

RELATIVE FREQUENCY OF THE VARIOUS JOINT LESIONS.¹—The following table was prepared by Dr. Vickery² from the records of



FIG. 234.—x-Ray of Hand in Gouty Arthritis. (Goldthwaite.)

the Massachusetts General Hospital (1893–1903):

Infectious arthritis	Acute rheumatic arthritis.....	591	} 873
	Subacute rheumatic arthritis.....	193	
	Gonorrhœal arthritis.....	86	
	Typhoid arthritis (spine).....	3	
Hypertrophic and atrophic arthritis.....		43	
Gout.....		9	

¹ Chronic villous arthritis ("dry joint") is a purely local process and therefore receives no further mention here.

² Boston Med. and Surg. Jour., November 17th, 1904.

CHAPTER XXV.

THE NERVOUS SYSTEM.

EXAMINATION OF THE NERVOUS SYSTEM.

THE outlines of neurological diagnosis depend on knowledge of:

- I. Disturbances of motion.
- II. Disturbances of sensation.
- III. Disturbances of reflexes (including sphincteric and sexual reflexes).
- IV. Disturbances of electrical excitability.
- V. Disturbances of speech and handwriting.
- VI. Disturbances of nutrition ("trophic").
- VII. Psychic disorders.

I shall attempt no *topical diagnosis* of nerve lesions, no diagnosis, that is, depending on memorizing the brain areas, cord levels, or skin-and-muscle areas corresponding to particular nerve lesions. The general practitioner for whom this book is intended will not attempt to carry such points in his head, but will refer to specialists or special text-books when the case confronts him. The general methods most often employed are all that I attempt to describe.

I. Disorders of Motion.

1. Gaits.
 2. Paralyses.
 3. Spasms and tremors.
 4. Ataxia.
1. *Gaits*.—The most important gaits are:
- (a) The *spastic*.
 - (b) The *ataxic*.

- (c) The gait of *paralysis agitans*.
- (d) The *toe-drop gait*.
- (e) The *gait of simple weakness*.

With the *spastic gait* there is rigidity of the legs, making it difficult to lift the feet; hence the patient scuffs along, usually with bent knees and as if his feet were fastened to the ground.¹

The *ataxic gait* is difficult to describe. The patient is not muscularly weak, but does not know where his feet are or where the ground is; hence he flounders and throws his feet about irregularly.

The *gait of paralysis agitans* is an exaggeration of the old man's gait, such as we often see on the stage. The whole body is bent forward and rigid (see Fig. 235), and, if progress is accelerated by a push given from behind, the patient may be unable to stop himself.

In the *toe-drop gait* the foot is raised high and slapped down upon the ground with a flail-like motion.

2. *Paralysis or Paresis*.—No detailed account can be given here of the method of testing individual muscles for loss or impairment of power. In general, a knowledge of the origins and attachments of muscles enables us to work out for ourselves a series of tests that will bring any desired group into contraction. It is convenient to class paralyzes according to their origin as follows:

- (a) *Brain paralysis*: usually *hemiplegia* (arm and leg on same side, with or without the face).
- (b) *Cord paralysis*: usually *paraplegia* (both legs, rarely both arms) or *monoplegia* (one extremity).
- (c) *Cranial nerve paralysis*: usually *one or more eye muscles*.
- (d) *Peripheral nerve paralysis*: *special muscle groups*, oftenest the extensors of the wrist or foot, the shoulder muscles, and those supplied by the facial nerve.

(e) *Hysterical paralysis*: no strict anatomical distribution, oftenest *monoplegia* (one extremity).

Peripheral nerve paralyzes are especially apt to be accompanied by sensory symptoms, electrical changes, and wasting. Brain paral-

¹The *cross-legged gait* is a spastic gait in which the adductors of the thighs are so contracted that the feet tend to be crossed. This gait is oftenest seen in the *congenital spastic paralyzes*.

yses have relatively few sensory symptoms (sometimes paræsthesiæ, see below, page 510) and relatively slight wasting. Mental changes, coma, or convulsions often precede or follow them. Cord



FIG. 235.—Attitude Characteristic of Paralysis Agitans. (Curschmann.)

paralyzes may or may not show these associations, but are often accompanied by disorders of the bladder and rectum.

3. *Spasm, Tremor, and Fibrillary Twitching*.—(a) Spasm means involuntary muscular contraction. The familiar "cramp" is a good example of the type of spasm known as *tonic spasm*. In contrast with this is the *clonic spasm*, in which flexors and extensors contract alternately to produce a motion like that of our forearm when

we shake up a fluid in a test tube, or like the ankle clonus (see below).

