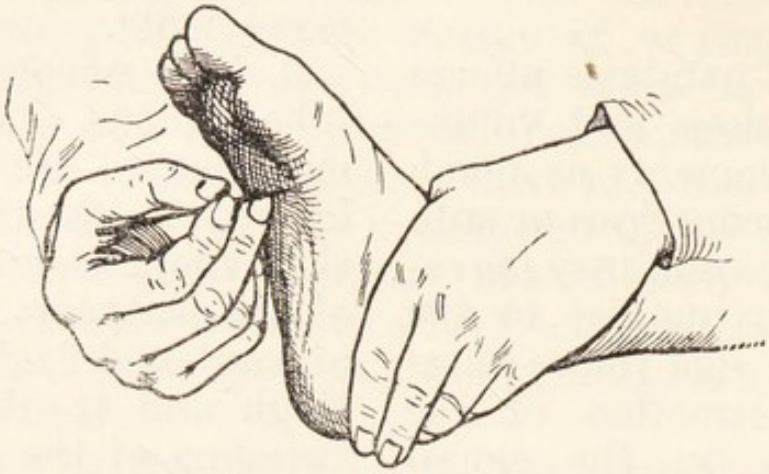


FIG. 16.—Normal plantar cutaneous reflex.

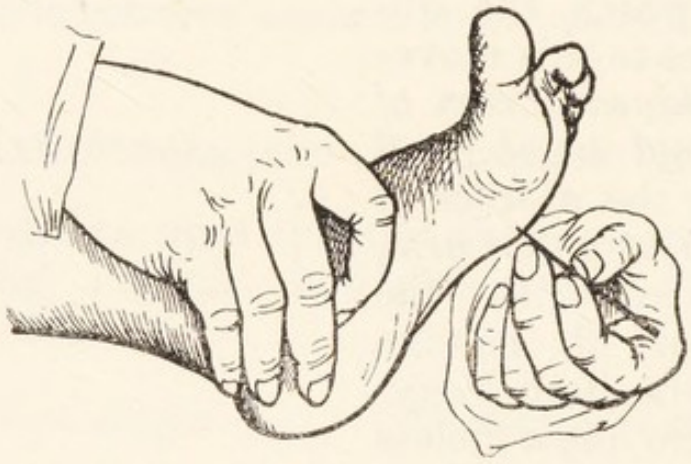


FIG. 17.—Extensor response (Babinski) (165, 167).

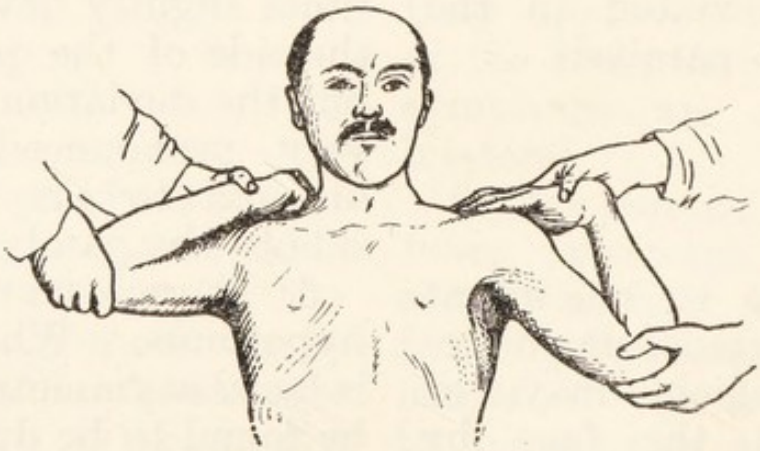


FIG. 18.—Exaggerated flexion of the forearm in right hemiplegia (Babinski) (166).

SIGNS OF ORGANIC HEMIPLEGIA (*continued*).

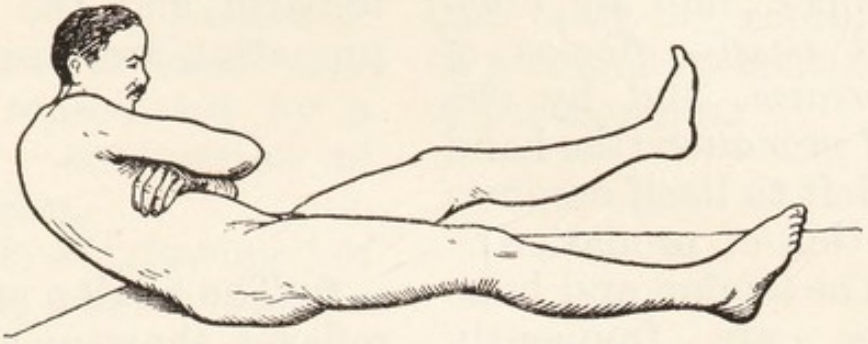


FIG. 19.—Combined flexion of the thigh and trunk in left hemiplegia (Babinski) (168).

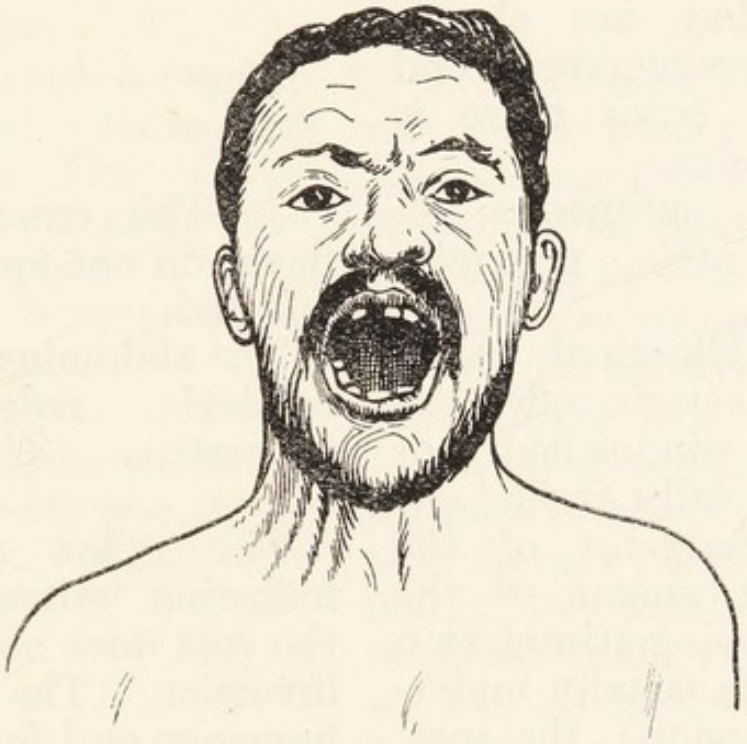


FIG. 20.—Platysma sign in left hemiplegia.

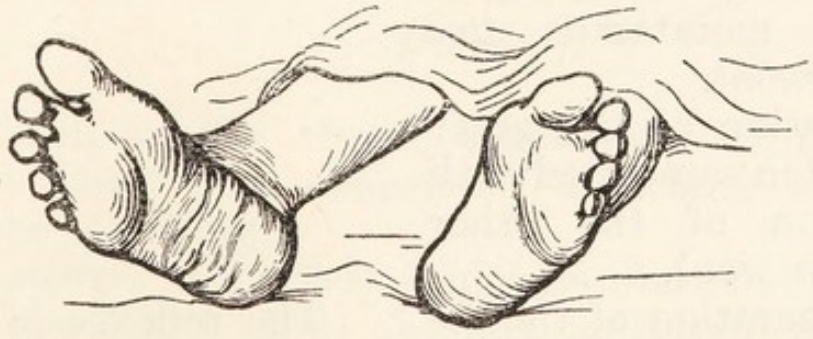


FIG. 21.—Abduction of the toes associated with combined flexion of the thigh and trunk in right hemiplegia (Babinski) (171).

ing of the eyebrow, and in the upper limb by *exaggerated passive flexion of the forearm*, and by the *sign of pronation* (the hand when left to itself assumes a position of pronation).

aggerated flexion of the forearm and the sign of pronation are absent.

6. The tendon and bone reflexes are frequently affected at the onset, when they may be lost, diminished or exaggerated. Later, they are almost always exaggerated, and in many cases there is ankle clonus.

6. The tendon and bone reflexes show no change : there is no ankle clonus.

7. The cutaneous reflexes are generally affected.

The abdominal reflex and cremasteric reflex are usually diminished or lost, especially at first.

7. The cutaneous reflexes do not appear to be affected.

The abdominal and cremasteric reflexes are normal.

The character of the reflex movement of the toes following stimulation of the sole usually undergoes inversion ; the toes, and especially the great toe, instead of being flexed, become extended on the metatarsus (*toe phenomenon*).

Extension of the great toe is often associated with abduction of the other toes (*fan sign*).

The reflex movement following stimulation of the sole does not undergo inversion. The toe phenomenon and fan sign are absent.

Exaggeration of the reflexes of defence may sometimes be noted.

The reflexes of defence are not exaggerated.

8. The form of contracture has particular characteristics and cannot be reproduced by a voluntary contraction of the muscles.	8. The form of contracture may be reproduced by a voluntary contraction of the muscles.
There is a "clawing" of the hand, which gives the sensation of an elastic resistance automatically increased during passive movements of extension of the fingers.	
9. The course is regular, contracture succeeding flaccidity. The disappearance of the motor disturbance, when it does take place, is progressive.	9. The course is capricious; the paralysis may remain flaccid indefinitely, or it may be spastic from the first; spastic phenomena are sometimes associated with paralysis, especially in the face.
The paralysis shows no tendency to become better and worse alternately (*permanence of motor troubles*).	The symptoms are frequently liable to subside and to get worse alternately, to become rapidly modified in their intensity as well as in their form, and to present transitory remissions which may last only a few moments (*variability of motor troubles*).

In addition to the above, other signs of organic hemiplegia have been described, of which we will mention the following—

10. *Raimiste's sign* (239), which is observed in the period of flaccidity. It is obtained as follows: Place the paralysed forearm and hand in a vertical position, with the elbow resting on a table. It will be found

that if the hand be left to itself, it will become rapidly flexed and at the same time pronated.

11. The *interossei phenomenon* described by Souques (242): movement of extension and abduction of the fingers whenever the patient raises the affected arm.

12. *Klippel and Weil's sign* (214): involuntary flexion of the thumb accompanying passive straightening of the flexed fingers (in the period of contracture).

13. The *tibialis anticus phenomenon* (Strümpell): an associated movement of dorsal flexion and adduction of the foot caused by voluntary flexion of the affected limb.

14. *Associated adduction and abduction* of the paralysed lower limb (Raimiste) observed in the patient lying on his back when he makes an energetic effort to adduct or abduct the sound limb against resistance.

15. *Various associated movements* which according to P. Marie and Foix (227) may be divided into the three following classes: *general synkinesis* (general contraction of all the muscles of the hemiplegic side on the occurrence of any effort), *imitation synkinesis* (involuntary movements of the hemiplegic side tending to reproduce the movements carried out voluntarily by the sound side), and *co-ordination synkinesis* (voluntary contraction of certain muscular groups in the paralysed limb giving rise to involuntary contraction of the functionally synergic muscles).

16. *Neri's sign* (237): flexion of the knee, accompanying flexion of the trunk on the paralysed side.

17. The *dorsal reflex of Mendel-Bechterew* (185), or dorso-cuboid reflex: flexion of the toes of the paralysed subject produced by percussion of the latero-dorsal surface of the cuboid, an opposite movement to that which occurs normally. This interesting phenomenon is associated with exaggeration of the tendon reflexes.

18. *Reflex hyperkinesis* (Claude) (194). Painful stimulation by pricking, pinching, or pressure of the muscles sometimes causes reflex movements in the paralysed upper limb.

19. The *reflex of adduction of the foot* (Raichline, P. Marie and H. Meige) obtained by stimulation of the skin on the inner border of the foot.

It should be noted that none of these signs is constant; the majority even may be absent in ill-developed organic hemiplegia, especially, it appears, when there is a traumatic cortical lesion.

Organic Paraplegia and Hysterical Paraplegia

It is mainly by the *absence of the objective signs* peculiar to organic paraplegia that hysterical paraplegia is recognised. These signs vary according to the seat of the lesion. They are as follows—

1. *Changes in the tendon reflexes.*—If the lesion is in the dorsal region, there is generally an exaggeration of the tendon reflexes of the lower limbs, accompanied sometimes by ankle clonus and patellar clonus. If the lesion is in the cervical region, in addition to exaggeration of the tendon reflexes in the lower limbs, there may be modifications in the reflexes in the upper limbs. According to the position and extent of the anatomical changes the reflexes may be all exaggerated, diminished or lost, or some may be lost and the others preserved or exaggerated (inversion of the radius reflex, paradoxical reflex of the elbow). Lastly, if the lesion is in the lower part of the cord or in the cauda equina, the tendon reflexes of the lower limbs are generally weakened or abolished.

2. The *toe phenomenon*, a characteristic sign of a disturbance of the pyramidal tract.

3. *Exaggeration of the reflexes of defence* which has the same significance as the preceding symptom. It can be best exhibited as follows: The skin of the dorsal aspect of the foot or lower part of the leg is vigorously pinched. When stimulation of this kind produces *dorsal* flexion of the foot, one is justified in asserting that the reflexes of defence are exaggerated (180). This mode of reaction is never found when the pyramidal tract is intact. Normally, this movement can only be

caused by stimulation of the sole, and even then it is less extensive and less sustained than in pathological conditions.

4. *Amyotrophy with reaction of degeneration* when the grey substance of the anterior cornua or the anterior roots have been affected.

5. *Sphincter troubles.*

6. *Trophic cutaneous* changes, including bed-sores. All these signs are invariably absent in hysterical paraplegia.

Peripheral Neuritis and Hysterical Paralysis

Generally speaking, the diagnosis is easy. There are several obvious signs peculiar to neuritis, which are never found in hysterical paralysis, viz.—

1. *Diminution or abolition of the bone and tendon reflexes*, e. g., of the ankle jerk in lesions of the sciatic nerve, of the knee jerk in lesions of the anterior crural, of the reflex of flexion of the forearm in lesions of the musculo-cutaneous, and of the triceps in injuries to the upper part of the musculo-spiral. In the last case flexion of the forearm instead of extension is sometimes observed on percussion of the triceps tendon (paradoxical reflex of the elbow).

2. *Muscular atrophy*, which should be taken into consideration only when it is sufficiently pronounced, as slight amyotrophies may exceptionally be found in hysterical paralysis.

3. *Complete or partial reaction of degeneration.*—But it must not be forgotten that even in cases of nerve section it is barely established before the eighth or tenth day.

4. *Hypotonus.*

5. Exclusive localisation of motor troubles, degenerative amyotrophy and sensory troubles in an area exactly corresponding to the anatomical distribution of one or more nerves (*peripheral topography of motor, trophic and sensory troubles*).

The attitude of the limb affected by peripheral

paralysis and the changes which this causes in its ordinary movements are often sufficiently characteristic. The present circumstances have no doubt made certain deformities, *e. g.*, the wrist-drop of musculo-spiral paralysis and the clawhand of ulnar paralysis, an everyday affair, and given rise to hysterical paralyses which resemble them, but the imitation is never a close one.

It is possible, for instance, to simulate inability to extend the fingers on the hand, and the hand on the forearm, but a simulator is unable to dissociate purposely the contraction of the muscles of the anterior region of the arm (biceps and brachialis anticus) from that of the supinator longus, as is done involuntarily by a patient with musculo-spiral paralysis during an energetic movement of flexion at the elbow. The associated flexion of the wrist accompanying energetic flexion of the fingers is also an interesting feature, as one of us has shown; it indirectly reveals the relative weakness of the extensors and the predominance of the flexors. The importance of this symptom lies in the fact that it may be observed in patients who have only a slight lesion which does not prevent extension of the hand on the forearm.

The mere study of certain morphological peculiarities in the affected limb in repose and during various movements will enable one to recognise infallibly peripheral neuritis. We think it advisable to dwell on this question, which has been brought into prominence again by the neurology of war, and to show some definite examples of what may be regarded as characteristic changes in form. We shall then consider different movements of the hand and fingers in succession.

When the thumb is adducted and applied close to the outer border of the index it normally forms two obtuse angles of about 160°; the upper angle opens outwards, its sides corresponding to the outer border of the forearm and first metacarpal, while the lower angle opens inwards and faces the palm of the hand,

being formed by the first metacarpal, the first phalanx of the thumb, and the extended second phalanx.

This outline of the adducted thumb is altered in ulnar and median paralysis, but its change in appearance differs entirely according to which of the two nerves is involved by the lesion.

AFFECTED SIDE. SOUND SIDE.

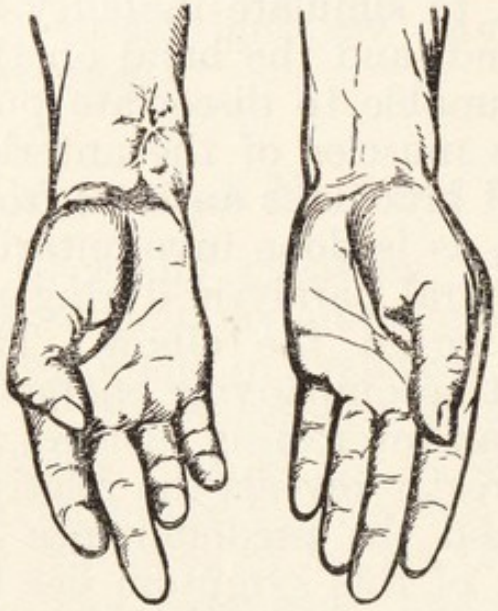


FIG. 22.—PARALYSIS OF THE RIGHT ULNAR. When the patient adducts the thumb, the radio-metacarpal and metacarpo-phalangeal angles disappear on the side of the ulnar paralysis and the second phalanx of the thumb becomes flexed.

AFFECTED SIDE. SOUND SIDE.



FIG. 23.—PARALYSIS OF THE RIGHT MEDIAN, with adduction of the thumb. The radio-metacarpal and metacarpo-phalangeal angles are more pronounced and come nearer to a right angle on the side of the paralysis than on the sound side.

In paralysis of the ulnar, when the thumb is adducted, the metacarpal becomes flexed and the first phalanx extended, causing a disappearance of the two angles (the lower angle even tends to be sometimes hyperextended); on the other hand, the flexion of the second phalanx which always accompanies this kind of adduction leads to the formation of another angle (Figs. 22 and 24). This peculiar appearance is explained in cases of paralysis of the adductor pollicis by a supplementary adduction pro-

duced by the extensor longus, and which appears to involve the synergic contraction of the flexor longus pollicis.

In paralysis of the median the outline of the adducted thumb is quite different (*v.* Fig. 23). The second phalanx remains extended as in the normal condition, and instead of disappearing the two angles become more pronounced and come nearer to a right angle (predominant action of the adductors and extensors after paralysis of the adductor brevis).[1]

Abduction of the thumb is not affected in ulnar paralysis, but it is abnormal in paralysis of the median: the second phalanx of the thumb cannot be extended, and the metacarpo-phalangeal angle, which normally disappears in this movement, is almost as marked as in adduction. In musculo-spiral paralysis this movement is impossible, and is replaced by a movement of opposition either to the index or to the ring finger when the abductor brevis is paretic (as is sometimes seen in pure musculo-spiral paralysis).

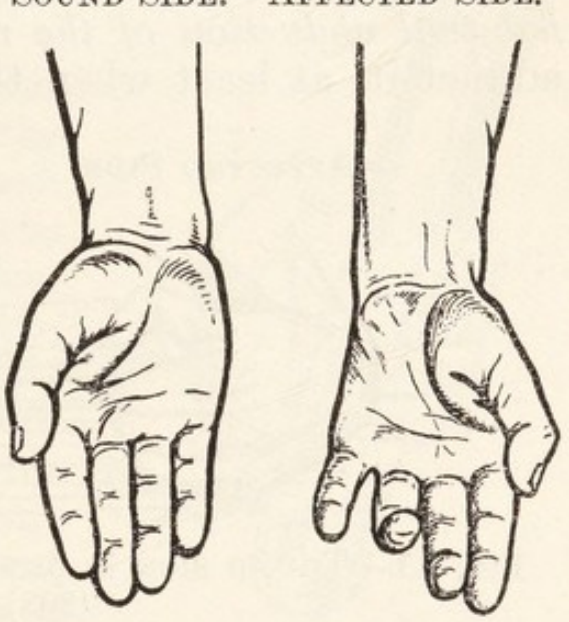


Fig. 24.—Paralysis of the left ulnar: the patient is trying to bring the fingers together, but the left *little finger* remains *abducted*, and the second phalanx of the thumb becomes flexed as in Fig. 22.

[1] This characteristic deformity of the thumb in paralysis of the median nerve has been very fully described by Létievant (226), in whose *Traité des Sections Nerveuses* we recently found the following description: "Deformity of the thumb characterised by marked projection outwards of the head of the first metacarpal; a depression above corresponding to the atrophied abductor brevis and opponens pollicis, and an internal rotation of the whole thumb, caused by the contraction of the adductor so that its palmar surface looks directly forwards" (p. 36, *v.* also p. 37).

When a patient with paralysis of the median endeavours to make a movement of *opposition*, he can only carry out a pseudo-opposition : the thumb is not separated from the palm or is separated insufficiently, and does not face the hand ; it still keeps the same outline, but in addition to the upper and lower angles already mentioned there is a new angle caused by flexion of the last phalanx when the flexor longus is not paralysed.

As regards the other fingers, one may consider that *habitual abduction of the ring finger* with inability to adduct it, at least when the patient does not flex the

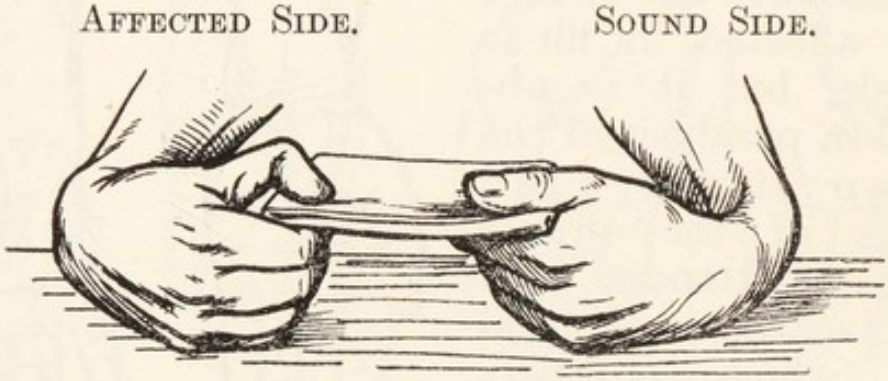


Fig. 25.—Thumb sign in paralysis of the right ulnar (Froment) (203), (204).

first phalanges, is one of the most constant and characteristic signs of ulnar paralysis (*v.* Fig. 24).

Lastly, it is often advisable in estimating the degree of mobility of a limb to make it execute *ordinary automatic* actions, such as *grasping movements*. In paralysis of the ulnar (with loss of power of the adductor) the vigorous grasp of a thin object, such as a newspaper or a piece of cardboard, between the thumb and index, bent beneath it, does not take place normally (first phalanx flexed, second phalanx extended or barely flexed, thumb approximated to the base of the index and directed towards its inner border). The thumb is doubled up and the grasp is made with the tip of the finger ; the first phalanx is extended, the second flexed, and the thumb is often brought to the extremity of the index and directed towards its

outer border (*v.* Fig. 25). These peculiarities are explained by the adoption of another mode of prehension and by the predominant action of the abductor brevis. This is known as the *thumb sign* (Froment) (203).

In paralysis of the median, on the contrary, the deformity is best shown by grasping a rather thick object, like a cylinder or a glass, when the thumb strikes against the object and does not grasp it.



FIG. 26.—ABNORMAL GRASP IN A CASE OF LEFT MEDIAN PARALYSIS. Owing to the inability to oppose, the thumb is pushed against the cylinder and does not grasp it.

We may add that *unipolar faradisation* in paralysis of the median and ulnar may cause a *paradoxical extension* of the hand when the negative electrode is applied to the antero-inferior part of the forearm, whereas bipolar faradisation causes flexion. The latter indicates the predominant action of the extensors, and enables one to detect even a slight weakness of the flexors of the hand (183).

Unipolar faradisation of the postero-superior surface of the forearm causes, on the other hand, a *paradoxical flexion* of the hand in musculo-spiral paralysis even when the faradic excitability of the musculo-spiral nerve does not appear appreciably affected (184). The reason is that as the electrical stimulus is applied to the median and ulnar at the same time as the musculo-spiral, the action of the flexors is stronger than that of the extensors. This sign may serve to detect an incomplete musculo-spiral palsy, such as may occur from the use of crutches.

We may add that Raimiste's test for the diagnosis of organic hemiplegia may also be used for the diagnosis

of musculo-spiral paralysis (H. Meige, Froment and Hoven).

These diagnostic points, in addition to those which we have previously described, will always enable hysterical paralysis to be distinguished from paralysis due to a lesion of a nerve trunk.

Diagnosis of Reflex Paralysis from Organic Paralysis

Reflex paralyses, with or without contracture, are localised in the injured limb, and consequently never assume the form of hemiplegia or paraplegia, unless there are multiple traumata. There is thus a whole series of cases in which it is possible to eliminate at once the hypothesis of reflex paralysis. In this respect the diagnosis of reflex paralysis from organic paralysis is easier than that of hysterical paralysis from organic paralysis, or at least its field is more limited.

But, on the other hand, reflex paralyses and contractures may show exaggeration of the tendon reflexes, considerable amyotrophy, hypotonus, vasomotor and thermal disorders, changes in the electrical and mechanical excitability of the muscles, phenomena which belong to the symptomatology of the organic affections of the nervous system and are absent in hysterical paralysis. From this point of view the diagnosis is more difficult, and in some cases errors are more likely to occur.

After these preliminary remarks we will discuss the various problems which may arise.

Monoplegia associated with a Lesion of the Pyramidal Tract. Reflex Contracture and Paralysis

Apart from the etiological factors, which are entirely distinct in these two conditions and thus form a most important guide, the following form the data for diagnosis—

Organic monoplegia of central origin.	*Reflex contracture and paralysis.*
1. The paralysis often occupies the whole limb; it may be complete, either in the upper or lower limb.	1. The paralysis hardly ever occupies the whole limb. In the upper limb as a rule only the movements of the fingers and hand are affected, and as a rule the paralysis is not complete. In the lower limb the root of the limb is often affected, but here, too, the paralysis is only partial.
2. Flaccid paralysis which lasts only a few weeks is usually followed by contracture.	2. The paralysis may remain flaccid for a long time. It frequently coexists with contracture, the hypertonus and hypotonus occupying different muscular groups.
3. In paralysis with contracture flexion with clawhand is the type seen in the upper limb, and in the lower limb the extensor type; the patient circumducts his leg in walking (*helicopodal gait*).	3. The deformity of the upper limb in the hypertonic forms often presents a peculiar appearance, e.g., *accoucheur's hand*, *holy-water-vessel hand*, and *crowded fingers*. In regard to the lower limb, the attitude and gait vary, but the patient never circumducts his leg in walking.
4. The tendon reflexes are exaggerated some weeks after the onset of the paralysis. Exaggeration of the reflexes necessarily accompanies the contracture.	4. The condition of the tendon reflexes varies. Exaggeration is often absent, even in hypertonic forms.

5. The plantar cutaneous reflex is generally affected in crural monoplegia : the extensor response is found.

5. In paralysis of the lower limb the cutaneous reflex may be lost, but it reappears after the foot has been warmed; the extensor response is never found.

Peripheral Neuritis. Reflex Contracture and Paralysis

The etiological factors are the same in both conditions, if traumatic neuritis, which is the commonest in the neurology of war, is only considered. The following characteristics enable a distinction to be made between the two affections—

Peripheral neuritis.	*Reflex contracture and paralysis.*
1. It is the rule for the motor and sensory disturbances and degenerative amyotrophy to be localised in an area exactly corresponding to the anatomical distribution of one or more nerves (*neuritic topography*).	1. The localisation of the motor and sensory disturbances and degenerative amyotrophy does not correspond to any anatomical area (*more or less segmentary topography*).
This is the cause of the deformities and attitudes described above.	The deformities and attitudes are typical.
2. *Amyotrophy is very pronounced.* The muscular prominences disappear, and certain regions of the limb become emaciated.	2. Amyotrophy variable, usually fairly marked, but never reaching the degree of intensity seen in neuritis.
3. *Reaction of degeneration*, and especially great weakness or abolition of	3. *No reaction of degeneration.* The faradic muscular excitability

the faradic muscular excitability.	never shows marked weakening, but is often normal, and sometimes even exaggerated.
4. The tendon reflexes corresponding to the muscular distribution of the affected nerve are diminished or lost.	4. When the tendon reflexes are affected, they are generally exaggerated; they are never abolished.

Volkmann's Ischæmic Paralysis and Reflex Paralysis

Volkmann's ischæmic paralysis or contracture (189), an affection also called retractile myositis, which chiefly occurs in the child of five to ten years of age, but which may also be observed in the adult, generally follows the application of too tight a splint in fractures of the forearm. In typical cases the long flexors of the fingers and the pronators are affected. It is preceded by intense pain and œdema. It gives rise to a more or less marked limitation of the movements of the hand and fingers, fibrous retractions which form rapidly, sensory disorders of a segmentary distribution (glove anæsthesia), hypothermia, and occasionally a modification in the colour of the forearm (red coloration).

The symptomatology of this affection thus obviously resembles that of reflex paralyses and contractures in some respects.

The principal features by which the two conditions can be distinguished, apart from their etiology, are the board-like hardness of the muscles and the remarkable diminution, or even absence, of faradic and voltaic muscular excitability, which are present in Volkmann's ischæmic paralysis, and are absent in reflex paralysis and contractures.

Arterial Obliteration and Reflex Vascular Spasm

When arterial obliteration is accompanied by attacks of characteristic intermittent claudication and gangrene, or in those cases in which it is situated in the upper limb when it is revealed by a disappearance of the radial pulse—phenomena which are always absent in reflex spasm—the diagnosis is perfectly obvious. If, in addition to the vascular spasm, the motor disturbances previously described appear in a characteristic and fully developed form, no mistake can possibly be made : the case is one of reflex nervous disorder, arterial obliteration never showing a symptomatology of this kind.

But there are cases in which the diagnosis may be doubtful. Take, for instance, the case of a patient, one of whose lower limbs is colder than the other, the coloration of the skin being red and cyanotic in places. There is no paralysis properly speaking, but the movements of the foot are a little less energetic on the affected side than on the normal side, and there is a state of paresis which renders walking any distance impossible.

The pulsations of the dorsalis pedis and posterior tibial arteries are imperceptible, thus preventing estimation of the blood-pressure by the method of Riva-Rocci and Vaquez. Pachon's oscillatory method does not give precise information either, for it is impossible to distinguish the first increasing oscillation or the last of the large oscillations, when the pointer does not cover more than two or three divisions of the dial in its maximum excursion.

In cases of this kind hesitation is natural, but the problem may be settled by the hot-bath test. The affected limb is plunged into water at 40° C. for ten minutes ; if the case is one of muscular spasm, the pulsations of the dorsalis pedis reappear, and the amplitude of the oscillations increases considerably,

even rising from 1° to 7°, while in the case of arterial obliteration there is no obvious change. This very simple test enables one to distinguish arterial obliteration from vaso-motor spasm, whether of reflex or central origin (Babinski and Heitz) (142).

Late Tetanus and Reflex Contracture

Bérard and Lumière (186), Montais (232), and Courtois-Suffit and Giroux (196) have recently shown that *tetanus* may be manifested by late contractures which develop after the wound has cicatrised (cicatricial tetanus), and become localised and confined more or less closely to the wounded limb (monoplegic form). Such cases as a rule only occur in patients who have had serum treatment. Some of them are not accompanied by trismus at any stage.

Unless care be taken, contractures of this kind may be confounded with reflex or hysterical contractures.

The following is a general account of the characters by which localised tetanic contracture can be recognised—

1. The contracture is *intense:* it cannot be altered by passive movements without causing severe pain, and even then it is difficult to modify it to any extent. "These contractures, which are persistent from the first," write Courtois-Suffit and Giroux, "feel on palpation like a *wooden limb.* As a rule there is a very painful contracture of the whole limb; in Routier's case the thigh was flexed on the pelvis, and the leg on the thigh with the toes strongly flexed, and all the muscles were rigid. In Laval's case the contracture, which had started in the foot and gradually extended to the leg, next day gained the whole limb, which as a result of the generalised contracture was in a position of forced extension, the foot, leg and thigh forming a rigid whole welded to the pelvis like a *bar of iron.*"

2. Extremely painful paroxysmal muscular con-

tractions may be observed resembling the spasm seen in the ordinary form of tetanus, and differing from them only by being confined to the wounded limb. The essential feature of these cramps is that they are provoked by any external cause. The attack begins with a very severe pain, generally starting in the cicatrised wound, and consists in clonic movements which recur at frequent intervals. These localised convulsions are hardly ever absent, being nearly always present at the beginning of the attack, but as a rule they recur at every stage of the disease, and constitute the principal symptom.

3. The contracture of late tetanus is generally not of long duration. It hardly ever lasts more than two or three months, and even that is exceptional.

As a rule there is a slight rise of temperature. The combination of these symptoms is sufficient to exclude the diagnosis of reflex contracture, and of hysterical contracture as well.

Diagnosis of Reflex Paralysis from Hysterical Paralysis

In the first part of the book we described in detail the signs peculiar to hysterical paralysis and contracture on the one hand, and to reflex paralysis and contracture on the other. To avoid needless repetitions we will confine ourselves to giving in tabular form the essential differences between these two classes of nervous disorders.

Reflex contracture and paralysis.	*Hysterical contracture and paralysis.*
1. Paralysis generally *limited* but *profound* and *persistent* even when submitted to methodical treatment.	1. Paralysis generally *extensive,* but *superficial* and *transient* when properly treated.

2. The attitude of the limb in the hypertonic forms *does not correspond to any natural attitude.* The general appearance of certain clinical types is characteristic.	2. The attitudes seen in hysterical contractures usually correspond to *natural attitudes which have become fixed.* Deformities may be observed resembling those characteristic of reflex contractures, but the imitation is imperfect.
3. Amyotrophy usually fairly marked and of rapid development.	3. Amyotrophy is usually absent, even when the paralysis is of long standing, and when present it is poorly developed.
4. *Vaso-motor and thermal disturbances are often very marked,* and are accompanied by an occasionally very pronounced reduction in the amplitude of the oscillations as measured by an oscillometer.	4. There may be thermo-asymmetry, but it is very slight. There are no definite vaso-motor symptoms or modifications in the amplitude of the oscillations.
5. Occasionally very marked hyperidrosis.	5. No definite hyperidrosis.
6. Tendon reflexes often exaggerated.	6. Never any change in the tendon reflexes.
7. Hypotonus sometimes very pronounced, and in paralysis of the upper limb "swinging hand."	7. No hypotonus.
8. Mechanical muscular hyperexcitability often accompanied by slowness of the contraction.	8. No mechanical muscular hyperexcitability.
9. Fibro-tendinous retractions developing rapidly (except in the com-	9. Hysterical paralysis, whether flaccid or with contracture, is generally

pletely flaccid forms, which are rare).	not accompanied by retractions even when it is of long duration. It is even a question whether their appearance does not require the addition of a factor which has nothing to do with hysteria.
10. Trophic disorders of the bones, hair and skin.	10. No trophic disorders.

The recent acquisitions of semeiology thus enable us to make a definite distinction between reflex nervous phenomena and pithiatic disorders.

Hystero-organic, Hystero-reflex and Organo-reflex Associations

Paralyses and contractures due to lesions of the nervous system are distinguished by special objective features, and it is by means of objective features which are absent in hysteria that motor disturbance of a reflex character can be recognised. If each of the various affections which give rise to paralyses and contractures were always to be found by itself, the diagnosis would be relatively easy, but it is far from being so. Morbid associations are, indeed, very common, and tend to complicate the problem.

How is it possible to recognise that there is an association and then to determine the share of each of the constituent elements? It seems to us to be impossible to draw up a formula enabling the question always to be answered correctly. We must confine ourselves to giving a few general indications which may serve as a guide to medical men who are not specialists.

We may remark, in the first place, that to attain the end in view it is essential to know exactly the intensity, extent and evolution of the lesions which may be produced by any given injury of the nervous system,

and to bear in mind what may be called *symptomatic incompatibilities*. But instead of dealing with this question in the abstract we think it best to choose some special examples, and to show in a concrete way the diagnostic criteria of which the clinician can avail himself.

Take a patient who has suffered for three months from hemiplegia which developed suddenly; the paralysis is complete, or almost complete; it is flaccid, and the tendon reflexes are only slightly exaggerated; stimulation of the sole is followed by extension of the great toe. The presence of the last sign indicates a lesion of the central nervous system affecting the pyramidal tract. But it may be asserted at the same time that the motor disorders are only partially due to the organic disturbance, inasmuch as a hemiplegia of sudden onset and of such intensity lasting for three months should be accompanied by a much more pronounced exaggeration of the tendon reflexes and contracture, if it was due to a pyramidal lesion only. This is an example of symptomatic incompatibility which justifies us in concluding that it was a case of hystero-organic association.

Let us take a few examples of various types of associated disorders selected from the neurology of war and relating to patients suffering from paralysis following wounds of the limbs.

A soldier was hit by a piece of shrapnel in the left supraclavicular region, and developed a complete paralysis of the upper limb which was of more than a month's duration at the time of our examination. Electrical exploration showed a very marked reaction of degeneration in the muscles innervated by the musculo-cutaneous nerve, and diminution of electrical excitability in the muscles innervated by the musculo-spiral; on the other hand, the electrical excitability was normal in the muscles supplied by the circumflex, ulnar and median. There were no vaso-motor symptoms. These findings suggested an *hystero-organic association*, and we were immediately able to confirm

this hypothesis. We declared that electrical treatment was bound to bring about an almost complete cure, and in conformity with this assertion the patient, after being subjected for a few months to induced currents, was able to work all the muscles of which the faradic contractility was normal; thus he was able to raise the arm, flex the wrist and fingers, close the hand, and extend the hand and fingers. Flexion of the forearm remained the only difficult movement, which was easily explained by the reaction of degeneration in the muscles on the anterior aspect of the upper arm; the partial execution of this movement was also explicable, and was due to the action of the supinator longus.

Another patient after a wound in the axilla developed paralysis with R.D. of the circumflex, musculo-cutaneous and musculo-spiral; he was also unable to carry out any movement of flexion of the hand and fingers, and yet the electrical excitability of the muscles on the anterior aspect of the forearm was normal at the time of examination, *i. e.*, three months after the onset of the symptoms; there were no vaso-motor troubles. There was every reason for supposing that this paralysis was entirely psychical, and as a matter of fact it was possible to make it disappear in a few moments by purely psychotherapeutical methods.

In other cases, the same muscular group may be at once the seat of an organic paralysis due to a lesion of the nerves, and a psychical paralysis grafted on the latter and aggravating the disturbance of function.

Lastly, the hysterical paralysis may be associated with the organic paralysis in an exceptional manner, the organic symptoms, as in the cases which we describe below, being preceded by hysterical symptoms (*v.* p. 218). The term *organo-hysterical association* was recently proposed by one of us to distinguish cases of this kind from the ordinary type of association (68).

A patient wounded in the upper part of the forearm showed the following symptoms : in the first place, in the distribution of the ulnar nerve, a paralysis with

reaction of degeneration of the hypothenar muscles, adduction of the thumb and interossei, and, secondly, an incomplete paralysis of the muscles of the hand innervated by the median and a paresis of the extensors and flexors of the fingers. These last muscles did not show R.D., but their mechanical excitability was exaggerated and the contraction caused by percussion was slow. Moreover, the whole of the hand, irrespective of the nervous territory involved, was cyanosed and cold. This was an example of an organo-reflex association and not of an hystero-organic one.

We will now take a few examples relating to the association of reflex motor disturbances with hysterical or pithiatic phenomena (*hystero-reflex association*).

As a result of a wound in the left leg a soldier presented a remarkable gait, which constituted a form of rhythmic chorea; at every step he bent his knees as if he were going to sit down, and then he raised himself again. But he also showed vaso-motor and thermal disturbance of the left lower limb, mechanical hyper-excitability of the small muscles of the foot and loss of the plantar cutaneous reflex with its transitory re-appearance under the action of heat. Such symptoms can hardly be explained except by the association of hysterical manifestations with reflex nervous disorders, and, as a matter of fact, counter-suggestion rapidly cured the disturbance of gait which was due to hysteria, but it had no action on the vaso-motor or thermal troubles, nor on other symptoms of the same kind observed in the wounded limb.

In the cases which we have just described the clinical problem was extremely simple, as it was very easy to distinguish the influence of each of the two factors in this association.

Another soldier developed complete brachial monoplegia after the lower part of the forearm had been perforated by a projectile without, however, causing any lesion of the nerves or vessels. All the movements of the different segments of the limb were abolished. The hand and forearm were slightly atrophied and

presented a salmon-red coloration. The temperature of these areas was 3°–4° C. lower on the affected side than on the sound side. The oscillations measured in the forearm with Pachon's sphygmometer were half the size of those on the sound side, but the systolic pressure (Riva-Rocci-Vaquez) was normal. There was mechanical muscular hyperexcitability and slight exaggeration of the osso-tendinous reflexes. There is no doubt that this paralysis is to some extent of a reflex character; but, inasmuch as hitherto no case of complete monoplegia has been found in definite cases of reflex disorders, but merely limited paralysis in which the extremity of the limb only is considerably affected, there are grounds for maintaining that hysteria enters to a large extent into the causation, and that we are dealing with a hystero-reflex association.

The same applies to another patient who is suffering from complete paraplegia of the legs following frostbite. Both his feet show vaso-motor symptoms, hypothermia and mechanical hyperexcitability, which are characters common to reflex phenomena. But these disturbances, intense as they are, appear incapable of producing a complete paraplegia of the legs. The paraplegia in question, not being accompanied by any of the objective signs indicating lesion of the nervous system, must be attributed to hysteria.

It seems unnecessary to give any more examples. We will merely remark that the modes of association may be even more complex than in the cases which we have quoted. The nervous symptoms found in a patient are sometimes derived from three sources: a nervous lesion, reflex action and hysteria (hystero-reflex-organic association), and even that is not all.

The preceding disorders may be complicated by disturbances of the functions of the wounded limb resulting from changes in the muscles, tendons, bones and vessels, as well as from cicatricial adhesions and retractions, which are so common after the wounds of warfare.

It is chiefly owing to the neglect of morbid associa-

tions that confusions and errors of interpretation were formerly, and are still, committed. It was on this account that suggestion carried out in hypnotic sleep or in the waking state was recently accredited with the faculty of attenuating and even curing organic affections (*v.* pp. 9, *et seq.*). The same reasons led to such symptoms as exaggeration or loss of the tendon reflexes being classed with the disturbances produced by hysteria.

Let us consider one of the cases of hystero-reflex association which we have already described. Counter-suggestion at once cures most of the motor disturbances, and the exercises performed by the patient warm the limb, which was previously in a condition of hypothermia. The success of this treatment might give rise to the hasty conclusion that the vaso-motor and thermal symptoms were hysterical in origin. But, if one follows up the patient, it will be found that conclusions drawn from the therapeutic test were premature and unjustified. The vaso-motor symptoms persist, the hypothermia returns, the disappearance of the motor disturbance is not complete, and the more or less considerable residue which often causes great discomfort as well as inaptitude for military service is refractory to counter-suggestion, and can only be improved slowly and progressively by physical methods and not by psychotherapy.

Hysteria and Simulation

Works dealing with simulation prior to Chavigny's *Diagnosis of Simulated Diseases* (193), did not attack the question of hysteria. Certain methods, therefore, of diagnosis advocated in these earlier text-books, and founded on surprise or violence, should be rejected. "If there were only diseases with a palpable and anatomical substratum," Chavigny very properly remarks, "these methods would have a real value, but it is just the peculiarity of hysteria and some neuroses

resembling it that the symptoms can be modified at will by these methods of surprise, violence or trickery." "The most characteristic feature of hysteria," he adds, "is the variability of its symptoms and their essentially functional character without an anatomical basis. It is precisely this variability of symptoms which makes hysteria difficult to distinguish from simulated disorders, which share the feature of symptomatic inconsistency. . . . Simulation is not necessarily proved by catching the patient tripping."

It is unnecessary to follow the writer in his examination of various hysterical symptoms such as stigmata, anæsthesia, paralysis and contracture. Although he unhesitatingly adopts the old conception of hysteria, he shows how variable and unstable these symptoms are, and how liable they are to be taken for mere fraud. These remarks so closely resemble the ideas which we have expressed that we need not dwell any further on the matter, but will merely remind the reader of what one of us wrote: "The hysterical subject always behaves as if he were partly able to control his disease, and as if his sincerity was not absolute; contrary to the epileptic he hardly ever has a fit, except under certain circumstances, and almost always recovers from the attack without being injured by the convulsions which frightened the bystanders; though a prey to terrifying hallucinations, he does not, like the alcoholic in his hallucinations, commit acts which are dangerous to himself; though he has a very deep thermal anæsthesia, he will not expose himself to the risk of being burnt like the syringomyelic, and a narrowing of the visual field, however pronounced it is, will not prevent him walking about and avoiding obstacles, as it would if the visual constriction were organic. All this makes hysteria resemble simulation, and I am in the habit of saying that the hysterical subject is to a certain extent a semi-simulator" (*v.* p. 25).

Does this mean that a distinction between a phenomenon due to simulation and one due to hysteria is

impossible? Chavigny does not hold this opinion. He thinks that hysteria may be recognised by the following characters—

1. Special disturbance of the cutaneous and tendon reflexes, loss of the cutaneous reflexes and dissociation of the reflexes consisting in an abolition of the plantar reflex with exaggeration of the knee jerk.

2. Fixed condition of the hysterical contracture (absence of variation in the patient's resistance when an attempt is made to overcome the muscular rigidity).

3. Special forms of anæsthesia, the simulation of which would be impossible, and the presence of permanent stigmata.

There is no need to make a fresh criticism of these so-called distinctive characters. We have shown that hysteria is incapable of modifying the condition of the cutaneous and tendon reflexes (*v.* pp. 10 and 65), and that hysterical contracture does not differ objectively from a voluntary contracture (*v.* p. 57). As regards the anæsthesia, although it is difficult to simulate this symptom when it is due to an organic cause owing to the special features which it then assumes (permanence, definite distribution, etc.), it is not clear why hysterical anæsthesia should be difficult to simulate, since it is essentially variable and unstable, as Chavigny himself recognises. What is there to prevent the conscious will carrying out what is readily done by auto- or hetero-suggestion?

Simulation can reproduce everything that hysteria or pithiatism is capable of doing. Anything that is impossible for simulation is also impossible for hysteria. This observation ought not, however, to lead us to confound hysteria and simulation. Some time ago, one of us, in pointing out the difficulty of this distinction, expressed himself as follows, in a lecture in which he set forth his views on hysteria and hypnotism (34)—

"As a careful examination of the facts leads to eliminating from hysteria all the objective phenomena

which suggestion is unable to produce, some of you may perhaps be inclined to wonder if hysteria is really a pathological condition, and if so-called hysterical manifestations are not merely due to simulation. The following is my opinion on this question, which deserves careful consideration. From the observation of very many hysterical patients whom I have followed up I have derived the conviction, which is shared by every neurologist, that many of these patients are sincere and cannot be regarded as simulators, but I must confess that this idea is founded on moral considerations and cannot be proved with the scientific rigour employed in the study of organic affections. A clever and well-trained simulator may succeed in closely reproducing every hysterical symptom, which is a source of almost insurmountable difficulty in medico-legal reports relating to cases of hystero-traumatism.

"How is it possible, then, to distinguish the true from the false? This is a difficult problem to solve. It must be confessed that it is impossible in any particular case to determine with certainty the degree of the patient's sincerity; circumstances alone enable one to form a probable opinion on this point. There is every reason for supposing that the unobtrusive symptoms of which the patient does not make any display are most probably genuine; this is so in particular in associated hysteria in which pithiatic phenomena become insidiously grafted on organic symptoms without the patient appearing to be conscious of their mechanism."

This view has been confirmed by the cases observed in the neurology of war. We will mention here an example of organo-hysterical association (68) which occurred under the following circumstances. The case was that of a lieutenant who developed an hysterical crural monoplegia after a contusion of the right thigh. Although the paralysis was of several months' duration, the tendon and cutaneous reflexes and electrical excitability of the muscles were absolutely normal, and the result of psychotherapy confirmed the

diagnosis of hysteria. But there was also a right musculo-spiral paralysis which was obviously organic, due to compression of the nerve by the crutch used by the patient. The following remarks accompanied the description of the case : "This association in my opinion is a remarkable one, because it seems to me to prove that it would be an error to confound hysteria and simulation, as is the tendency with some writers nowadays. I have myself insisted, it is true, on the difficulty of separating simulated phenomena from those which are the result of suggestion, and on the absence of objective characters enabling a line of demarcation to be made between these two conditions. I have even said that hysteria is a sort of semi-simulation, but this expression clearly indicates that the simulation is not complete. In the present case it may be affirmed that the patient was sincere and thought that he was quite incapable of moving his leg or standing on it, since with the object of remedying this imaginary loss of power he had been accustomed to support himself so conscientiously on his crutch that an organic paralysis had resulted. I may add that the patient did not inform me of this musculo-spiral paralysis except as an afterthought. It may be said, therefore, that a purely imaginary disorder occupied a much more important place in the patient's mind than the real disorder which accompanied it." The hypothesis of simulation could also be dismissed in another case, reported by Ivan Moricand (80), in which bilateral musculo-spiral paralysis from compression developed in a soldier suffering from hysterical crural monoplegia as the result of the prolonged use of crutches.

Other arguments might be given in favour of the sincerity of patients suffering from hysteria or hystero-traumatism, such as the joy and sincere and lasting gratitude expressed by the patient after his recovery, as well as the devotion to duty and sometimes even actual heroism shown by the man who returns to the firing-line. The value of these arguments is not to be

underestimated, although they are exclusively of a moral character.

The question of simulation has been dealt with since the beginning of the war at the Neurological Society (91).

In the first place, Gilbert Ballet proposed the following definition in order to give a precise meaning to the terms employed in the course of the discussion—"Simulation: a subjective or objective disorder invented by the patient with the object of voluntarily and consciously misleading the observer. Closely connected with it is the conscious and intentional exaggeration or prolongation of a real disorder."

As regards simulation most neurologists are agreed that there are two absolutely certain criteria: being caught in the act, and confession. But it must be admitted that confession is not conclusive in every case, as it may be nullified by the methods employed to elicit it, and the mental state of the individual. Moreover, magistrates are agreed that confessions are only of value if corroborated by the actual facts.

As regards being caught in the act, this, of course, cannot apply to the observation of a sudden movement in a case of contracture or paralysis. The term "caught in the act" can really only be used when the patient who pretends to be suffering from a nervous disorder, *e. g.*, deafness or a motor disability, constantly behaves like a normal person as soon as he thinks that he is out of the range of medical observation.

Cases of genuine simulation appear to be very rare. Although there are others in which simulation may be suspected, it must be laid down that, in the absence of decisive proofs, the subject under suspicion should benefit from the doubt. Not only should the diagnosis of simulation not be made, but the mere word "simulation" should not be uttered in such cases, considering the gravity of the accusation under present circumstances. There is no practical objection to this method of procedure, which is the only fair one. One may, indeed, follow the same line of conduct in every case

of exaggeration or simulation as in hysteria, and have recourse to psychotherapy in its different forms, just as if it were a case of pithiatism. Judging by our experience, these disorders of doubtful nature are as a rule cured in this way, provided that energy, tact and perseverance be employed.

Dept. of Neurology & Psychiatry

CHAPTER II

TREATMENT AND DECISIONS BY MEDICAL BOARDS

The treatment required for pithiatic manifestations differs considerably from that needed in cases of reflex contracture and paralysis. Decisions by medical boards cannot be the same in the two conditions. We have thought it advisable, however, to consider them together, for their frequent association often renders necessary a simultaneous employment of psychotherapeutic and physiotherapeutic methods. We shall thus be able to illustrate for the last time the fundamental differences between them.

Treatment of Hysteria

As in most other affections, the medical man should have two equally important aims: first, to prevent the development of pithiatic disorders (hygiene and prophylaxis), and secondly to cure them when once they have developed (therapeutics).

Hygiene and prophylaxis.—The determining cause of hysterical manifestations is auto-suggestion and hetero-suggestion. The patient sometimes derives the first idea and the theme of his disorders from his inner self (auto-suggestion), his present or past sensations, his experience, the true or false notions which he has acquired, and from his meditations. Various pithiatic disorders may thus arise a few days or even a few hours after a physical or moral shock, without it having been possible to use any method to prevent their development.

But they often appear much later, *e. g.*, in the hospital

to which the patient has been removed. The patient's removal may have been due not to a neuropathic state, but to a contusion or wound sometimes of a trifling nature.

Auto-suggestion is also liable to intervene in such cases, but it is almost always combined with hetero-suggestion, which then usually constitutes the essential factor.

This hetero-suggestion is derived from the entourage, the friends, and all who come near or look after the wounded man. Nurses, with the best possible intentions, often exercise a very bad influence on their patients by their questions, attitude and injudicious attentions. Their emotion, anxiety, compassion and continual desire to save the patient the slightest effort or discomfort, all constitute the most powerful agents of suggestion.

Doctors themselves, who do not sufficiently realise the good or bad effects which their statements, comments, examinations and gestures may have upon the mind of their patients, whom suffering, privations and moral or physical commotions have made very responsive to suggestion, doctors, we say, sometimes unconsciously exercise a hetero-suggestion which is all the more powerful as their profession gives them authority. They should always be alive to this possibility, and should place their patients under the least favourable conditions for suggestion.

They must keep the wounded away from demoralising influences, set an example to their staff, supervise the entourage and keep a perpetual watch upon themselves. Every one knows of the ward epidemics which were so common in certain hospitals in former times. In those days it was not uncommon to see during the doctor's visit several patients in hysterical convulsions simultaneously or successively. Although these manifestations of collective hysteria have disappeared, thanks to the development of ideas and their practical results, a reappearance of such epidemics might be witnessed if the conditions were suitable for their development.

Convinced of the rôle played by suggestion in its various forms, neurologists, at a meeting devoted to the study of so-called functional disorders, were all agreed as to the dangers involved by writing on the soldiers' evacuation cards such diagnosis as "epileptic attacks," "epileptiform attacks," "sciatica," "paralysis," and "cerebral" or "spinal commotion." This card, which the soldier keeps in his book and may constantly be reading again and again, gives rise to the most harmful reflections. All the vague apprehensions to which the patient is liable are made concrete by this diagnosis. It gives a genuine character to his complaints, a most regrettable occurrence, as may be imagined, when an error of diagnosis has been committed and he is suffering from hysteria.

According to the recommendation made at the meeting, medical officers dealing with the evacuation of cases in order to avoid any suggestion should confine themselves to giving a detailed account of the symptoms which they have found, and refrain from recording their diagnosis, which should only be done after a prolonged examination in special centres.

It is obvious therefore, that there is what may properly be called a hygiene and prophylaxis of hysteria, and it is easy to understand its importance under present conditions.

Therapeutics.—What is the right way to treat pithiatic disorders, once they have developed? As every one knows, recourse should be made to psychotherapy, persuasion and counter-suggestion. A priori, this appears very simple. It might be supposed that it is enough to tell the patient that his affection is a purely imaginary one, and ought to disappear by an effort of the will. But, in reality, a formula of this kind is too simple. In order to be successful, persuasion and counter-suggestion require the presence of various conditions which we will now discuss.

An all-important condition is the creation of an atmosphere of *confidence and faith.* It may be said generally that confidence in the doctor is beneficial to

the patient, but this is particularly true as regards the hysterical patient. He has already taken a step in the right direction when he has gained the conviction that his doctor has the power to cure his troubles. He readily acquires this conviction when he has seen rapid recoveries from what he thought were severe attacks in the cases of other patients, or when his ward companions tell him that they have been cured by methods similar to those which are proposed for him. His confidence increases in proportion to the frequency of the recoveries and the number of favourable reports which he hears.

The environment, therefore, exercises an influence which, instead of being harmful, as it so frequently is, constitutes a most valuable help. But an environment of this kind which is in sympathy with the doctor and beneficial to the patient is not made to order, but gradually develops as the result of successful treatment which strikes the attention and provokes the astonishment and admiration of the bystanders, especially if it is immediate. The first successes are the most difficult to obtain; as they increase in number there is less difficulty with them. In the first trial of psychotherapy it is essential not to spare time or trouble, but to attain the end at all costs. It goes without saying that an accurate diagnosis is indispensable for success.

To treat an organic or physiopathic affection by psychotherapy, and to promise a rapid recovery in the case of a patient suffering from a non-pithiatic disorder, *e. g.*, a reflex contracture without any association with hysteria, and in such a case to employ counter-suggestion of any kind, is not only to waste time, but, what is more important, to lose prestige and to bring discredit on the method.

The disappearance of the symptoms should not be promised until a complete examination has been made and the diagnosis of hysteria has been firmly established. In a case of associated hysteria the patient should be told that his trouble will improve, but he

should be given to understand that the improvement will only be partial. One should then set to work and persist if necessary till success has been attained.

It is in this way that the neurologist creates for himself, to the great benefit of his patient, the reputation of being infallible in his cures. His psychotherapeutic power becomes very great as soon as there is no doubt as to the certainty of his diagnosis, and the accuracy of his prognosis and statements generally.

Cure is, as a rule, easily obtained when an *early treatment* has been started, as can readily be understood. Under opposite circumstances there is more difficulty : the older the disease, the more deep-rooted it is in the mind, and the more automatism intervenes to keep it there. In hysterical contracture or tremor, for instance, all the patient's attention is at first required to keep up the disorder, but later he holds his arm stiff or swings it about automatically almost without thinking about it, as in the act of walking. Charcot said many years ago: " Contractures should not be allowed to become chronic " ; the same applies to all hysterical manifestations. This justifies the conclusion that hysterical soldiers should be treated as far as possible in *units at the front.* Medical officers who have done this systematically have obtained excellent results. It should not, however, be inferred from these remarks that hysterical symptoms of long duration are incurable, but more perseverance and energy are required to cure them.

Whether we are dealing with a recent or an old-standing complaint, it is important in our opinion to have recourse to what may be called the *abrupt treatment,* which we consider to be far superior to slow and progressive psychotherapy combined with isolation.

It may be laid down as a rule that it is very desirable to obtain a definite improvement at least on the first application of treatment. The first interview or encounter with the patient presents particularly favourable conditions from the therapeutical point of

view. It is at this moment that the patient's faith in his doctor's power is usually most active, and with this sentiment is associated a sort of apprehension, emotion and anxiety which favours the curative process. We have shown that deep emotion is incompatible with hysterical manifestations. It is not the same with an emotion of a lesser degree; it may, however, result in distracting the patient's attention from the object of his suggestion. The person under the influence of suggestion should be regarded in the light of an actor on the stage (but not as a simulator, as we have already explained). A moral shock, a fright or a mere surprise caused by an unexpected occurrence may change the course of his ideas, and make him forget his part for the time being. Thus a patient with hysterical paralysis, owing to the emotion and bewilderment caused by the doctor's numerous questions, orders, tests and mysterious medical rites, will for the moment forget his part, and carry out a few movements with his paralysed arm or leg (*v.* p. 185). This is the moment which the doctor must be on the look-out for; the patient should at once be shown that he is no longer a cripple. In his state of confusion and stupefaction he will be persuaded to reproduce the movements which occurred almost unconsciously before. It is most important then to persevere and to try to obtain at once a complete cure, or at least a definite result in conformity with the doctor's forecast and promises.

The method of treatment should vary somewhat with the mentality of the subject, his intellectual and social level, degree of education, state of mind and desire to recover. A cultivated man should be given to understand that the art of diagnosis has now attained such a degree of perfection that there is complete justification in his case for excluding the idea of any organic lesion. He should be told that his condition has been caused by suggestion and is undoubtedly neuropathic, and that he will be sure to recover. If such statements appear to humiliate him he should

be persuaded that such a state of mind, after the shocks which he has experienced, is quite compatible with normal intelligence, an excellent moral and great courage. Persuasion alone without any physiotherapeutic assistance may then produce an immediate and decisive effect. It is in cases of this kind, it may be said in passing, that the diagnosis of hysteria can be undoubtedly established.

But in dealing with patients who are less able to follow a scientific train of thought, it is advisable to strike their imagination by employing a material method as well. Electrical treatment is one of the commonest and most successful methods, as can readily be understood. The laity, in fact, readily believe in the power of electricity; moreover, the movements caused in a paralysed leg by variations in the intensity of the current are calculated to impress the imagination and to dispel the idea of a loss of strength; lastly, the physical and moral impression caused by electricity is well calculated to produce the distraction and surprise of which we have endeavoured to show the good results.

It may be advisable for the same reason to have recourse to various exercises likely to bring physiological automatism into play. For instance, what should be done in the case of a paraplegic patient with contracture, who, in spite of every variety of treatment, appears incapable when in bed of carrying out the slightest voluntary movement?

With the help of an assistant the doctor should pull him suddenly out of bed, put him on his feet, and drag him forwards, taking care to prevent his falling. Very often in such cases the patient, taken unawares, takes a few steps to preserve his balance. As in the case quoted above, his attention should at once be drawn to this result; he should be told that his recovery is imminent, and the movement should be accelerated without leaving him a moment's rest, the fatigue which he feels constituting a favourable circumstance.

Meanwhile, you must keep on encouraging him in

every way, and as soon as you feel that he has almost gained his balance, which usually occurs if you have the patience to wait, you may leave him to himself, taking care to prevent him from falling, as you would with a child learning to walk. The conviction thus acquired, that his paralysis is no longer complete, constitutes a success. Complete recovery henceforward takes place without much difficulty and may be rapid —the patient, who has been brought on a stretcher, sometimes walking back to the ward by himself after the first treatment.

But such results, it must be said, usually require a prolonged effort on the part of the doctor, who must not spare either time or trouble. The patient, who was sceptical and recalcitrant at first, gradually begins to show confidence and ends by helping the doctor as much as he can. On taking leave he expresses his joy and gratitude with obvious sincerity—a scene which we have often witnessed.

At the beginning of the war neurologists were not all agreed as to the results to be obtained, especially in hysteria of old standing. Some of them regarded the condition as permanent and refractory to any method of treatment. Some even were in favour of a discharge from the army. This view has been discussed, but fortunately it has not been generally accepted. The great majority of neurologists rightly considered that such a procedure would be regrettable in every respect, and at its meeting on October 21, 1915, the Neurological Society sent a recommendation to the Under Secretary of State for the Sanitary Service to the effect that "*no soldier at the present time, under any circumstances, with a psycho-neurosis should be brought before a medical board with a view to discharge from the army.*"

Personally, we have long insisted on the possibility of an almost certain cure of purely hysterical manifestations (*v.* p. 15), and this opinion has been strengthened by what we have seen in the course of the last two years. In dealing with recent disorders our task is

relatively easy. If they are of old standing they sometimes offer great resistance to treatment; however, even then they end by giving way, if the conditions which we have specified are realised. This is the result of observations made by several of our colleagues, especially Souques, Meige, Albert Charpentier, Clovis Vincent, Roussy and Léri, and is also the outcome of the numerous observations which we have made ourselves since the beginning of the war. Clovis Vincent, who had the opportunity of treating a very large number of hysterical cases, informed us that he had cured almost all of them.

There is no need to add that in cases of association the hysterical disorders are the only ones to disappear under the influence of the methods such as we have described. Disorders of an organic or physiopathic nature associated with the preceding persist, and are not likely to be affected except by other modes of treatment. In the neurology of war these associations are particularly frequent, which doubtless explains why, after a considerable improvement in disorders treated by psychotherapy, more or less obstinate and important sequelæ often persist.

Treatment of Reflex Nervous Disorders

We have just remarked that hysteria was fairly frequently associated with other affections; among these reflex nervous disorders take a prominent place. This is one of the reasons why the latter have for a long time been confused with hysterical manifestations.

The frequency of this mode of association, in which it is not always easy to distinguish the part played by each of the constituent elements, is an encouragement to make an almost invariable use of *psychotherapy* in undoubted cases of reflex nervous disorders. No harm can result from this, provided that the rules mentioned above be strictly complied with, so as not to bring discredit on the method; but it cannot be too frequently repeated that counter-suggestion has

no action on the reflex troubles themselves. It is, therefore, advisable to adopt *physiotherapeutic methods* at once as well as the measures already mentioned.

This method of treatment, however, frequently involves a hidden danger which it is important to avoid. Violent exercise, intensive mechanotherapy and electrotherapy, and massage accompanied by energetic kneading of the muscles, have often been followed by an aggravation of the contractures, as a large number of observers have found. The use of these methods is, however, justifiable, provided they are undertaken with gentleness and circumspection and under medical supervision. We would go so far as to say that recourse should be made as soon as possible to *continuous extension* and *gentle and methodic movement*, to avoid, as far as possible, the formation of fibrous retractions which takes place so early in such cases.

Considering the importance of the vaso-motor symptoms and the hypothermia, it appeared natural to make a trial of *thermotherapy* in its different forms (balneotherapy, hot-air douches, and light baths). Diathermia, judging from our experience, seemed very beneficial. It was followed in many cases by progressive improvement, and we could hardly believe that this was a mere coincidence. There is no need to add that great prudence is still required, as high temperatures are not well borne, and are likely to do much harm. The results obtained were not always the same, and in our experience were never rapid.

In view of the chronic character of these disorders and the mechanical obstacles created by fibrous retractions, it was necessary to have recourse to surgery. Sudden correction under anæsthesia, and tenotomy followed by immobilisation in splints, had decidedly unfavourable results. Sicard appeared to be pleased with the use of alcohol injected into the nerves in some cases of obstinate acro-contracture.

In flexion contractures of the leg on the thigh L. Bérard successfully performed continuous extension combined with injections of novocain (1 per cent.

solution) into the trunk of the sciatic nerve and the contractured muscles.

The presence of scars adherent to the deep parts seen in cases of this kind justifies operative interference. Tixier obtained encouraging results by *excision of the scar and dissection and liberation of the subjacent tissue;* one of his cases was published by Duvernay (124).

Leriche advocated the tearing apart of the periarterial plexuses in causalgia (130) (143), and performed the operation in cases of reflex contracture with pronounced and obstinate vascular spasm with interesting results. He has written to us about the operation as follows: "I operated on three cases of reflex contracture of the upper limb in which I excised the plexuses of the brachial artery, and all three showed distinct improvement. One patient, as the result of the operation, was able to extend his contractured fingers in which the nails were causing ulceration of the skin; as soon as this result had been obtained, it was possible to practise continuous extension and re-education of movements, which had hitherto been impossible. In another patient, who had an 'accoucheur's hand' contracture following a through-and-through wound of the wrist, the operation was followed in a few days by considerable improvement in the movements of the fingers, which became easier and more extensive. The improvement coincided with an increase in the blood-pressure in the limb which had been operated on (Heitz), and a very decided rise in the local temperature."

But it must be admitted that these questions are not yet definitely settled, and that we must wait before giving a final opinion as to the respective value of these different methods.

As regards the question of decisions by medical boards on wounded soldiers who show nervous disorders of this kind, we will simply remind our readers of the conclusions drawn up by one of us, and unanimously adopted at the Neurological Society at the end

of a discussion devoted to the study of so-called functional nervous disorders (140)—

" Regarding the matter exclusively from the standpoint of a medical board we have to distinguish among so-called functional motor disorders (*i. e.*, motor disorders with none of the objective signs characteristic of organic affections of the brain, cord or nerves, or of vascular lesions)—

" 1. Hysterical or pithiatic disorders properly so called.

" 2. Nervous disorders quite distinct from the preceding, associated with real physiological disturbances, the mechanism of which is still a matter of discussion, but which may be grouped with the reflex disorders observed after osteo-articular lesions.

" The nervous symptoms belonging to the second group appear in the form of paralyses or contractures which are more or less complete and assume different types. They are accompanied by the following objective signs which enable them to be distinguished from the nervous disorders of the first group, viz. pronounced and obstinate vaso-motor and thermal troubles, modifications of muscular tonus (hypotonus, hypertonus, and association of hypotonus and hypertonus), increase in the mechanical excitability of the muscles and sometimes even of the nerves, quantitative changes in the electrical excitability of muscles without R.D., muscular atrophy and trophic changes in the osteo-articular tissues and sometimes in the skin. Contractures belonging to this group are characterised by their prolonged resistance to Esmarch's band and general anæsthesia. Although there is no reason for denying that the disorders in this group are curable, it must be recognised that even under the most favourable circumstances they are sometimes very persistent.

" Before any decision is made by a medical board, it is important that wounded men suffering from this variety of motor disturbance should undergo a prolonged examination at a neurological centre, and that every appropriate psychotherapeutic and physio-

therapeutic method should be employed simultaneously. But after all attempts at treatment have proved a failure, it does not appear advisable to prolong the stay in hospital indefinitely in cases where the reality of the physiological disorders mentioned above has been established beyond a doubt. Leave for convalescence may be granted, but on condition that the patients on the expiration of their leave are sent back for examination or fresh treatment to the same neurological centre. In obstinate cases discharge from the army may be suggested, but this should always be a temporary one."

At a recent meeting of the representatives of the neurological centres (December 15, 1916) to discuss the subject of " Discharges from the Army, Disabilities and Allowances in the Neuroses," the questions with which we have dealt in this book were discussed from the point of view of a medical board, and the conclusions of a report drawn up by one of us were adopted to serve as a groundwork for the next edition of *The Ready Reckoner of Disabilities.*[1]

They are of interest to all medical officers, and may therefore be reproduced here. They are as follows—

1. For purely hysterical or pithiatic disorders : no discharge nor allowances.

2. In cases where pithiatic symptoms are associated with organic, physiopathic or mental disorders, the hysterical manifestations should not be taken into account in estimating the degree of disability.

3. In the physiopathic or so-called reflex nervous disorders following wounds in war and refractory to prolonged treatment, service with the auxiliary forces or temporary discharge with allowance proportionate to the loss of function is indicated.[2]

[1] *Guide-Barême des Invalidités.* Published by Lavauzelle.

[2] It should be understood that the degree of disability in the case of reflex paralyses and contractures should be calculated by *The Ready Reckoner of Disabilities* according to the scale

It is clear from these recommendations and from the discussion which took place at the meeting, that there is no doubt as to the distinction between hysterical or pithiatic disorders and the so-called reflex disorders. It is well recognised that the prognosis, treatment and administrative measures differ entirely in the two conditions. It is generally agreed that they should be separated and that so-called reflex nervous disorders are more closely allied to organic disease.

The possibility of granting a temporary discharge and allowance to patients suffering from reflex disorders constitutes an equitable measure. It would be unjust and prejudicial to the general interest to keep patients suffering from physiopathic disorders on which the will has no effect, indefinitely in isolation wards, as has been done sometimes on the suspicion of aboulia and even of simulation.

In their recommendation that there should be no discharge or allowance in purely hysterical disorders, the representatives of the neurological centres proved that they shared the ideas which have been set forth in this book, and have long been maintained by one of us.

Neurologists to-day are almost unanimously agreed that hysterical or pithiatic disorders should be almost infallibly cured by persuasion or counter-suggestion when the conditions required for the treatment are realised. It would, indeed, be difficult to dispute this, considering what remarkable results have been obtained in neurological centres at the front and at the base, where the number of recoveries from hysterical or pithiatic disorders has been almost incalculable.

It is no exaggeration to say that an extremely

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used for determining the degree of disability in organic nervous diseases. The specialist's opinion should be drawn up without the patient's knowledge, and sent off in a sealed envelope to prevent its giving rise to claims and counter-claims. Although the medical expert should pay careful attention to it, it must not be forgotten that he is the only one legally qualified to fix the amount of the allowance.

useful service has thus been performed. Thanks are due to the Neurological Society, which from the first year of the war has clearly specified what line of conduct should be followed in hysterical cases, and has demanded the creation of special services; to the heads of the different centres and their assistants, whose efforts have been incessant; and, lastly, to the Under Secretary of State for the Sanitary Service of the Army, for having supported all these efforts, encouraged initiation, and completed the organisation of neurological centres.

POSTSCRIPT

AFTER the manuscript of the French edition had gone to press some new publications appeared, the conclusions of which are in more or less complete disagreement with our own. Some discussion of them therefore appears necessary.

Generally speaking, this is the line of argument adopted by our opponents. They maintain that there are no physiopathic contractures or paralyses of a reflex character; the motor disorders considered as such are pithiatic phenomena; as regards the amyotrophy, circulatory disturbances, cyanosis, hypothermia, mechanical hyperexcitability of muscles and nerves with slowness of the muscular contraction and premature fusion of the faradic contractions, hypotonus, and exaggeration of the tendon reflexes, all these are merely disorders due to immobilisation or inactivity in association with pithiatic motor disturbances.

The principal argument brought forward in support of this view consists in the therapeutical results said to have been obtained, such as the cure of motor disorders by psychotherapy and progressive improvement in other symptoms under the influence of methodical exercises. It should be noted that this second part of the treatment requires a relatively long time, even in the opinion of its most enthusiastic advocates. Roussy, Boisseau and d'Oelsnitz,[1] for instance, think

[1] ROUSSY, BOISSEAU ET D'OELSNITZ, La station neurologique de Salins (Jura) (centre de psychonévroses) après 3 mois de fonctionnement. Rapport présenté à la Conférence interalliée pour l'Etude de la Rééducation professionnelle (Paris, 8–13 Mai 1917) et publié dans le *Bulletin de la Réunion Médico-Chirurgical de la 7e Région*, Besançon, Juin 1917.

that an average period of three to four months is necessary to obtain a cure.

Without disputing the excellence of the results obtained by a combination of psychical and physical methods, under particularly favourable conditions, we are guarded as to the general possibility of obtaining a complete cure of physiopathic disorders within a definite period when they are very pronounced. We mean by complete cure a return to the normal condition identical with that in which the patients were before the traumatism.

We may admit provisionally that most of the patients belonging to the class in question recover after a treatment of three to four months under the influence of psychical and physical treatment combined, if carried out under the best conditions. Must we conclude from this that physiopathic symptoms are merely the consequence of pithiatic motor disorders, and are due to immobilisation produced by hysterical paralysis or contracture, and that the so-called reflex nervous disorders should be regarded as hysterical? We do not think that such a conclusion is justified, and we will state some of the reasons on which our opinion is founded.

It is very common to find hysterical contractures and paralyses of very long duration, *e. g.*, two years and even more, unaccompanied by any physiopathic disorder, such as amyotrophy, vaso-motor symptoms or hypotonus. It is therefore difficult to suppose that immobilisation of this kind which has not caused any physiopathic disorder in some cases after lasting for so long, may cause very marked disturbances in others after a relatively short lapse of time. Is it not logical to suppose that another factor must have intervened?

But, if hysterical immobilisation which the patient has accepted of his own free will, so to speak, is insufficient, is it not possible that these disorders may be produced by the immobilisation due to organic disorders or wounds causing pain and necessitating the application of a splint? This kind of immobilisa-

tion, which the patient has not desired but to which he has had to submit, is no doubt more injurious, but it does not appear to be an adequate explanation of all these physiopathic phenomena.

We showed the resemblance of these cases to those observed by Charcot and Vulpian after osteo-articular lesions, and described by them under the names of reflex amyotrophic paralysis and reflex contracture, and invoked a mechanism of the same kind to explain their origin, the expression "nervous disorders of a reflex character" merely implying the idea of a disturbance of the nerve centres.

This was merely an interpretation which we put forward, and we remarked that its non-acceptance would not in any way modify the question at issue. Our object was to draw attention to the existence of a special group of nervous disorders following injury, which had to be distinguished from phenomena connected with well-recognised organic affections of the nervous and vascular systems as well as from hysterical manifestations. They are phenomena which are not of a psychical but of a physical nature, and we will now proceed to discuss them.

Can muscular atrophy depend on an hysterical motor disorder? We do not deny that it can, and a priori we ought to be all the more inclined to admit it, as hysterical amyotrophy was first described by Charcot and one of us; but we must add that this amyotrophy is not the rule in hysterical paralysis; that it is slight in degree when it does occur, and that we regard a pronounced muscular atrophy as always due to some other cause.

Charcot and Vulpian long ago insisted on the fact that amyotrophy following an articular lesion cannot be caused by immobilisation. In his Tuesday lectures of 1888 and 1889, which were therefore delivered long after he had given such a remarkable description of hystero-traumatism, Charcot proved that the hypothesis that immobilisation was the cause of the so-called reflex amyotrophy was absolutely untenable,

when the atrophy had developed very rapidly after a lesion of the joint which had required only a few days' rest.

Vincent's cases, in which the atrophy showed no change or even became more pronounced in spite of active mobilisation, constitute a powerful argument against this point of view. In fact, of all the so-called reflex nervous disorders, amyotrophy seems to be the one about which there is least discussion at the present time. Roussy and Boisseau [1] appear to agree with us in this respect. They have recently published the case of a patient in whom amyotrophy of the thigh did not show any appreciable change after a very active treatment of four months' duration, when the circumference of the affected thigh was 6 cm. smaller than that of the opposite side, the difference at the beginning of the treatment having been 7 cm.

If it be granted that the amyotrophy in these cases may be of a reflex character, why should not the same mechanism be accepted in the case of exaggeration of the reflexes? The intervention of a disturbance of the central nervous system appears to be still more certain in the latter than in the former.

It may even be said that exaggeration of the tendon reflexes, observed either in the waking state or in chloroform narcosis, is the most important argument that can be brought forward in support of the reflex pathogeny.

The hyperidrosis which is sometimes observed in these cases cannot be attributed to immobilisation either, and it appears to be the consequence of a stimulation of the nerve centres. André Thomas [2] has arrived at practically the same conclusion in his study of hyperidrosis due to peripheral stimulation. "Whatever may be the mechanism," he writes, "of the perspiration in the three previous cases, its starting-point

[1] Roussy et Boisseau, Sur le pronostic et le traitement des troubles nerveux dits réflexes. *Soc. de Neurol.*, 7 Juin 1917.

[2] André Thomas, Hyperidrose par irritation périphérique. *Soc. de Neurol.*, 9 Nov. 1916, and *Rev. Neurol.*, Nov.–Dec. 1916, p. 544.

is a peripheral irritation, and it implies the involvement of the nerve centres, but probably in a more complicated manner than that of ordinary reflexes." The appearance later of hyperidrosis in the corresponding limb of the opposite side, a phenomenon which we have sometimes seen very clearly displayed, appears to us to constitute a valuable argument in favour of the reflex pathogeny.

It seems to us to be quite as difficult to attribute the pronounced hypotonus seen in some of the cases which we have reported to immobilisation due to hysterical paralysis. It is strange that this argument should be advanced when we remember that about a year ago some neurologists regarded hypotonus as indicating not merely a nervous lesion but an extremely profound lesion of the nerves. Hypotonus, in fact, was considered as one of the signs which formed part of the syndrome of a complete interruption.

We will now discuss the circulatory disturbances which are manifested by cyanosis, hypothermia, and a considerable reduction in the amplitude of the oscillations as measured by Pachon's oscillometer. Is immobilisation alone the cause of this? It would in that case be difficult to explain the fact that hypothermia sometimes alternates with hyperthermia, and that the oscillations after having been at a given moment less extensive on the affected side than on the sound side, may on the contrary become greater on the affected side as the result of the application of heat to the corresponding limbs on both sides simultaneously. It would be still more difficult to explain the fact that in some cases the hypothermia in one region coincides with hyperthermia in another, and that walking can increase hypothermia, as has been shown by Souques. These phenomena fit in well with the idea of a disturbance of the vaso-motor control.

However, whatever the mechanism of these disorders may be, when once they have developed, they are sometimes extremely persistent. Many patients declare that on waking up they feel no difference

between the two sides, but that as soon as they are out of bed, especially if the atmospheric temperature is low, the chilling of the limb appears, and they need hours to get warm again, even in front of the fire. If one of these patients is examined in the morning when his limbs are covered and warm, the symptoms appear to be absent, but when they are uncovered the thermo-asymmetry soon appears. If he is put astride on a stool, with his legs hanging down, and both under the same conditions, the cyanosis appears on the affected side. The obstinacy of these symptoms has been confirmed by Vincent's observations. Like amyotrophy they may resist mobilisation.

It is true that Roussy and Lhermitte [1] in their work on "The Psycho-neuroses of War" made the following statement: "Vaso-motor symptoms, fall of the temperature, cyanosis of the paralysed extremities, hyperidrosis, œdema, etc., are the result of functional inactivity, as is proved by their rapid disappearance when an hysterical paralysis or contracture is cured by psychotherapy."

But in a more recent communication Roussy and Boisseau themselves admit the obstinacy of these disorders, since they express themselves as follows: "As regards disorders of the thermal and vaso-motor control, it has been proved that they may persist for a long time after the recovery of motor power, and improvement, when it does occur, is extremely slow."

When these vaso-motor disorders are pronounced, they give rise to a series of disturbances of a physical character. There may result a diminution or disappearance of the plantar cutaneous reflex, an impairment of the tendon reflexes, especially of the ankle jerk, to which Clovis Vincent [2] has drawn attention, mechanical hyperexcitability of the muscles, and a modification

[1] Roussy et Lhermitte, Psychonévroses de guerre (Collection Horizon), p. 20.

[2] Clovis Vincent, Variations du réflexe achilléen chez certains hommes atteints de troubles physiopathiques des membres inférieurs. *Soc. de Neurol.*, 5 Avril 1917.

of the contraction produced by percussion, which becomes extremely sluggish, and a premature fusion of the faradic contractions. The sluggishness of the muscular contraction produced by percussion, as is shown by the tracings taken in collaboration with Hallion, may be as great as is occasionally seen in the reaction of degeneration.

But the application of heat to the chilled limb is sufficient to cause an immediate reappearance of the plantar cutaneous reflex, an increase in the intensity of the tendon reflexes, which become equal on both sides, a disappearance of the sluggishness of the muscular contraction, and premature faradic tetanus. These circulatory disorders, which we attribute to a reflex vascular spasm, resemble those which are sometimes produced by arterial obliteration.

Oscillometric examination appears to give identical results in both cases. But, as we have shown in the chapter on "Diagnosis," the warm-bath test serves to distinguish the two conditions. Whatever interpretation may be given them, the circulatory disorders which we have studied have a clinical physiognomy of their own, and are entitled to a special place in pathology.

Our opponents will perhaps say : "We readily admit that the symptoms which have just been discussed are quite different from those of pithiatism, and we will even consent to their being considered as of a reflex character or at least of a physiopathic nature, but that does not prove that the motor disorders which accompany them, viz. paralysis and contracture, are of the same character, and we maintain that these phenomena are of a pithiatic nature."

We will now examine these motor disorders and discuss this new aspect of the question. Though we do not dispute the very frequent association of hysterical paralysis or contracture with vaso-motor disorders, as we have ourselves drawn attention to the importance and frequency of this association, we consider that when hypothermia is considerable it causes a diminution of

motor power which is to some extent of a physiopathic nature.

On this point some explanations appear to be necessary. Some medical men in whose minds the word paralysis doubtless suggests the idea of complete or very extensive loss of power, such as hemiplegia, monoplegia or paraplegia, have been surprised by the expression "reflex paralysis" which we have used, and have regarded it as a return to a doctrine which had been given up a long time ago.

The term paralysis, we may say, merely signifies a more or less marked diminution of motor power, without specifying its degree.

Besides, we have expressly stated that there is no such thing as a reflex monoplegia or paraplegia, and that reflex motor disorders are generally limited, partial and incomplete. The fact is that it is impossible to determine in a given case how much is due to the physical factor in the impairment of motor power, but it may be affirmed that this factor enters into play, at least to some extent.

A hypothermia which gives a very decided sensation of cold when the limb is touched and in which the thermometer shows, for instance, a drop of 8° C. as compared with the sound limb, and affects the deep parts as indicated by the slowness of the muscular contraction on mechanical stimulation similar to that observed in the reaction of degeneration, such hypothermia, we say, entails a diminution of the muscular power, or a paresis which is manifested by difficulty in making a prolonged physical effort. A patient who is capable, for instance, of walking quite well for half an hour, but is unable to walk for several hours as he did before, is no longer normal from the motor point of view, and this diminution of his muscular power should be taken into serious consideration, especially in the case of a soldier.

The relation of the phenomena to one another is according to our view quite different from that proposed by our opponents. It is not the hysteria which

comes first, but the disorders of a physical character. The immobilisation due to the traumatism, and the disturbance of the nervous system which is the consequence of this traumatism, give rise to the circulatory disorders and the hypothermia which we have described. These disorders in their turn produce a more or less marked impairment of motor power, which is possibly connected with a sort of torpor of the cells of the anterior cornua of the cord, according to Charcot's hypothesis, and there is no need to attribute all these phenomena to mental disturbance.

If the patient is energetic he will make a great effort to struggle against the disorders which have developed, he will endeavour to put his torpid muscles into action in spite of the discomfort and fatigue which he feels, and indirectly his will can exercise a certain action on his physiopathic symptoms. In the contrary case he will abstain from all effort, and if then suggestion intervenes, pithiatic disorders will be grafted upon the preceding and may even assume a preponderating rôle.

Sometimes all these patients are accused of aboulia; this reproach may be justified in some cases, but in others it is not, for these patients require a strong will or an actual hyperboulia to react with success.

We think that we have definitely proved that the so-called functional contractures are not all pithiatic. The value of our argument, which consists in observations made during chloroform narcosis, does not appear to have been sufficiently appreciated. When a contracture persists, as we have seen, in an advanced stage of narcosis, after obvious loss of consciousness, or when in flexion contracture of the leg on the thigh, it is possible to produce spasmodic movements of the affected limb by traction, although the cutaneous and corneal sensibility are still abolished, it is impossible to admit that we are dealing with a disorder due to suggestion.

We will also remark in this connection that we have never maintained, as some appear to believe, that every flexion contracture of the leg on the thigh is of a

reflex nature, for we are well aware that this form may be caused by hysteria.

In the case of the patients whose photographs we have reproduced, the diagnosis of reflex contracture was made because the spasmodic phenomena persisted until a very advanced stage of narcosis.

It should be noted that in these flexion contractures of the leg the symptoms generally followed wounds of the posterior surface of the thigh; it might, therefore, be urged that the spasm is not of a reflex character, but is due to a direct stimulation of the nerves or muscles; it might be compared with the facial hemispasm, which, as one of us has shown, is due to direct stimulation of the facial. But even admitting that this is so, one would be dealing all the same with a physiopathic contracture, and not an hysterical one, and that is, we repeat, the essential point.

We should like to make it clear that our observations introduce a new idea into neurology. Chloroform narcosis had not been employed before except to distinguish contractures from fibro-tendinous retractions, but it also serves, as we see, to distinguish the various types of contractures.

We should like to say a few words about acro-contracture or accoucheur's hand. We have been credited with the view that all contractures of this kind were due to a disorder of a reflex nature. We have never held such an opinion, but on the contrary have maintained that everything that can be reproduced by the will is within the scope of hysteria. Now, it is quite obvious that the attitude assumed by the accoucheur's hand can be easily reproduced. It is only the deformities which cannot be produced voluntarily that must be excluded from the clinical picture of hysteria; they can only be due to an organic or physiopathic disorder. "But," they may retort, "what is the explanation of the therapeutical results which have been obtained?" They will cause no surprise to those who have carefully read the preceding chapters. We have never regarded reflex disorders

as incurable, and have even definitely expressed the opposite opinion. We have said, it is true, that physiopathic disorders are generally obstinate, but chiefly in comparison with hysterical disorders, which sometimes disappear almost instantaneously under the influence of counter-suggestion. The occasionally very rapid disappearance of the motor symptoms associated with physiopathic phenomena is readily explained by the frequency of the association of hysteria with every other affection.

It appears, however, that this very simple notion has not been understood by some medical men, or at least that they have not grasped its complete significance. As regards hystero-reflex associations in particular, they are extremely common, and we have given several examples of them in the chapter on "Diagnosis."

We were so convinced of this truth in writing our book that we expressly recommended that these patients should undergo psychotherapeutic treatment, even in cases in which the reflex symptoms were most characteristic.

To regard as permanent, or even as necessarily obstinate, all the motor disorders associated with some physiopathic phenomenon would be in practice as grave an error as to attribute them all indiscriminately to hysteria.

It would indeed be a gross and wilful exaggeration of our ideas, which do not in any way justify such conclusions. We can hardly admit even that the so-called reflex disorders can last beyond a certain period, even when they are very marked. Cases of amyotrophy of the quadriceps following arthritis of the knee have been known to last for years, and to show changes for the better or the worse, but the latter is due to a recrudescence of the joint affection. When the causal lesion is definitely cured, the motor disorders and other physiopathic symptoms ought to be cured also.

If they persist it is doubtless because they are fixed

by the psychopathic element, which was first associated with them and then took their place, the motor disorders of paralysis and contracture having become purely hysterical, and the residue of the other symptoms, such as atrophy, hypotonus and circulatory disorders, being kept up by immobilisation.

We have now to determine the possible duration of this stage in which the motor disorder is reflex. As a matter of fact we have no certain knowledge on this point. The duration sometimes appears to be fairly long; in several patients who had been examined during chloroform narcosis more than a year after the onset of the symptoms, their contracture persisted until an advanced stage of the narcosis, which indicated its physiopathic nature. But there is every reason to suppose that such cases are relatively rare, and that the substitution of pithiatic phenomena for reflex symptoms may be rapid. A patient therefore who may resist psychotherapy at one period may be amenable to it later.

This is one of the reasons for which the following clause was contained in the conclusions drawn up by one of us, and adopted by the Neurological Society on April 7, 1916, to terminate the discussion on so-called functional nervous disorders.

"Before any decision is taken by a medical board it is important that the wounded suffering from this variety of motor disorders should undergo a prolonged examination in a neurological centre, and that all the appropriate psychotherapeutic and physiotherapeutic methods should be employed simultaneously. . . . Leave for convalescence may be granted, but on condition that the patients on the expiration of their leave are sent back to the same neurological centre for examination and fresh treatment."

We understood that some medical men are inclined to regard as incurable patients suffering from traumatic motor symptoms when they present some physiopathic phenomena such as hypothermia, more or less marked hypotonus or slight amyotrophy, and that patients

of this kind are too often recommended for discharge from the service. We regret that this is so, but nothing of what we have written justifies such a procedure. This constitutes, however, a danger against which we have warned medical men who were not sufficiently alive to it.[1]

At the beginning of this postscript we provisionally admitted that the great majority of patients with physiopathic disorders were capable of recovering after three or four months' treatment, and we have just shown that if this was correct, as some of our opponents mentioned, it would not be in opposition to the ideas which we have set forth. It remains clearly established that there is a group of nervous disorders comprising contractures and paretic states, occupying, as it were, an intermediate position between organic affections properly speaking and hysterical phenomena.

But are we justified in asserting that patients with nervous disorders of this kind, even under the most favourable conditions, can be cured almost infallibly in a few months? Such optimism would not be justified, for careful observations undoubtedly prove that the duration of physiopathic phenomena may be much longer. Clovis Vincent's observations which we have quoted are most conclusive in this respect.

In a recent communication our colleague brought forward some equally conclusive cases which prove the obstinacy of physiopathic symptoms in some cases. The military distinction which he gained, his remarkable success in the treatment of inveterate hysterical symptoms, his energy and perseverance, all confer considerable value on his observations. What makes them still more conclusive is that Clovis Vincent was convinced at first, as he recently stated,[2] that

[1] J. Babinski et J. Froment, Troubles physiopathiques d'ordre réflexe—Association avec l'Hystérie—Evolution—Mesures Médico-militaires. *Presse Médicale*, 9 Juillet 1917.

[2] Clovis Vincent, Sur le traitement et le pronostic des phénomènes physiopathiques. A propos de la communication de MM. Roussy, Boisseau et d'Oelsnitz. *Soc. de Neurol.*, 7 Juin 1917.

the so-called reflex disorders would not resist the treatment which he had adopted at Tours, and in which he had simultaneously employed rapid psychotherapy, energetic galvanism, intensive re-education, and methodical exercises and training.

For several months he made the patients suffering from disorders of this kind carry out these exercises under his personal supervision, and his long experience led him to conclude that unlike pithiatic phenomena reflex nervous disorders are very obstinate, and may resist the most energetic treatment and a training greatly exceeding in duration the time previously fixed.

Moreover, even those of our opponents who are most convinced of the efficacy of combined psychical and physical measures in the treatment of so-called physiopathic disorders have been led to declare recently that a cure, *i.e.*, a return to a completely normal condition, is far from constant, and that the patients in question, even if they can be cured, often remain unfit for military service.[1]

This does not mean that complete recovery from the most pronounced physiopathic disorders of a reflex character is impossible in the more or less distant future. We have seen a slow and progressive disappearance of contractures which during chloroform anæsthesia had presented the following characters: persistence of the contracture until an advanced stage of narcosis, and spasmodic movements of the affected limb caused by any attempt to correct the vicious attitude.

As regards determining the proportion of cases in which a complete cure will require a long time as compared with those in which recovery is fairly rapid, and fixing the maximum period necessary to obtain complete return to the normal condition, these, it must be confessed, are questions which our present experience does not yet allow us to answer.

We have one more remark which we should like to

[1] Roussy et Boisseau, *Soc. de Neurol.*, 5 Juillet 1917.

make. We have been confronted with the objection that the so-called physiopathic disorders are complex, and that care must be taken to avoid mixing them all up together. Possibly distinctions will have to be made later in this group, but the separation made by us far from being a confusion constitutes a dissociation, and we should be inclined to apply to our opponents the criticism which they have addressed to us. We have often had occasion to see patients with physiopathic disorders of a reflex character, whom other observers without any solid argument to support their diagnosis had considered as suffering from neuritis, arteritis or merely fibro-tendinous retractions. Sometimes the diagnosis of neuritis had been solely based on the slowness of the contraction caused by percussion of the muscles, although the characteristic signs of the reaction of degeneration were absent, and there were no motor or sensory disorders with a peripheral distribution; in some cases the mere presence of cyanosis or very marked hypothermia had led to the diagnosis of an arterial lesion without any measurement of the blood-pressure or any attempt to exclude the hypothesis of reflex vaso-motor disorders by the hot-bath experiment; in other cases a reflex contracture was not recognised because the vicious attitude was attributed to fibro-tendinous retractions, which, as was shown by examination under chloroform, were either non-existent or were associated with a contracture which was mainly responsible for the deformity.

Such errors and confusions led to the elimination from the group of physiopathic disorders of just those very ones which in our opinion were the most characteristic, and which offer most resistance to treatment. It is to cases of this kind that the term physiopathic is most applicable: a psychopathic or pithiatic state cannot explain them, and although there is a justification for the statement that the condition is due to physical changes, none of the pathognomonic physical signs of lesions of the nervous or vascular systems are found; if such lesions exist they are too limited

to account for the disorders present. We are well aware of the existence of those complex cases in which so-called reflex disorders are associated with a disturbance of the activity of the wounded limb resulting from a lesion of a nerve trunk, or changes in the muscles, tendons and bones, accompanied by cicatricial adhesions which are so common after wounds in war. The interpretation of such cases, as we have already shown, is sometimes a very difficult matter.

If, on the one hand, the group of so-called reflex disorders has the most marked and consequently the most obstinate symptoms eliminated from it, and if, on the other hand, motor disorders are introduced, accompanied by only very slight physiopathic phenomena which in our opinion are mostly of a pithiatic nature, a necessarily false conception is obtained of those physiopathic phenomena known as reflex.

This is perhaps the motive which has led some neurologists to refuse to accept the ideas which we have developed, although they recognise the correctness of the various new facts which our researches have enabled us to establish.

July 1917.

APPENDIX

REFLEX NERVOUS DISORDERS

Considerations of space prevent us from giving a full account of the numerous cases of contracture and paralysis on which our description of reflex nervous disorders is based. We will confine ourselves to giving a summary of some of our observations dealing in the first place with the state of the tendon reflexes, and secondly with the state of the peripheral circulation and the results of our sphygmometric and oscillometric examinations.

1. Observations made during Chloroform Narcosis

A. *Exaggeration of the tendon reflexes of the traumatised limb in reflex contractures*

It may be noted, first of all, that normally the stage of exaggeration of the tendon reflexes in chloroform anæsthesia appeared to us to be inconstant; in any case, it is ill marked. The order in which the reflexes disappear and reappear varies; sometimes the disappearance of the plantar cutaneous reflex precedes disappearance of the tendon reflexes and sometimes follows it; sometimes also, as we have noted, the evolution of the phenomena is still more complex. Thus in a patient who had been operated on for a tumour of the breast under chloroform, we found on her coming round from the anæsthetic that the reflexes reappeared in the following order: ankle jerk, plantar cutaneous reflex, knee jerk, elbow jerk; the disappearance of the reflexes had been too rapid to allow us to follow the

various stages. There are, therefore, very great individual differences between one case and another, but normally the phenomena of the tendon reflexes including their disappearance, return, diminution and exaggeration, always appeared to us to be symmetrical (122). The following are our cases relating to reflex contractures (125)—

Case I.—L. . . . Shrapnel wound which had involved the upper and external part of the right thigh. Contracture of pelvi-trochanteric muscles. *The right knee jerk is a little more marked than the left; the difference is very slight,* but constant, having been found again at several days' interval. After a few stimuli the right knee jerk becomes even a little polykinetic. The ankle jerks are normal and equal. There is no ankle or patellar clonus.

Chloroform anæsthesia, September 20, 1915.—From the commencement of the anæsthesia and even before the stage of motor excitement and struggling, exaggeration of the two knee jerks and a faint patellar clonus on both sides have been found; but while the excitement rapidly diminishes on the left, it progressively increases on the right. During complete muscular relaxation when all the other tendon reflexes (knee and ankle jerks on the left, and wrist and elbow jerks on both sides) are lost, a very definite patellar clonus can be obtained on the right. The reflex obtained by percussion of the patellar tendon is strong and polykinetic. The right ankle jerk is preserved but not exaggerated. On coming round from the anæsthetic, at the time when the reflexes are returning, a slight patellar clonus on the left is found; the right clonus is as marked as before. At no stage did we meet with ankle clonus. *Right patellar clonus continued for an hour after coming round.* The reflexes then returned to the state in which they had been before the anæsthesia.

Case II.—Corporal B. . . . Wounded April 22, 1915, by a bullet which penetrated the scrotum and came out through the middle of the right buttock. The urethra was injured, and the wound required fully four months to cicatrise. Contracture of pelvi-trochanteric muscles. *The right knee jerk seems a little stronger and of wider range than the left, but this difference is very slight and it is difficult to declare that*

the patient does not increase the amplitude of the movements caused by percussion of the tendon.

Chloroform anæsthesia, October 10, 1915.—No stage of definite exaggeration of the tendon reflexes found when the patient went under the anæsthetic. The tendon reflexes became diminished and then disappeared very early. On coming round the plantar cutaneous reflexes appeared long before the knee jerks. *The right knee jerk appeared distinctly and a fairly long time before the left. It was already brisk when hardly any muscular contraction was detected in the left.*

Case III.—Soldier V. . . . as the result of a fall, complained of pain in the right hip and presents claudication. Contracture of pelvi-trochanteric muscles. Right knee jerk a little the stronger, perhaps slightly polykinetic, *but the difference between the two knee jerks is very slight.*

Chloroform anæsthesia, September 5, 1915.—As soon as the patient went under the anæsthetic the knee jerks became more marked without there being any general exaggeration of the tendon reflexes. *After termination of the anæsthesia and during the stage of reappearance of the reflexes the right knee jerk became polykinetic, and patellar clonus on the same side was obtained of short duration but definite and typical.* The difference between the two knee jerks was much more marked than in the waking state.

Case IV.—Soldier L. . . . was hit by a bullet which penetrated the inner surface of the root of the right thigh and came out at the level of the great trochanter, after causing a fracture of the upper extremity of the femur. Contracture of the pelvi-trochanteric muscles. Both knee jerks are somewhat brisk, but *the right knee jerk on careful examination seems a little stronger than the other.* Sudden depression of the patella causes a faint clonus on the right, but it is difficult to be certain about its nature and to assert that it is a true clonus.

Chloroform anæsthesia, September 10, 1915.—During the stage of motor excitement exaggeration of the tendon reflexes was not observed at any moment, and the faint clonus noted in the right patella disappeared. The radial and olecranon reflexes completely disappear. It is the same

with the left knee jerk, but its disappearance is less definite. Reduction in the degree of anæsthesia is sufficient to make it reappear. *It is not, however, possible to make the right knee jerk disappear completely.* During the stage of recovery from the anæsthetic the difference between the two knee jerks is well marked; *the right knee jerk is much the strongest,* the right leg describes a more extensive movement, and on falling back strikes the operation table with greater suddenness and violence. Even to an observer who does not see it but merely hears the noise produced, the difference is considerable. Sudden depression of the patella causes a slight *clonus on the right,* which can also be produced by suddenly raising the thigh and letting the leg fall by its own weight. *The asymmetry in the reflexes which was doubtful in the waking state is thus made quite obvious.*

Case V.—Lieutenant M. . . . aged 33. Bruise from shell fragment, October 6, 1914. Contracture of the right pelvi-trochanteric muscles. *Both knee jerks are brisk, but the right is slightly more so than the other.* The muscular contraction is stronger and lasts longer, with a slight tendency to polykinesis. There is no patellar clonus nor ankle clonus, and the ankle jerks are normal.

Chloroform anæsthesia, August 15, 1915.—Although *all the other reflexes* (tendo Achillis, radial, olecranon, plantar cutaneous and corneal), *including the left knee jerk, are abolished, a very marked right patellar clonus is observed.* To produce this clonus it is not necessary to employ the ordinary method; it is enough to raise the limb and let it fall by its own weight. The right knee jerk is very brisk and very definitely polykinetic. On recovery from the anæsthetic, the patellar clonus becomes bilateral, but remains very unequal. It can scarcely be detected on the left, whereas it is extremely definite and brisk on the right. After recovery from the anæsthetic the patellar clonus persists with the same characters for about an hour and a half, and the ankle clonus for about three hours.

Case VI.—Soldier D. A. . . . aged 26, was hit by a bullet in the right calf in September 22, 1914. There was no fracture as was shown by the X-rays, but cicatrisation was slow and took no less than three months. *The right*

knee jerk is a little stronger and more sudden than the left, but the difference is very slight, and there is some doubt as to whether this exaggeration really does exist. *The difference between the two ankle jerks is even more doubtful:* all that can be said is that if there really is one, the balance is in favour of the right side.

Chloroform anæsthesia, October 1915.—As soon as the patient lost consciousness, the following phenomena were noted: both knee jerks and the left ankle jerk disappeared even before the end of the stage of motor excitement and restlessness. They rapidly became weaker before disappearing, and did not show any stage of exaggeration any more than the other tendon reflexes. The anæsthesia was then stopped: *the right ankle jerk which had never disappeared was still definite and even more marked than in the normal condition and was polykinetic.* During the stage of recovery from the chloroform the right ankle jerk remains brisk and polykinetic without, however, any ankle clonus. *The difference between the two ankle jerks is very distinct and admits of no doubt.* The period of distinct asymmetry of the knee and ankle jerks lasted about ten minutes after cessation of the anæsthesia, a little longer in the case of the knee jerks than in that of the ankle jerks.

Case VII.—B. . . . Typhoid fever, October 20, 1914; phlebitis, abscess in right buttock. Contracture of pelvi-trochanteric muscles. Sent to the out-patient department at La Pitié for a second report to be made on him. We found the following notes in the patient's case sheet—

"*Examination on September* 22, 1915.—The patient shows a slight laxity of the patellar tendon, but as much on the left as on the right. The right side is more cyanosed, which is due to the inactivity of the limb. There is no œdema. *Tendon and cutaneous reflexes normal.*

"*The loss of power is entirely functional. The patient will begin to walk as soon as he wants to.*"

In the examination at La Pitié we found that the knee jerks were brisk and polykinetic; *the right knee jerk seemed to be a little more marked than the left.*

Chloroform anæsthesia, October 25, 1915.—The knee jerks, ankle jerks, plantar cutaneous and cremasteric re-

flexes, disappeared almost instantaneously. During the first stage of anæsthesia no increase in the asymmetry of the reflexes was noted.

At the commencement of the period of recovery *an early appearance of a very definite right knee jerk was noted, while the left knee jerk was still lost.* At a later stage of recovery, the right knee jerk suddenly showed a very definite exaggeration, and on the right, but *on the right only there was patellar clonus.* Percussion of the left patellar tendon caused a contraction of the right adductors, and at the time when the exaggeration of the reflexes was most marked an actual tonic and clonic spasm in these muscles. Percussion of the right patellar tendon did not cause any contraction of the right or left adductors. Ankle clonus was never observed.

Case VIII.—Soldier P. . . . Typhoid fever, November 25, 1914. Abscess at the root of the left thigh. Contracture of the left pelvi-trochanteric muscles. *The knee jerks are both brisk, but the left is a little brisker than the right.* There is no patellar clonus. Percussion of the left tendo Achillis causes a slow and sustained contracture of the gastrocnemius.

Choloroform anæsthesia, October 25, 1915.—An obvious increase in the asymmetry of the knee jerks was noted from the commencement of the anæsthesia about four minutes after the patient had begun to take the chloroform and while he was still struggling and reacting to a prick; the left knee jerk was much more brisk than the right, but there was never any patellar clonus. *An exaggeration of the ankle jerk with ankle clonus* was also observed on the left side. Six minutes after the commencement of anæsthesia the right knee jerk was lost, the right ankle jerk extremely weakened, and the same applied to the left knee jerk. *Ankle clonus in the left foot was present throughout the recovery stage, and was also quite as marked three-quarters of an hour after complete recovery.*

Case IX.—Soldier P. . . . Wounded September 8, 1914, by a fragment of shell, which entered the upper part of the right buttock and lodged in the sacro-coccygeal region, from which it was removed. *The knee and ankle jerks*

seemed to be a little brisker on the right, but the exaggeration was doubtful.

Chloroform anæsthesia, October 15, 1915.—*Throughout the anæsthesia a decided unilateral exaggeration of the right knee jerk with unilateral patellar clonus was observed.* The left knee jerk never showed any obvious exaggeration, but grew progressively weaker. (The anæsthetic was not continued until it disappeared.) The ankle jerks grew weaker and disappeared; ankle clonus was never observed.

Case X.—Soldier F. . . . Wound of the left arm August 22, 1915, followed by cellulitis. Contracture of upper limb in position of extension with accoucheur's hand No exaggeration of the tendon reflexes in the affected hand.

Chloroform anæsthesia.—The contracture did not persist till an advanced stage of the narcosis, but an *exaggeration of the left ulnar pronator reflex with tendency to clonus was observed.*

B. *Persistence of the contracture to an advanced stage of narcosis*

Case XI.—L. . . . Bullet wound of left ankle, September 1, 1914. Contracture of foot and last four toes in position of extension with flaccid paresis of the great toe (*v.* Pl. VIII, p. 172). The left knee jerk was a little brisker than the right; the left ankle jerk appeared weaker, but the contracture of the foot made this difficult to decide.

Chloroform anæsthesia, October 22, 1915.—No definite asymmetry of the tendon reflexes except that the left ankle jerk appeared somewhat weaker than the right. The contracture disappeared completely during the stage of muscular relaxation, but reappeared soon after the return of the tendon reflexes and continued henceforward without any change. *The reappearance of the contracture preceded the return of consciousness by twenty to twenty-five minutes.*

Case XII.—B. . . . Wounded on November 11, 1914, in the right thigh (middle third), flexion contracture of leg (*v.* Pl. I, p. 96). The right knee jerk was normal, and the right ankle jerk a little weaker than the left.

Chloroform anæsthesia, November 2, 1915.—The contracture disappeared completely during the stage of muscu-

lar relaxation, but reappeared at the same time as the right knee and ankle jerks as soon as the administration of chloroform was stopped. *The reappearance of the contracture definitely preceded the return of sensibility as well as the return of the cutaneous reflexes and conjunctival reflex, and was already complete twenty minutes, at least, before consciousness returned.* Slight asymmetry of the tendon reflexes during the stage of recovery.

Case XIII.—Soldier J. Pl. . . . Wound of the posterior surface of the left thigh, September 6, 1914. Contracture of the leg in a position of hyperextension on the thigh, and contracture of the foot in a position of equino-varus (*v.* Fig. 12, p. 150).

Chloroform anæsthesia, September 12, 1916.—The deformity of the leg and foot diminished during the stage of muscular resolution, but did not disappear completely. Very pronounced fibrous retractions were therefore associated with the contracture.

The contracture reappeared very definitely before the return of consciousness. The left knee jerk reappeared before the right, and left patellar clonus was then found. At a more advanced stage of recovery it was possible to produce clonus on the right, but the phenomenon was much less marked than on the left.

C. *Spasm produced during narcosis*

Case XIV.—Captain B. . . . Wounded in the posterior part of the thigh. Paralysis of the sciatic with flexion contracture of the leg on the thigh.

Chloroform anæsthesia, October 15, 1915.—The contracture disappeared completely in the period of muscular relaxation, *i. e.*, twenty-five minutes after the commencement of the anæsthesia, while consciousness disappeared in eight minutes. Its disappearance and that of the plantar cutaneous reflex were almost simultaneous. During complete anæsthesia any effort to correct the vicious attitude caused a movement of flexion of the leg resembling that produced by cutaneous stimulation in cutaneo-reflex contractures, but here the cutaneous stimulation was ineffec-

tive. The spasm which was not present in the waking state did not return in the stage of muscular relaxation; it disappeared and reappeared at the same time as the plantar cutaneous reflex [1] and the contracture; it could be provoked about ten minutes before the return of the first manifestations of consciousness.

Sphygmometric and Oscillometric Observations

As will be seen in the annexed tables which contain a summary of some of our observations, our researches (161) deal with the state of the peripheral circulation in various classes of cases,[2] including reflex nervous disorders, lesions of the nerve trunks, lesions of the large vessels, and various associations of nerve disorders. This comparative study has enabled us to estimate better the sphygmometric and oscillometric character of the circulatory disturbances in reflex paralysis and contractures.

[1] In a woman who showed a cutaneo-reflex contracture with flexion paraplegia, whom we had the opportunity of examining during chloroform narcosis, the disappearance as well as the return of the reflexes of defence and plantar cutaneous reflexes were equally simultaneous.

[2] In their interesting study on "the real symptomatology of complete section of peripheral mixed nerves," H. Claude and Stephen Chauvet (195) studied the vaso-motor reactions in complete section of the peripheral mixed nerves. They referred to the researches of Lapinski, who had observed the three following stages after experimental section: 1. A short stage of arterial constriction. 2. A stage of marked vaso-dilatation lasting 26 to 60 hours. 3. A stage in which the intensity of the vaso-dilatation diminished although it still remained quite distinct. In the clinical cases of recent nerve sections (less than a month) which they had the opportunity of seeing they noted vaso-dilatation; we should state that they based the diagnosis of vaso-dilatation simply on the redness of the skin. It should be added that in order to make this redness more distinct in certain cases they recognised the necessity of examining the patient after he had been in a warm room, and let his hand hang down for a few moments when the upper limb was affected. Lastly, they noted that this vaso-dilatation was not of indefinite duration, and that even in the absence of a union of the nerves the normal vascular tonicity was likely to return.

TABLE I

Name.	Reflex Disorders of Upper Limb without Lesion of Nerve Trunks.		Systolic Pressure. Riva-Rocci-Vaquez.	Oscillations. Brachial	Oscillations. Radial.	Gaertner on Index.	Date of Examination.
I. R . . .	Wound of left shoulder, August 1914; atrophy, cyanosis, hypothermia, reflex paresis associated with hysteria.	Sound side	14·5	18°	3°	11	Nov. 1915
		Affected side	14·5	15°	1°	3	
II. M . . .	Through and through wound of left forearm without fracture, December 1914; atrophy, cyanosis, tendinous retractions, paralysis of muscles of forearm and hand, very pronounced hypothermia, exaggeration and slowness of mechanical contractility.	Sound side	14·5	24°	7°	9	Feb. 24 1916
		Affected side	13·5	20°	1°	0	
		Sound side	12·5	20°	6°		Mar. 8 1916
		Affected side	11·5	14°	0°·5		
III. B . . .	Through and through wound of left forearm, August 1915; slight cone-shaped contracture of hand, variable disturbances of temperature.	Sound side	10·5	14°	8°	9	Feb. 1916
		Affected side	10·5	14°	8°	8	
IV. D . . .	Through and through wound and fracture of left carpus, November 1914; very pronounced cone-shaped contracture of hand, slight hypothermia, exaggeration	Sound side	13	18°	6°	15	Dec. 1915
		Affected side	13	16°	4°	11·5	

V. P . . .	Wound of antero-inferior part of right axilla, January 1915; slight contracture of hand, slight hypothermia.	Sound side	14°	26°	14°	10·5	April 1916
		Affected side	14·5	26°	7°	9	
VI. M . . .	Wound of left arm, September 1914; bicipital retraction, paresis, slight hypothermia.	Sound side	14·5	20°	6°	14	Feb. 1916
		Affected side	14	17°	4°	11	
VII. B . . .	Wound of right forearm, January 1915; retraction of flexor tendons, hypothermia, exaggeration of mechanical contractility, slight paresis of hand.	Sound side	13·2	20°	6°	10	Jan. 1916
		Affected side	13	20°	2°	4	
VIII. A . . .	Through and through wound of left wrist, April 1915; paralysis of muscles of forearm and hand, very pronounced hypothermia.	Sound side	11·5	20°	5°	7·5	Mar. 1916
		Affected side	11·5	20°	3°	4	
IX. M . . .	Dislocation and fracture of left elbow, April 1915; total paralysis of muscles of forearm and hand, diffuse redness of limb, hypothermia and mechanical contractility very pronounced on certain days, absent on others.	Sound side	14	24°	4°	12·5	Mar. 2 1916
		Affected side	14	24°	2°	10	
		Sound side			5°		Mar. 6 1916
		Affected side			6°·5		

TABLE I—(*continued*)

Name.	Reflex Disorders of Upper Limb without Lesion of Nerve Trunks.		Systolic Pressure. Riva-Rocci-Vaquez.	Oscillations.		Gaertner on Index.	Date of Examination.
				Brachial.	Radial.		
X. M . . .	Wound of left arm, June 1915; paralysis of hand with pronounced hypothermia.	Sound side	14	16°	5°	5	Mar. 1916
		Affected side	13	14°	3°	5	
XI. F . . .	Wound of left forearm, August 1914; paralysis of extensors of hand, variable disturbance of temperature.	Sound side	13	14°	2°·5	7	Mar. 1916
		Affected side	12	12°	0°·5	5	
XII. P . . .	Wound of anterior surface of left forearm; paresis of forearm and hand, hypothermia.	Sound side	16	28°	8°	11	Mar. 1916
		Affected side	15·7	24°	5°	7	
XIII. B . . .	Fracture of neck of humerus by bullet, September 1914; paresis of arm, hypothermia.	Sound side	11	22°	4°	9	May 1916
		Affected side	11	14°	2°	8	
XIV. S . . .	Through and through wound of right wrist, September 1914; contracture of hand with flexion, hypothermia.	Sound side	14·5	16°	11°		Dec. 1915
		Affected side	14·5	14°	6°		

TABLE II

Name.	Reflex Disorders of Lower Limb without Lesion of Nerve Trunks.		Systolic Pressure (Riva-Rocci-Vaquez) in dorsalis pedis.	Oscillations.		Gaertner Second Toe.	Date of Examination.
				Femoral.	Tibial.		
XV. M . . .	Traumatism from falling in of trench, November 1914; cyanosis, œdema, and extreme coldness of left lower limb, paralysis, exaggeration of mechanical contracture.	Sound side	12		4°		Sept. 1915
		Affected side	0 ?		1°		
		Sound side	12	26°	8°	3	May 1916
		Affected side	10 ?	14°	1°	0	
XVI. V . . .	Wound of right leg, September 1915; slight paralysis, coldness, exaggeration of mechanical contractility and tendon reflexes.	Sound side	16	14°	11°	8·5	April 1916
		Affected side	16	12°	6°	7	
XVII. D . . .	Wound of left leg, September 1915; paresis of leg and foot, exaggeration of mechanical contractility.	Sound side	12·5	20°	10°	12	Mar. 1916
		Affected side	10 ?	14°	2°·5	6	
XVIII. L . . .	Wound of right calf, November 1914; contracture of right knee, muscular atrophy.	Sound side	15	18°	10°		Mar. 1916
		Affected side	14	16°	3°		
XIX. D . . .	Fracture of right tibia, muscular weakness of leg, very marked hypothermia, exaggeration of mechanical contractility.	Sound side	12		12°		May 1916
		Affected side	?		2°		

TABLE II—(*continued*)

Name.	Reflex Disorders of Lower Limb without Lesion of Nerve Trunks.		Systolic Pressure (Riva-Rocci-Vaquez) in dorsalis pedis.	Oscillations. Femoral.	Oscillations. Tibial.	Gaertner. Second Toe.	Date of Examination.
XX. B . . .	Contusion of right lower limb from shell explosion, December 1916; paresis of limb with hypothermia and exaggeration of mechanical contractility with modification of electrical reactions.	Sound side	14·0	14°	12°	15	June 1916
		Affected side	13·5	11°	6°	9	
XXI. G . . .	Wound of metatarso-phalangeal joint of little finger, August 1914; atrophy, coldness, paresis of right leg and foot, exaggeration of mechanical contractility.	Sound side	12·5		10°		Oct. 1915
		Affected side	12		7°		
		Sound side		20°	14°		Mar. 1916
		Affected side		18°	7°		
XXII. B . . .	Wound of right thigh, November 1914; contracture of knee persisting during light chloroform narcosis, no hypothermia nor exaggeration of mechanical contractility in foot.	Sound side	14		8°		Jan. 1916
		Affected side	14		8°		

XXIII. V . . .	Wound of calf, November 1914; with adherent scar; slight contracture of left knee, no hypothermia nor exaggeration of mechanical contractility except on posterior surface of thigh.	Sound side	14		4°·5		July 1915
		Affected side	14		4°		
XXIV. L . . .	Slight wound of dorsum of left foot, end of October 1914; paralysis of extensors of toes and tibialis anticus, coldness of leg, exaggeration of mechanical contractility of leg and foot muscles.	Sound side	12	24°	7°	11	Mar. 1916
		Affected side	12	20°	4°	8	
XXV. L . . .	Wound of posterior surface of right thigh, contracture of knee with hypothermia and exaggeration of mechanical contractility of leg and foot muscles.	Sound side	14·5	16°	5°		April 1916
		Affected side	14·5	14°	4°		
XXVI. R . . .	Commotion from shell explosion, April 1914; paralysis of right leg and foot with hypothermia and exaggeration of mechanical contractility (hystero-reflex association).	Sound side	12		6°		Feb. 1916
		Affected side	12		2°		

TABLE II—(*continued*)

Name.	Reflex Disorders of Lower Limb without Lesion of Nerve Trunks.		Systolic Pressure (Riva-Rocci-Vaquez) in dorsalis pedis.	Oscillations.		Gaertner. Second Toe.	Date of Examination.
				Femoral.	Tibial.		
XXVII. A . . .	Slight wound of left leg and commotion from shell explosion, September 1914; paralysis of left lower limb with hypothermia and exaggeration of mechanical contractility (hystero-reflex association).	Sound side	16	18°	12°	8°	Dec. 1915
		Affected side	16	14°	8°	6°	
XXVIII. M . . .	Seton in left buttock, September 28, 1914; hypothermia of limb, exaggeration of mechanical contractility, contracture of knee and toes in flexed position.	Sound side	13·5		18°		May 1916
		Affected side	13		14°		
XXIX. G . . .	Trench foot in winter of 1914–15, wound of left leg by 3 shell fragments, left lower limb weak and atrophied, hypothermia especially in winter, cyanosis, exaggeration of knee jerk, and mechanical contractility of muscles.	Sound side	14		9°		Mar. 1916
		Affected side	14		2°		
		Sound side	14		18°	12·5	July 1916
		Affected side	14		12°	11·5	

As may be seen on reference to Tables I and II, the systolic pressure is not modified in the limb affected with reflex nervous disorders, but the amplitude of the oscillations in the radial or in the tibial arteries is weaker, and the arterio-capillary tension is lower than in the sound limb.[1] This asymmetry is so obvious and so frequently obscured, at least in cold weather, that one is justified in regarding it as one of the characteristic symptoms of the nervous disorders under consideration. So long as the conditions under which the observations are made remain the same, it may be found in the same patient at each examination (Cases II, XV, XXI and XXIX), but its intensity may vary considerably from one month to another. A rise in the atmospheric temperature or a prolonged stay in a hot room is sufficient to cause a disappearance of the differences previously noted (Case IX). Even in cases where this asymmetry is very marked, a hot bath, as we shall see later (p. 284), diminishes it (Cases II, XI and XV), or causes it to disappear (Cases IV, VIII, XVI and XXVI); sometimes even this asymmetry is reversed (Case IX).

The diminution of the amplitude of the oscillations and of the arterio-capillary tension in the wounded limb, in view of its instability and changeable character, can only be explained by a vascular spasm which occurs whenever the atmospheric temperature is low. This indicates, as we have shown, an actual disturbance of the local vaso-motor control. The wounded limb behaves as if it were specially sensitive to the action of thermal agents, and as if it were unable to maintain normal control over its circulation except under particularly favourable atmospheric conditions.

We will now relate the results of our further researches, which may be classified as follows :—

Table III.—Lesions of nerve trunks without the association of definite reflex nervous disorders. Tables IV and V.—Reflex nervous disorders associated with a lesion of a nerve trunk. Tables VI and VII.—Arterial lesions associated with lesions of nerve trunks and reflex nervous disorders.

[1] All these examinations were carried out with the same Pachon's instrument which had already been used for the study of oscillations in the normal individual. This detail deserves to be noted, as different instruments do not always register oscillations of equal amplitude in the same individual, and the oscillometers on sale at the present time show less ample oscillations than those of the old pattern, such as the one which we employed.

TABLE III

Name.	Lesion of Nerve Trunks without Association of Definite Reflex Nervous Disorders.		Systolic Pressure Riva-Rocci-Vaquez.	Oscillations.		Gaertner.		Date of Examination.
				Brachial.	Radial.	Index.	Ring Finger.	
XXX. P . . .	Wound of left arm, December 1914; section of ulnar nerve severed by operation (complete R.D., anæsthesia), no reflex disorder, no hypothermia, no exaggeration of mechanical contractility, no tendinous retractions.	Sound side	12	14°	12°			Feb. 1916
		Affected side	12	14°	12°			
		Sound side	12	16°	8°	11·5	11	July 1916
		Affected side	12	17°	8°	11	11	
XXXI. A . . .	Cellulitis of the hand with lesion of right median nerve (partial R.D. very marked), no vaso-motor trouble, no mechanical hyperexcitability of muscles.	Sound side	12	10°	7°	13	13	Mar. 1916
		Affected side	12	12°	7°	13	13	
XXXII. V . . .	Section of 5th left cervical root, May 1915; anæsthesia in region of circumflex and musculo-cutaneous, total R.D. of deltoid, biceps, brachialis anticus, and supinator longus; hypothermia limited to upper arm and forearm, no exaggeration of mechanical contractility of muscles of forearm and hand.	Sound side	11·5	18°	4°	11	13·5	June 1916
		Affected side	11	14°	6°	11·5	13	

XXXIII. M . . .	Wound in upper part of left arm with perforation of median nerve, July 10, 1916; large swelling in the course of the nerve, atrophy and partial R.D. of muscles innervated by median, hypæsthesia in region of this nerve, no reflex motor disorders, no hypothermia nor changes in colour of the skin.	Sound side	15·5	20°	8°	15	16	Aug. 1916
		Affected side	15·5	16°	8°	15	15	
XXXIV. L . . .	Wound of right thigh (lower third), September 1915; slight lesion of internal popliteal (pains, hypæsthesia, partial R.D.); hypothermia only in leg, no increase of mechanical excitability.	Sound side	16	22°	12°	10		June 1916
		Affected side	16	18°	8°	12		
XXXV. A . . .	Wound of left leg, June 1915; section of external popliteal (complete R.D.) very moderate hypothermia, no modifications of mechanical contractility, normal reflexes.	Sound side	12	12°	6°	5		Jan. 1916
		Affected side	12	14°	6°	5		

TABLE III—(*continued*)

Name.	Lesion of Nerve Trunks without Association of Definite Reflex Nervous Disorders.		Systolic Pressure Riva-Rocci-Vaquez.	Oscillations.		Gaertner.		Date of Examination.
				Brachial.	Radial.	Index.	Ring Finger.	
XXXVI. F . . .	Wound in popliteal space, March 1916; lesion of external popliteal (hypæsthesia, complete R.D.), no reflex disorders.	Sound side	14	16°	8°	9		June 1916
		Affected side	14	16°	9°	9		
XXXVII. G . . .	Wound of outer aspect of right leg, August 1914; lesion of external popliteal (complete R.D. followed in 18 months by partial R.D.), no reflex troubles, very moderate hypothermia.	Sound side	12	24°	8°	10		Feb. 1916
		Affected side	12	22°	8°	9		
XXXVIII. M . . .	Wound of right knee, September 1914; lesion of internal popliteal (plantar anæsthesia, complete R.D. of plantar muscles), hypothermia of foot, no other reflex disorders.	Sound side	13·5	20°	14°	11		Mar. 1916
		Affected side	14	18°	12°	10·5		

TABLE IV

Name.	Reflex Disorders Associated with Lesions of a Nerve Trunk (Upper Limb).		Systolic Pressure. Riva-Rocci-Vaquez.	Oscillations.		Gaertner.		Date of Examination.
				Brachial.	Radial.	Index.	Ring Finger.	
XXXIX. M . . .	Fracture of right carpus, May 1915; section of median at wrist (anæsthesia, complete R.D. of thenar eminence), cyanosis, pronounced hypothermia, exaggeration of mechanical contractility, paralysis of muscles of forearm and hand.	Sound side	12·5	18°	10°	9	14	April 1916
		Affected side	11·5	16°	6°	0	2	
XL. B . . .	Through and through wound of right elbow, September 1914; section of median (anæsthesia, complete R.D. of anterior muscles of forearm and thenar eminence); pronounced hypothermia, hypotonus, exaggeration of mechanical contractility of muscles of hand and posterior surface of forearm with paresis.	Sound side	13	21°	12°	9		Mar. 1916
		Affected side	12	18°	1°	5		

TABLE IV—(*continued*)

Name.	Reflex Disorders Associated with Lesions of a Nerve Trunk (Upper Limb).		Systolic Pressure. Riva-Rocci-Vaquez.	Oscillations.		Gaertner.		Date of Examination.
				Brachial.	Radial.	Index.	Ring Finger.	
XLI. C . . .	Through and through wound of right arm, June 1915; musculo-spiral paralysis (hypæsthesia, complete R.D. of supinator longus and posterior muscles of forearm), hypothermia, weakness of flexors, exaggeration of mechanical contractility of muscles of hand and anterior surface of forearm, with faradic hyperexcitability.	Sound side	12	20°	4°	11	14	Jan.
		Affected side	11	22°	2°	9·5	13	1916
XLII. B . . .	Through and through wound of right arm, April 1916; slight lesion of median (anæsthesia of index, with coldness of this finger, partial R.D. of thenar eminence), hypothermia, exaggeration of mechanical contractility of hand muscles.	Sound side	12	14°	6°	10	13	June 1916
		Affected side	12	12°	2°·5	5	10	

XLIII. B . . .	Wound of left arm, September 1914; musculo-spiral paralysis (complete R.D. of supinator longus and muscles of posterior surface of forearm), paresis of other muscles of forearm, hypothermia, exaggeration of mechanical contractility.	Sound side	13	20°	12°	10		Mar. 1916
		Affected side	13	18°	6°	7		
XLIV. D . . .	Through and through wound of left forearm, October 1915; lesion of median above wrist with complete R.D. of thenar eminence; reflex disorders in region of ulnar nerve.	Sound side	13·5	18°	8°	10	11	June 1916
		Affected side	13	18°	5°	6	10	
XLV. L . . .	Wound of right upper arm, June 1915; with complete R.D. and anæsthesia of inner surface of hand; hypothermia, exaggeration of mechanical contractility of forearm muscles, atrophy.	Sound side	11	20°	3°	8	12	Mar. 1916
		Affected side	11	20°	1°	11	10	
XLVI. V . . .	Right middle finger crushed, September 1914; painful neuritis of median (hypæsthesia, partial R.D. of thenar eminence), coldness of hand, especially index, exaggeration of mechanical contractility of muscles of hand.	Sound side	14	12°	5°	14	15	April 1916
		Affected side	14·5	16°	5°	10	15	

TABLE IV—(*continued*)

Name.	Reflex Disorders Associated with Lesions of a Nerve Trunk (Upper Limb).		Systolic Pressure Riva-Rocci-Vaquez.	Oscillations.		Gaertner.		Date of Examination.
				Brachial.	Radial.	Index.	Ring Finger.	
XLVII. C . . .	Wound of left forearm, November 1915; section of ulnar nerve, pronounced hypothermia, atrophy and exaggeration of mechanical contractility of forearm muscles.	Sound side	10·5	14°	5°	11		April 1916
		Affected side	11	7°	1°	9		
XLVIII. F . . .	Wound of right elbow, November 1914; musculo-spiral paralysis with complete R.D., reflex disorders in the area of the other nerves of the limb.	Sound side	13·5	14°	6°	6		April 1916
		Affected side	13	12°	5°	4		
XLIX. L . . .	Section of right forearm, April 1916; slight lesion of median (partial R.D. of thenar muscles), paresis of hand with increase of mechanical contractility of muscles of hand and forearm, temperature of hand very variable.	Sound side	12·2	14°	10°	12	12·5	July 1916
		Affected side	12·5	12°	6°	11	11	
L. E . . .	Wound of left elbow, August 1914; incomplete lesion of ulnar nerve (partial R.D.), hypothermia reaching to shoulder, most marked in 5th finger, atrophy and weakness of limb.	Sound side	12·5	20°	14°	13	12	June 1915
		Affected side	12·5	16°	16°	12	3	

LI. A . . .	Through and through wound of left forearm, June 1915; section of ulnar nerve, pronounced hypothermia, atrophy of forearm, exaggeration of mechanical contractility of thenar muscles.	Sound side	10·5	17°	5°	11	11	May 1916
		Affected side	10·5	14°	4°	9	1	
LII. L . . .	Through and through wound of right arm, August 1914; lesion of musculo-spiral and ulnar nerves (complete R.D.), hypothermia, paresis and increase of mechanical contractility of muscles innervated by median.	Sound side	13	20°	3°	10		April 1916
		Affected side	12·5	20°	1°·5	7		
LIII. F . . .	Through and through wound of right arm, December 1914; pseudarthrosis of humerus, lesion of musculo-spiral nerve (complete R.D.), marked hypothermia, exaggeration of mechanical contractility of hand muscles.	Sound side	12·5	22°	8°	12		April 1916
		Affected side	13	20°	4°	11		
LIV.	Cellulitis of right hand, April 1915; with lesion of median nerve (complete R.D.), retractions, hypothermia, spasms of hypothernar eminence, exaggeration of mechanical contractility of muscles innervated by ulnar.	Sound side	11·5	10°	7°	14	13	June 1916
		Affected side	11	16°	7°	9	7	

TABLE V

Name.	Reflex Disorders Associated with a Lesion of a Nerve Trunk (Lower Limb).		Systolic Pressure (Riva-Rocci-Vaquez) in dorsalis pedis.	Oscillations.		Gaertner. Second Toe.	Date of Examination.
				Femoral.	Tibial.		
LV. Le T . . .	Wound in left foot, October 1915; lesion of anterior tibial nerve at ankle (complete R.D. of extensor brevis digitorum); contracture of foot in equino-varus position, pronounced hypothermia, cyanosis, exaggeration of mechanical contractility of plantar muscles.	Sound side	12·5		20°	6	June 1916
		Affected side	12		9°	4	
LVI. B . . .	Wound of right thigh, October 1915; lesion of some branches of anterior crural (hypæsthesia and partial R.D. of vastus internus), reflex contracture of other portions of quadriceps, marked atrophy of thigh, pronounced hypothermia of thigh not extending to foot, exaggeration of mechanical contractility of muscles of leg and thigh.	Sound side	16·5	14°	12°	12	Dec. 1915
		Affected side	16·5	8°	8°	12	

					8°		Aug. 1915
LVII. F . . .	Through and through wound of left leg in lower third, May 1915; lesion of posterior tibial nerve with complete R.D. of plantar muscles, pain, plantar anæsthesia; atrophy, paresis, exaggerated mechanical excitability of muscles of leg and extensor brevis digitorum, hypothermia, exaggeration of left knee jerk.	Sound side	12·5		8°		
		Affected side	12·5		5°		
		Sound side	13·2	18°	18°	9	July 1916
		Affected side	13	10°	9°	7	
LVIII. Ch . . .	Through and through wound of upper part of right thigh, September 1915; lesion of sciatic principally affecting fibres of external popliteal (complete R.D.); hypothermia, exaggeration of mechanical contractility of plantar muscles, exaggeration of knee jerk.	Sound side	12	28°	11°	11	July 1916
		Affected side	12	24°	6°	7	
LIX. L . . .	Wound of posterior aspect of left thigh, September 1914; complex section of sciatic (complete R.D. of all the muscles innervated by this nerve); atrophy and exaggeration of the mechanical contractility of the quadriceps, exaggeration of knee jerk, hypothermia.	Sound side	15	22°	10°	12	June 1915
		Affected side	15·2	12°	8°	5	

TABLE VI

Name.	Arterial Lesions, Associated with Lesions of Nerve Trunks and Reflex Disorders (Upper Limb).		Blood Pressure.		Oscillations.		Gaertner on Index.	Date of Examination.
			Systolic Riva-Rocci-Vaquez.	Diastolic.	Brachial.	Radial.		
LX. B . . .	Ligature of right axillary, July 1915; section of median and ulnar nerves (bullet wound), pronounced hypothermia, cyanosis.	Sound side	12·5	9	12°	8°	10	Nov. 1915
		Affected side	6	0	4°	0°·5	1	
LXI. L . . .	Ligature of right brachial in upper third (bullet wound), June 1915; musculo-spiral paralysis (complete R.D.); hypothermia, 25° C. left hand and 20°·5 C. right hand, cyanosis, exaggeration of mechanical contractility.	Sound side	13	6·5	16°	10°	11	Jan. 1916
		Affected side	7·5	6·5	7°	1°·5	7	
LXII. B . . .	Ligature of left axillary for aneurysm, following wound, September 1914; complex lesion of brachial plexus, pronounced hypothermia, 26° C. right hand and 19° C. left hand.	Sound side	13	8·7	18°	9°	9	Feb. 1916
		Affected side	9·5	9	5°	1°	5	
LXIII. G . . .	Ligature of left axillary, October 1915 (bullet wound), lesion of musculo-spiral, ulnar and median; very slight	Sound side	13	10	14°	6°	13	Dec. 1915
		Affected side	0	0	6°	3°	6	

	hand and 27° C. left hand.							
LXIV. P . . .	Obliteration of right brachial, following bullet wound, May 1915, found on operation; paralysis of the whole brachial plexus; hypothermia, 27° C. left hand and 23° C. right hand, pronounced cyanosis.	Sound side	11	9·5	8°	5°	10	Dec. 1916
		Affected side	0	0	0	0	0	
LXV. S . . .	Forceps left 4 days on right brachial, September 1914; lesion of ulnar nerve, hypothermia, cyanosis, exaggeration of mechanical contractility.	Sound side	11·5	7·5	22°	6°	8	Feb. 1916
		Affected side	7·5	7·5	12°	1°	8	
LXVI. Cl . . .	Obliteration of left axillary artery following bullet wound, October 1914; lesion of median and ulnar nerves, hypothermia, 27° C. right hand and 15° C. left hand, pronounced cyanosis.	Sound side	15	9	20°	12°	12	Dec. 1915
		Affected side	0	9	3°	1°	10	
LXVII. B . . .	Bullet wound of right arm, September 1914; obliteration of brachial by tourniquet; lesion of median, hypothermia, 25° C. left hand and 17° C. right hand, cyanosis, exaggeration of mechanical contractility.	Sound side	12	7	26°	10°	7	Dec. 1915
		Affected side	8	8	12°	1°·5	6	

TABLE VII

Name.	Arterial Lesions with Association of Lesions of Nerve Trunks and Reflex Disorders.		Blood Pressure. Systolic Riva-Rocci-Vaquez.	Blood Pressure. Diastolic.	Oscillations. Femoral.	Oscillations. Tibial.	Gaertner on Index.	Date of Examination.
LXVIII. S . . .	Section by bullet of right popliteal, May 1915; tourniquet, sloughing of toes; lesion of external popliteal nerve, foot red and hot, hypothermia of calf.	Sound side	15·5	8·5		16°		Feb. 1916
		Affected side	0	0		0°·5		
LXIX. M . . .	Ligature of left femoral, October 1914, for aneurysm following wound, slight lesion of external popliteal, *absence of any reflex disorder*, no hypothermia, nor exaggeration of mechanical contractility.	Sound side	14·5	9		8°		April 1916
		Affected side	13	10·5		2°		
LXX. C . . .	Ligature of right femoral in upper third, May 1915; *no nervous lesions;* very slight hypothermia, no exaggeration of mechanical contractility.	Sound side	15	10·5	16°	8°		Mar. 1916
		Affected side	0	0	2°	1°		

LXXI. V . . .	Ligature of right femoral in upper third for wound, January 1916; *no nervous lesions*, pronounced hypothermia, cyanosis, exaggeration of mechanical contractility.	Sound side	20	11	32°	10°		July 1916
		Affected side	0	0	6°	0		
LXXII. C . . .	Obliteration of left femoral in lower third with diffuse aneurysm from bullet, May 1915; *no nervous lesions*, pronounced hypothermia, 24° C. right foot and 20° C. left foot, exaggeration and slowness of mechanical contraction of muscles.	Sound side	14·5	9·5	14°	3°		Nov. 1915
		Affected side	12	11	12°	0°·5		

Influence of Hot or Cold Baths on the State of the Local Circulation

In the normal subject the limb when plunged into water at 40° C. for five minutes becomes red, its temperature rises from 23°–27° C., the arterial oscillations become amplified and the arterio-capillary pressure, as taken by Gaertner's tonometer, rises. In a cold bath (12° C.) of the same duration the temperature falls, and sinks, for instance, from 25°–15° C., or from 18°–12°·5 C., while the amplitude of the oscillations and the arterio-capillary pressure diminish. But as a general rule all these changes disappear fairly rapidly, and in about ten minutes the limb has returned to its former condition.

In the subject suffering from *reflex nervous disorders* the temperature, as the result of the hot bath, frequently rises on the affected side more than on the sound side. Under the action of the cold bath the fall of the local temperature is more marked in the affected limb. Thus, in one of our patients (Table I, Case II), we noted—

	Before the bath.	After bath at 40° C.
Sound side . . .	23°	27°
Affected side . . .	15°	28°

	Before the bath.	After bath at 12° C.
Sound side . . .	18°	12°·5
Affected side . . .	14°	9°

In another patient we noted—

	Before the bath.	After bath at 12° C.
Sound side . .	25°	15°
Affected side . . .	27°	13°

We may add that the return to the original condition is generally slower in the affected limb than in the sound limb.

As regards *the state of the circulation*, this is modified in a similar manner in that as the result of a warm bath the amplitude of the oscillations tends to increase on the

affected side more than on the sound side. It is the same as regards the arterio-capillary pressure. Here are some examples—

CASE II (TABLE I)

	Before the bath.		After bath at 40° C.	
	Radial oscillations.	Gaertner.	Radial oscillations.	Gaertner.
Sound side . .	7	9	16	10
Affected side. .	1	0	4	9

At the same time the skin of the affected side becomes hot and the muscular contraction on percussion becomes perceptibly more rapid and less ample.

CASE IV (TABLE I)

	Before the bath.		After bath for 5 min. at 40° C.	
	Radial oscillations.	Gaertner.	Radial oscillations.	Gaertner.
Sound side . .	4	10	6	11
Affected side . .	2	11	5	12

CASE VIII (TABLE I)

	Before the bath.		After bath at 40° C.	
	Radial oscillations.	Gaertner.	Radial oscillations.	Gaertner.
Sound side . .	5	7·5	8	10
Affected side . .	3	4	8	8

Another day—

Sound side . .	4	4
Affected side . .	2	8

In both experiments the affected hand had become definitely hotter than the sound hand, and the mechanical excitability of the muscles, which had been very exaggerated, had returned to normal.

Case IX (Table I)

	Before the bath. Radial oscillations.	After bath at 40° C. Radial oscillations.
Sound side	4	12
Affected side . . .	2	22
Fresh experiments a few days later—		
Sound side	5	18
Affected side . . .	6	22

It should be noted that the hyperthermia in the affected limb can still be found thirty minutes after the bath. This case is a very striking one, as it clearly shows the disturbance of the vaso-motor mechanism in the affected limb.

Case XV (Table II)

	Before the bath. Tibial oscillations.	After a bath of 5 minutes at 40° C. Tibial oscillations.	After a bath of 10 minutes at 40° C.
Sound side .	8	8	14
Affected side .	1	6	12

Simultaneously with a progressive increase in the oscillation a full pulse was felt in the dorsalis pedis artery, which could not be felt on the affected side before the bath when the foot was very cold. The cyanosis and œdema persisted, but the mechanical excitability, which had been very much increased before the bath, became normal again.

Case XVI (Table II)

	Before the bath. Tibial oscillations.	After bath at 40° C. Tibial oscillations.
Sound side . . .	11	12
Affected side . . .	6	13

Case XXVI (Table II)

	Before the bath. Tibial oscillations.	After bath at 40° C. Tibial oscillations.	15 min. after bath. Tibial oscillations.
Sound side .	6	6	6
Affected side .	2	8	8

Cold baths produced the opposite effect; the amplitude of the oscillations diminished in the affected limb more than in the sound limb. Thus in one of the cases observed we noted—

	Before the bath. Radial oscillations.	After bath at 12° C. Radial oscillations.
Sound side . . .	3	0·75
Affected side . . .	3	0

In another patient we noted—

	Before the bath.		After the bath.	
	Radial oscillations.	Gaertner.	Radial oscillations.	Gaertner.
Sound side .	4	12	3	12
Affected side .	4	6	2	4

We sometimes employed this method during the summer months to demonstrate the circulatory disturbances in the paretic or contractured limb in doubtful cases.

In patients presenting *reflex nervous disorders associated with a lesion of a nerve trunk*, as in the preceding case (pure reflex disorders), the hot bath causes the amplitude of the oscillations to increase more on the affected side than on the sound side; it is the same for the arterio-capillary pressure. The following are two examples—

Case XLIII (Table IV)

(Musculo-spiral paralysis with pronounced reflex disorders.)

	Before the bath.		After bath at 40° C.	
	Radial oscillations.	Gaertner on the index.	Radial oscillations.	Gaertner on the index.
Sound side	12	10	14	10
Affected side	6	7	16	7

Simultaneously with a considerable increase in the oscillations on the paralysed side, the hand which had been cold before the bath became as hot as on the sound side, the white patch disappeared equally rapidly on the two sides, and the mechanical excitability of the hand muscles perceptibly diminished.

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Case XLIV (Table IV)

(Paralysis of the median with reflex disorders.)

This case is still more striking because it shows the rise of arterio-capillary pressure in the index, due to the bath, in a case of lesion of the median.

	Before the bath.		
	Radial oscillations.	Gaertner on the index.	Gaertner on the ring finger.
Sound side . .	8	10	11
Affected side . .	5	6	10
	After bath at 40° C.		
	Radial oscillations.	Gaertner on the index.	Gaertner on the ring finger.
Sound side . .	10	11·5	14
Affected side . .	10	10·5	15

In the case of *arterial obliteration* the local temperature rose under the action of the warm bath, but less than in cases of reflex disorders; the arterio-capillary pressure also rose, but the oscillations were not modified or showed only a very slight increase, *e. g.*, if the amplitude was 0·5 before the bath, after the bath it was 0·5 or 1° (143) (161).

To sum up, we have studied the state of the peripheral circulation in the following conditions—

1. In reflex nervous disorders unaccompanied by lesions of the nerve trunks or large vessels (pure reflex disorders).
2. In lesions of the nerve trunks unaccompanied by reflex nervous disorders, with the motor disorders exclusively localised in the area of the region affected.
3. In lesions of the nerve trunks associated with reflex nervous disorders.
4. In lesions of the large vessels either alone or combined with various nervous associations (lesions of the nerve trunks, reflex nervous disorders).

How are these various conditions to be distinguished from one another?

We have described above the condition of the circulation in cases of *pure reflex nervous disorders*, of which the following are the essential features—

(*a*) Diminution of the amplitude of the oscillations, ill-marked in the brachial and femoral, and often pronounced in the radial and tibial arteries.

(*b*) Fall of the arterio-capillary pressure, as measured by Gaertner's instrument.

(*c*) Absence of any change in systolic or diastolic arterial pressure.

(*d*) Considerable increase in the affected limb as the result of the application of heat, of the amplitude of the oscillations, which may become equal or superior to that of the oscillations in the sound limb.

In *pure lesions of the nerve trunks* there may not be any appreciable change in the circulation.

When *reflex nervous disorders are associated with a lesion of a nerve trunk*, the state of the circulation resembles that seen in pure reflex disorders, except that the vaso-motor phenomena generally predominate in the area of the affected nerve, as can be ascertained by Gaertner's apparatus; the fall of the arterio-capillary pressure, as well as the hypothermia and cyanosis are more marked in the index, when the median nerve is affected, and in the ring and little finger in lesions of the ulnar; after application of heat, the difference diminishes or disappears.

In cases of pure or associated *arterial obliteration*, the amplitude of the oscillations is considerably diminished, and in this respect this class of cases resembles reflex nervous disorders; but contrary to what is seen in the latter, the systolic blood pressure is very much weakened when the artery is obliterated, and another important distinguishing feature is the fact that the application of heat does not increase the amplitude of the oscillations or only in an insignificant degree.

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III.—LITERATURE QUOTED IN THE TEXT, BUT WITH ONLY AN INDIRECT BEARING ON THE QUESTIONS DISCUSSED IN IT

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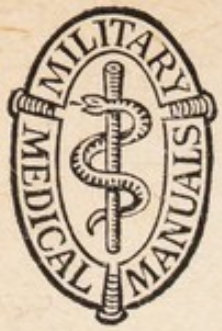
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LONDON:

UNIVERSITY OF LONDON PRESS

18, WARWICK SQUARE, LONDON, E.C. 4

PARIS:

MASSON ET Cie., 120, Boulevard St. Germain.

Extract from

the Introduction by the General Editor,

Sir Alfred Keogh.

THE special interest and importance, in a surgical sense, of the great European War lies not so much in the fact that examples of every form of gross lesion of organs and limbs have been seen, but is to be found in the enormous mass of clinical material which has been presented to us and in the production of evidence sufficient to eliminate sources of error in determining important conclusions. For the first time also in any campaign the labours of the surgeon and the physician have had the aid of the bacteriologist, the pathologist, the physiologist and indeed of every form of scientific assistance in the solution of their respective problems.

The achievements in the field of discovery of the chemist, the physicist and the biologist have given the military surgeon an advantage in diagnosis and treatment which was denied to his predecessors, and we are able to measure the effects of these advantages when we come to appraise the results which have been attained.

But although we may admit the general truth of these statements it would be wrong to assume that modern scientific knowledge was, on the outbreak of the war, immediately useful to those to whom the wounded were to be confided. Fixed principles existed in all the sciences auxiliary to the work of the surgeon, but our scientific resources were not immediately available at the outset of the great campaign; scientific work bearing on wound problems had not been arranged in a manner adapted to the requirements,

were not fully foreseen; for the workers in the various fields were isolated or had isolated themselves pursuing new researches rather than concentrating their powerful forces upon the one great quest.

However brilliant the triumphs of surgery may be, and that they have been of surpassing splendour no one will be found to deny, experiences of the war have already produced a mass of facts sufficient to suggest the complete remodelling of our methods of education and research.

The series of manuals, which it is my pleasant duty to introduce to English readers, consists of translations of the principal volumes of the "Horizon" Collection which has been appropriately named after the uniform of the French soldier.

The views of great authorities, who derive their knowledge from extensive first-hand practical experience gained in the field cannot fail to serve as a most valuable asset to the less experienced, and must do much to enable them to derive the utmost value from the experience which will, in time, be theirs. The series covers the whole field of war surgery and medicine, and its predominating note is the exhaustive, practical and up-to-date manner in which it is handled. It is marked throughout not only by a wealth of detail, but by clearness of view and logical sequence of thought. Its study will convince the reader that, great as have been the advances in all departments in the services during this war, the progress made in the medical branch may fairly challenge comparison with that in any other, and that not the least among the services rendered by our great Ally, France, to the common cause, is this brilliant contribution to our professional knowledge.

UNIVERSITY OF LONDON PRESS, LTD.
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THE TREATMENT OF INFECTED WOUNDS

By A. CARREL and G. DEHELLY. Translated by HERBERT CHILD, Capt. R.A.M.C., with Introduction by Sir ANTHONY A. BOWLBY, K.C.M.G., K.C.V.O., F.R.C.S., Surgeon-General Army Medical Service. With 97 illustrations in the text and six plates. Price, 5*s.* net. Postage 5*d.* extra.

"Is as fine an example of correlated work on the part of the chemist, the bacteriologist, and the clinician as could well be wished for, and bids fair to become epoch-making in the treatment of septic wounds.

"I am glad to take the opportunity of expressing the appreciation of British Surgeons at the Front of the value of what is known to us as Carrel's method. The book itself will be found to convey in the clearest manner the knowledge of those details which have been so carefully elaborated by the patient work of two years' experience, but it is only by scrupulous attention to every detail that the best results will be obtained . . .

"The utility of Carrel's method is not confined to recent wounds, and in the following pages those surgeons who are treating the wounded in Great Britain will find all the necessary information for the treatment of both healthy and suppurating wounds."—*From Sir Anthony Bowlby's Introduction.*

This volume is included by arrangement with Messrs. Baillière, Tindall and Cox.

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THE PSYCHONEUROSES OF WAR

By Dr. G. ROUSSY, Assistant Professor in the Faculty of Medicine, Paris, and J. LHERMITTE, sometime Laboratory Director in the Faculty of Medicine, Paris. Edited by Colonel WILLIAM ALDREN TURNER, C.B., M.D., and Consulting Neurologist to the Forces in England. Translated by WILFRED B. CHRISTOPHERSON. With 13 full-page plates. Price, 6*s*. net. Postage 5*d*. extra.

The Psychoneuroses of War being a book which is addressed to the clinician, the authors have endeavoured, before all else, to present an exact semeiology, and to give their work a didactic character.

After describing the general idea of the psychoneuroses and the methods by which they are produced, the authors survey the various clinical disorders which have been observed during the War, beginning with elementary motor disturbances and passing on through sensory disorders and disorders of the special senses to disturbances of a purely psychical character. Under the motor system, affections such as paraplegia, the tics and disturbances of locomotion are detailed; under the sensory system, pains and anæsthesias are passed in review; under disorders of the special senses, deafness and blindness are studied; then follows a detailed account of the visceral symptoms and finally some types of nervous attacks and lastly the psychical disorders.

A special chapter is given to a consideration of cerebral concussion and a review of the symptoms following the explosion of shells in close proximity to the soldier. The book ends with a survey of the general etiology of the psychoneuroses of war, the methods of treatment adopted and used successfully by the authors, and finally the points bearing upon the invaliding of the soldier and his discharge from the Army.

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THE CLINICAL FORMS OF NERVE LESIONS

By Mme. ATHANASSIO BENISTY, House Physician of the Hospitals of Paris (Salpêtrière), with a Preface by Prof. PIERRE MARIE. Edited with a Preface by E. FARQUHAR BUZZARD, M.D., F.R.C.P., Captain R.A.M.C.T., etc. With 81 illustrations in the text, and 7 full-page plates. Price, 6*s*. net. Postage 5*d*. extra.

In this volume will be found described some of the most recent acquisitions to our knowledge of the neurology of war. But its principal aim is to initiate the medical man who is not a specialist into the examination of nerve injuries. He will quickly learn how to recognise the nervous territory affected, and the development of the various clinical features ; he will be in a position to pronounce a precise diagnosis, and to foresee the consequences of this or that lesion. In this way his task as military physician will be facilitated.

With this end in view considerable space has been devoted to the illustrations, which are intended to remind the physician of the indispensable anatomical elements, and the most striking clinical pictures. Numerous diagrams in black and white enable him to effect the essential work of localisation. The diagnosis of nervous lesions is thus facilitated.

A second volume will be devoted to the study of the *lesions* themselves, together with their *restoration*, and all the methods of *treatment* which are applicable to such lesions. This will appear immediately.

Together these volumes will represent a complete epitome of one of the principal departments of "war neurology."

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THE TREATMENT AND REPAIR OF NERVE LESIONS

By Mme. ATHANASSIO BENISTY, House Physician of the Hospitals of Paris, with a Preface by Professor PIERRE MARIE, Members of the French Academy of Medicine. Edited by E. FARQUHAR BUZZARD, M.D., F.R.C.P., Captain R.A.M.C.T., etc. With 62 illustrations in the text and 4 full-page plates. Price, 6*s*. net. Postage 5*d*. extra.

The other book published by Mme. Athanassio Benisty, which was devoted to the *Clinical Features of Injured Nerves*, explained the method of examination, and the indications which enable one to differentiate the injuries of the peripheral nerves. It is a highly practical guide, which initiates in the diagnosis of nervous lesions those physicians who have not hitherto made a special study of these questions. —This second volume is the necessary complement of the first. It explains the nature of the lesions, their mode of repair, their prognosis, and above all their *treatment*. It provides a series of particularly useful data as to the evolution of nerve-wounds—the opportunities of intervention—and the prognosis of immediate complications or late sequelae.

But it is especially the application of prosthesis which constitutes the principal therapeutical innovation by which our "nerve cases" have benefited. All these methods of treatment ought to be made commonly known, and a large space has been reserved for them in this volume, which will not only furnish an important contribution to the science of neurology, but will enable the medical profession to profit by the knowledge recently acquired in respect of the diagnosis, prognosis, and treatment of nerve-wounds.

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THE TREATMENT OF FRACTURES

By R. LERICHE, Assistant Professor of the Faculty of Medicine, Lyons. Edited by F. F. BURGHARD, C.B., M.S., F.R.C.S. Formerly Consulting Surgeon to the Forces in France.

Vol. I. **FRACTURES INVOLVING JOINTS.** With 97 illustrations from original and specially prepared drawings. Price, 6*s.* net. Postage 5*d.* extra.

The author's primary object has been to produce a handbook of *surgical therapeutics*. But surgical therapeutics does not mean merely the technique of operation. Technique is, and should be, only a part of surgery, especially at the present time. The purely operative surgeon is a very incomplete surgeon in time of peace; "in time of war he becomes a public disaster; for operation is only the first act of the first dressing."

For this reason Prof. Leriche has cast this book in the form of a compendium of articular therapeutics, in which is indicated, for each joint, the manner of conducting the treatment in the different stages of the development of the wound. In order to emphasize their different periods he has described for each articulation:

1. The anatomical types of articular wounds and their clinical development.—2. The indications for immediate treatment at the front.—3. The technical indications necessary for a good functional result.—4. Post-operative treatment.—5. The conditions governing evacuation.—6. The treatment of patients who come under observation at a late period.

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THE TREATMENT OF FRACTURES

By R. LERICHE, Assistant Professor in the Faculty of Medicine, Lyons. Edited by F. F. BURGHARD, C.B., M.S., F.R.C.S. Formerly Consulting Surgeon to the Forces in France.

Vol. II. **FRACTURES OF THE SHAFT.** With 156 illustrations from original and specially prepared drawings. Price, 6*s.* net. Postage 5*d.* extra.

Vol. I. of this work was devoted to *Fractures involving Joints;* Vol. II. (which completes the work) treats of *Fractures of the Shaft*, and is conceived in the same spirit—that is, with a view to the production of a work on *conservative surgical therapeutics.*

The author strives on every page to develop the idea that anatomical conservation must not be confounded with functional conservation. The two things are not so closely allied as is supposed. There is no conservative surgery save where the function is conserved. The essential point of the treatment of diaphysial fractures consists in the early operative disinfection, primary or secondary, by an extensive sub-periosteal removal of fragments, based on exact physiological knowledge, and in conformity with the general method of treating wounds by excision. When this operation has been carefully performed with the aid of the rugine, with the object of separating and retaining the periosteum of all that the surgeon considers should be removed, the fracture must be correctly reduced and the limb immobilized.

For each kind of fracture the author has given various methods of immobilization, and examines in succession : the anatomical peculiarities—the physiological peculiarities—the clinical course—the indications for early treatment—the technical steps of the operations—and the treatment of those who only come under observation at a late period.

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FRACTURES OF THE LOWER JAW

By L. IMBERT, National Correspondent of the Société de Chirurgie, and PIERRE RÉAL, Dentist to the Hospitals of Paris. With a Preface by Medical Inspector-General FÉVRIER. Edited by J. F. COLYER, F.R.C.S., L.R.C.P., L.D.S. With 97 illustrations in the text and 5 full-page plates. Price, 6*s.* net. Postage 5*d.* extra.

Previous to the present war no stomatologist or surgeon possessed any very extensive experience of this subject. Claude Martin, of Lyons, who perhaps gave more attention to it than anyone else, aimed particularly at the restoration of the occlusion of the teeth, even at the risk of obtaining only fibrous union of the jaw. The authors of the present volume take the contrary view, maintaining that consolidation of the fracture is above all the result to be attained. The authors give a clear account of the various displacements met with in gunshot injuries of the jaw and of the methods of treatment adopted, the latter being very fully illustrated.

In this volume the reader will find a hundred original illustrations, which will enable him to follow, at a glance, the various techniques employed.

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FRACTURES OF THE ORBIT AND INJURIES OF THE EYE IN WAR

By FELIX LAGRANGE, Professor in the Faculty of Medicine, Bordeaux. Translated by HERBERT CHILD, Captain R.A.M.C. Edited by J. HERBERT PARSONS, D.Sc., F.R.C.S., Temp. Captain R.A.M.C. With 77 illustrations in the text and 6 full-page plates. Price, 6*s.* net. Postage 5*d.* extra.

Grounding his remarks on a considerable number of observations, Professor Lagrange arrives at certain conclusions which at many points contradict or complete what we have hitherto believed concerning the fractures of the orbit: for instance, that traumatisms of the skull caused by fire-arms produce, on the vault of the orbit, neither fractures by irradiation nor independent fractures; that serious lesions of the eye may often occur when the projectile has passed at some distance from it. There are, moreover, between the seat of these lesions (due to concussion or contact) on the one hand, and the course of the projectile on the other hand, constant relations which are veritable clinical *laws*, the exposition of which is a highly original feature in this volume.

The book is thus far more than a mere "document," or a collection of notes, though it may appear both; it is, on the contrary, an essay in synthesis, a compendium in the true sense of the word.

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HYSTERIA OR PITHIATISM, AND REFLEX NERVOUS DISORDERS

By J. BABINSKI, Member of the French Academy of Medicine, and J. FROMENT, Assistant Professor and Physician to the Hospitals of Lyons. Edited with a Preface by E. FARQUHAR BUZZARD, M.D., F.R.C.P., Captain R.A.M.C.T., etc. With 37 illustrations in the text and 8 full-page plates. Price, 6*s*. net. Postage 5*d*. extra.

The number of soldiers affected by hysterical disorders is great, and many of them have been immobilized for months in hospital, in the absence of a correct diagnosis and the application of a treatment appropriate to their case. A precise, thoroughly documented work on hysteria, based on the numerous cases observed during two years of war, was therefore a necessity under present conditions. Moreover, it was desirable, after the discussions and the polemics of which this question has been the subject, to inquire whether we ought to return to the old conception, or whether, on the other hand, we might not finally adopt the modern conception which refers hysteria to pithiatism.

This book, then, brings to a focus questions which have been especially debated; it does not appeal exclusively to the neurologist, but to all those who, confronted by paralysis or post-traumatic contractures, convulsive attacks, or deafness provoked by the bursting of shells, have to grapple with the difficulties of diagnosis and ask themselves what treatment should be instituted. In it will be found all the indications which are necessary to the military physician, summarized as concisely as is possible in a few pages and a few illustrations.

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WOUNDS OF THE SKULL AND THE BRAIN. Clinical forms and medico-surgical treatment.

By C. CHATELIN, and T. De MARTEL. With a Preface by Professor PIERRE MARIE. Edited by F. F. BURGHARD, C.B., M.S., F.R.C.S. Formerly Consulting Surgeon to the Forces in France. With 97 illustrations in the text, and 2 full-size plates. Price, 6*s*. net. Postage 6*d*. extra.

Of all the medical works which have appeared during the war, this is certainly one of the most original, both in form and in matter. It is, at all events, one of the most individual.

The authors have preferred to give only the results of their own experience, and if their conclusions are not always in conformity with those generally accepted, this, as Professor Pierre Marie states in his Preface, is because important advances have been made during the last two years; and of this the publication of this volume is the best evidence.

Thanks to the method of radiographing the convolutions after filling the furrows, which has become sufficiently exact to be of real service to the clinician, the authors have been able to work out a complete and novel cerebral pathology, which presented itself in lamentable abundance in the course of their duties, which enabled them to examine and give continued attention to many thousands of cases of head injuries.

Physicians and surgeons will read these pages with profit. They are pages whose substance is quickly grasped, which are devoid of any display of erudition, and which are accompanied by numerous original illustrations.

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LOCALISATION AND EXTRACTION OF PROJECTILES

By Assistant-Professor OMBRÉDANNE, of the Faculty of Medicine, Paris, and M. LEDOUX-LEBARD, Director of the Laboratory of Radiology of the Hospitals of Paris. Edited by A. D. REID, C.M.G., M.R.C.S., L.R.C.P., Major (Temp.) R.A.M.C., with a Preface on Extraction of the Globe of the Eye, by Colonel W. T. LISTER, C.M.G. With 225 illustrations in the text and 30 full-page photographs. Price, 10*s.* 6*d.* net. Postage 6*d.* extra.

Though intentionally elementary in appearance, this compendium is in reality a complete treatise concerning the localisation and extraction of projectiles. It appeals to surgeons no less than to radiologists.

It is a summary and statement—and perhaps it is the only summary recently published in French medical literature—of all the progress effected by surgery during the last two and a half years.

MM. Ombrédanne and Ledoux-Lebard have not, however, attempted to describe all the methods in use, whether old or new. They have rightly preferred to make a critical selection, and—after an exposition of all the indispensable principles of radiological physics—they examine, in detail, all those methods which are typical, convenient, exact, rapid, or interesting by reason of their originality: the technique of localisation, the compass, and various adjustments and forms of apparatus. A considerable space is devoted to the explanation of the method of extraction by means of *intermittent control*, in which the complete superiority of radio-surgical collaboration is demonstrated.

Special attention is drawn to the fact that the numerous illustrations contained in this volume (225 illustrations in the text and 30 full-page photographs) are entirely original.

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WOUNDS OF THE ABDOMEN

By G. ABADIE (of Oran), National Correspondent of the Société de Chirurgie. With a Preface by Dr. J. L. FAURE. Edited by Sir ARBUTHNOT LANE, Bart., C.B., M.S., Colonel (Temp.), Consulting Surgeon to the Forces in England. With 67 illustrations in the text and 4 full-page plates. Price, 6*s*. net. Postage 5*d*. extra.

Dr. Abadie, who, thanks to his past surgical experience and various other circumstances, has been enabled, at all the stations of the army service departments, to weigh the value of methods and results, considers the following problems in this volume, dealing with them in the most vigorous manner:

1. How to decide *what is the best treatment* in the case of penetrating wounds of the abdomen.

2. How to instal the *material organisation* which permits of the application of this treatment; and how to recognize those conditions which prevent its application.

3. How to decide *exactly what to do in each special* case; whether one should perform a radical operation, or a palliative operation, or whether one should resort to medical treatment.

This volume, therefore, considers the penetrating wounds of the abdomen encountered in our armies under the triple aspect of *doctrine, organisation, and technique.*

We may add that it contains nearly 70 illustrations, and the reproductions of sketches specially made by the author, or photographs taken by him.

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WOUNDS OF THE BLOOD-VESSELS

By L. SENCERT, Assistant Professor in the Faculty of Medicine, Nancy. Edited by F. F. BURGHARD, C.B., M.S., F.R.C.S. Formerly Consulting Surgeon to the Forces in France. With 68 illustrations in the text and 2 full-page plates. Price, 6*s.* net. Postage 5*d.* extra.

Hospital practice had long familiarised us with the vascular wounds of civil practice, and the experiments of the Val-de-Grâce School of Medicine had shewn us what the wounds of the blood-vessels caused by modern projectiles would be in the next war. But in 1914 these data lacked the ratification of extensive practice. Two years have elapsed, and we have henceforth solid foundations on which to establish our treatment. This manual gathers up the lessons of these two years, and erects them into a doctrine.

In a first part, Prof. Sencert examines the wounds of the great vessels in general; in a second part he rapidly surveys the wounds of the vascular trunks in particular, insisting on the problems of operation to which they give rise.

"I should like it to be clearly understood," he concludes, "that the surgery of the blood-vessels is only a particular case of the general surgery of wounds received in war. There is only one war surgery: the immediate operative surgery which we have been learning for the last two years.

"This rule is never more imperative than in the case of vascular wounds. Early operation alone prevents deferred and secondary haemorrhage; early operation alone can prevent the complications which are so peculiarly liable to result from the effusion of blood in the tissues; early operation alone can obviate subsequent complications. Here, as everywhere, the true and useful surgery is a surgery of prophylaxis."

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THE AFTER-EFFECTS OF WOUNDS OF THE BONES AND JOINTS

By AUG. BROCA, Professor of Topographical Anatomy in the Faculty of Medicine, Paris. Translated by J. RENFREW WHITE, M.B., F.R.C.S., Temp. Captain R.A.M.C., and edited by R. C. ELMSLIE, M.S., F.R.C.S.; Orthopædic Surgeon to St. Bartholomew's Hospital, and Surgeon to Queen Mary's Auxiliary Hospital, Roehampton; Major R.A.M.C.T. With 112 illustrations in the text. Price, 6*s.* net. Postage 5*d.* extra.

This new work, like all books by the same author, is a vital and personal work, conceived with a didactic intention.

At a time when all physicians are dealing, or will shortly have to deal, with the after-effects of wounds received in war, the question of sequelae presents itself, and will present itself more and more.

What has become—and what will become—of all those who, in the hospitals at the front or in the rear, have hastily received initial treatment, and what is to be done to complete a treatment often inaugurated under difficult circumstances?

This volume successively passes in review: vicious calluses—prolonged and traumatic osteo-myelitis (infected stumps)—articular and musculo-tendinous complications—and "dissolving" calluses—terminating by considerations of a practical nature as to discharged cases.

Profusely illustrated under the immediate supervision of Professor Broca, this volume contains 112 figures, all executed by an original process.

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ARTIFICIAL LIMBS

By A. BROCA, Professor in the Faculty of Medicine, Paris, and Dr. DUCROQUET, Surgeon at the Rothschild Hospital. Edited and translated by R. C. ELMSLIE, M.S., F.R.C.S., etc. ; Orthopædic Surgeon to St. Bartholomew's Hospital, and Surgeon to Queen Mary's Auxiliary Hospital, Roehampton ; Major R.A.M.C.T. With 210 illustrations. Price, 6*s*. Postage 5*d*. extra.

The authors of this book have sought not to describe this or that piece of apparatus—more or less "new-fangled"—but to explain the anatomical, physiological, practical and technical conditions which an artificial arm or leg *should* fulfil.

It is, if we may so call it, a manual of *applied mechanics* written by physicians, who have constantly kept in mind the anatomical conditions and the professional requirements of the artificial limb.

Required, during the last two years, to examine and equip with appliances hundreds of mutilated soldiers, the authors have been inspired by this guiding idea, that the functional utilisation of an appliance should take precedence of considerations of external form. To endeavour, for æsthetic reasons, to give all subjects the same leg or the same arm is to risk disappointment. The mutilated soldier may have a "show hand" and an every-day hand-implement.

The manufacturer will derive no less profit than the surgeon or the mutilated soldier himself from acquaintance with this compendium, which is a substantial and abundantly illustrated volume. He will find in it a survey and a reasoned criticism of mechanisms which notably display the ingenuity of the makers —from the wooden "peg" of the poor man, together with his "best" leg and foot, to the artificial limb provided with the very latest improvements.

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TYPHOID FEVERS AND PARA-TYPHOID FEVERS (Symptomatology, Etiology, Prophylaxis)

By H. VINCENT, Medical Inspector of the Army, Member of the Academy of Medicine, and L. MURATET, Superintendent of the Laboratories at the Faculty of Medicine of Bordeaux. Second Edition. Translated and Edited by J. D. ROLLESTON, M.D. With tables and temperature charts. Price, 6*s*. net. Postage 5*d*. extra.

This volume is divided into two parts, the first dealing with the clinical features and the second with the epidemiology and prophylaxis of typhoid fever and paratyphoid fevers A & B. The relative advantages of a restricted and liberal diet are discussed in the chapter on treatment, which also contains a description of serum therapy and vaccine therapy, and general management of the patient.

A full account is to be found of recent progress in the bacteriology and epidemiology of these diseases, considerable space being given to the important question of the carrier in the dissemination of infection.

The excessive frequency of typhoid fever in war time is demonstrated by a sketch of its history from the War of Secession of 1861-1866 down to the present day.

The concluding chapter is devoted to preventive inoculation, the value of which is proved by the statistics of all countries in which it has been adopted.

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DYSENTERIES, CHOLERA, AND EXANTHEMATIC TYPHUS

By H. VINCENT, Medical Inspector of the Army, Member of the Academy of Medicine, and L. MURATET, Director of Studies in the Faculty of Medicine, Bordeaux. With an Introduction by Lt. Col. ANDREW BALFOUR, C.M.G., M.D. Edited by GEORGE C. LOW, M.A., M.D., Temp. Captain I.M.S. Price, 6*s.* net. Postage 5*d.* extra.

This, the second of the volumes which Professor Vincent and Dr. Muratet have written for this Series, was planned, like the first, in the laboratory of Val-de-Grâce, and has profited both by the personal experience of the authors and by a mass of recorded data which the latter years of warfare have very greatly enriched. It will be all the more welcome as hitherto there has existed no comprehensive handbook treating these great epidemic diseases from a didactic point of view. The articles scattered through the reviews, or memoirs buried in the large treatises, did not respond to the need which was felt by the military physician, in France as well as in distant expeditions, of a work which should bring to a common focus a number of questions which were, in general, very imperfectly understood.

The authors review, in succession, the Clinical details, the Epidemiology, and Prophylaxis of *Dysenteries*, *Cholera*, and *Typhus*. In the section dealing with *Prophylaxis*, in particular, will be found practical advice as to the special hygiene possible in the case of large collections of people placed in conditions favourable to the development of these diseases.

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ABNORMAL FORMS OF TETANUS

By MM. COURTOIS-SUFFIT, Physician of the Hospitals of Paris, and R. GIROUX, Resident Professor. With a Preface by Professor F. WIDAL. Edited by Surgeon-General Sir DAVID BRUCE, C.B., F.R.S., LL.D., F.R.C.P., etc., and FREDERICK GOLLA, M.B. Price, 6*s*. net. Postage 5*d*. extra.

Of all the infections which threaten our wounded men, tetanus is that which, thanks to serotherapy, we are best able to prevent. But serotherapy, when it is late and insufficient, may, on the other hand, tend to create a special type of attenuated and localised tetanus ; in this form the contractions are as a general rule confined to a single limb. This type, however, does not always remain strictly monoplegic ; and if examples of such cases are rare this is doubtless because physicians are not as yet very well aware of their existence.

We owe to MM. Courtois-Suffit and R. Giroux one of the first and most important observations of this new type ; so that no one was better qualified to define its characteristics. This they have done in a remarkable manner, supporting their remarks by all the documents hitherto published, first expounding the characteristics which individualise the other atypical and partial types of tetanus, which have long been recognized.

The preventive action of anti-tetanic serum should not cause us to disregard its curative action, the value of which is incontestable. However, a specific remedy, even when a powerful specific, cannot act upon all the complex elements which constitute a disease ; and tetanus presents itself, in the first place, as an affection of the nervous system. To contend with it, therefore, a symptomatic medication should come to the aid of a pathogenic medication.—*Professor Widal.*

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SYPHILIS AND THE ARMY

By G. THIBIERGE, Physician of the Hôpital Saint-Louis. Edited by C. F. MARSHALL, F.R.C.S. Price, 6*s*. net. Postage 5*d*. extra.

It seemed, with reason, to the editors of this series that room should be found in it for a work dealing with syphilis considered with reference to the army and the present war.

The frequency of this infection in the army, among the workers in munition factories, and in the midst of the civil population where this is in contact with soldiers and mobilized workers, makes it, at the present time, a true epidemic disease, and one of the most widespread of epidemic diseases.

Dr. Thibierge, whose previous labours guarantee his peculiar competence in these difficult and important questions, has, in writing this manual, very notably assisted in this work.

But the treatment of syphilis has, during the last six years, undergone considerable modifications ; the new methods are not yet very familiar to all physicians ; and certain details may no longer be present to their minds. It was therefore opportune to survey the different methods of treatment, to specify their indications, and their occasionally difficult technique, which is always important if complications are to be avoided. It was necessary before all to state precisely and to retrace, for all those who have been unable to follow the recent progress of the therapeutics of venereal diseases, the characters and the diagnostic elements of the manifestations of syphilis.

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