Spasms may be general or local, *i.e.*, involve few or many muscles. In strychnine poisoning the whole body may be thrown into rigidity or *general tonic spasm*. At the beginning of an epileptic seizure the body stiffens out (tonic spasm), then becomes "convulsed" (*general clonic spasm*). *Local tonic spasm* is exemplified in the ordinary "*cramp*." The spastic gait, above described, is another common example of tonic spasm limited mainly to one group of muscles. The *contractures* which so often affect the sound muscles in a partially paralyzed limb (see above, page 506) are also examples of *local tonic spasms*.

Athetosis, a special variety of local tonic spasm, has been described on page 45.

Local clonic spasm is not common. It may be due to irritation of a small portion of the cerebral cortex by various lesions ("Jacksonian epilepsy"), and sometimes precedes or alternates with the general spasms of ordinary epilepsy. It also occurs in hysteria.

Artificially a momentary or prolonged clonic spasm of the foot muscles is often produced in testing for the *ankle clonus* (see below, page 513).

(*b*) *Tremor* may be defined as a *clonic spasm of short excursion*. Its causes and varieties have already been discussed (see page 43).

(*c*) *Fibrillary twitchings* means the brief repeated contraction of small bundles of muscle fibres. It is seen in patients who are cold or nervous, in many debilitated and neurasthenic conditions, and often in muscles affected by *progressive muscular atrophy*.

(*d*) *Choreic* and *choreiform* movements have already been described (page 44).

4. *Ataxia*.—Inco-ordination of the various muscles which normally act together to produce a well-directed movement is called *ataxia*. All young infants exhibit ataxia in their more or less unsuccessful grasping movements. Alcoholic intoxication often produces typical ataxia, and it is also exemplified in the *gait of tabes dorsalis*. There is no lack of muscular contraction—often too much—but it is disorderly and ill-directed.

Deficiency in the power to balance in standing or walking is perhaps the commonest type of ataxia, and may be due not only to the causes just mentioned, but also to cerebellar disease and ear disease. In these types there is often a tendency to stagger in one particular direction, *e.g.*, to the right, and the ataxia is associated with vertigo and with other evidences of brain tumor or of ear disease.

In *tabes dorsalis* and other diseases we test the power to balance by asking the patient to bring his feet together (toe to toe and heel to heel) and to close his eyes. If he is unable to preserve his balance his failure is known as "*Romberg's sign*."

II. Disorders of Sensation.

The following are the most important types:

1. *Anæsthesia* (or insensibility to pain, to touch, to heat and cold, and to muscle sensation).
2. *Hyperæsthesia* (or *oversensitiveness*).
3. *Paræsthesia* (abnormal, false, or disordered sensation).
4. *Pain*.
5. *Disorders of special sense*.

These disturbances may all be seen in different stages or types of lesions of the spinal cord or peripheral nerves. They are less common in brain lesions.

1. Tests of *anæsthesia* are time-consuming and difficult, because we depend for our data on the patient's intelligent answer to the question, "Do you feel that?" As a rule, we cover the patient's eyes and then touch the suspected parts—first lightly, then more strongly—questioning him to see if he feels the touch, can judge the nature of the touching object (finger, pencil, pin), and tell where he is touched. A pin-prick is oftenest used to test pain sense, and test tubes filled, one with hot, one with cold water, are convenient for trying the temperature sense. Finally, we try whether the patient can recognize familiar objects placed in his hand and can tell the position in which you may put his arms or legs. Failure to make these discriminations is known as *astereog-*

nosis, and occurs oftenest in brain lesions affecting the temporal lobes.

Dissociation of sensation—the preservation, for example, of sensations of touch with loss of those of pain and temperature—occurs oftenest in syringomyelia.

Delayed sensation and mistakes regarding the point touched in testing are commonest in *tabes dorsalis*, which disease presents a great variety of sensory disorders not here catalogued.

The distribution of anæsthesia depends, like the distribution of paralysis, on the lesion. *Hemianæsthesia* is seen oftenest in *hysteria* and *organic brain lesions*. Cord lesions, such as *transverse myelitis* or *compression of the cord*, usually produce anæsthesia in the area supplied by the spinal nerves below the lesion. *Peripheral nerve lesions* may produce anæsthesia of the skin areas supplied by the nerve in question.

Areas of *hysterical anæsthesia* (with hyperæsthesia and paræsthesia) usually do not correspond to the distribution of any set of nerves or centres, and are distinguished by this fact.

2. *Hyperæsthesia* is most often recognized as hyperæsthesia for pain (tenderness) or in the special senses (sensitiveness to light or noise). It is commonest in peripheral nerve lesions and in hysteria. The tests are the same as those for anæsthesia.

3. *Paræsthesia* is commonest in the form of the familiar pricking and tingling felt when one's arm or leg has "gone to sleep." Sensations as of crawling insects are not uncommon; the "hot feet" of many elderly persons (with arteriosclerosis) and the "burning hands" of many washerwomen are other familiar examples.

Local paræsthesia is not uncommon in lesions of the cerebral cortex, and constitutes the preliminary "*aura*" with which many attacks of epilepsy are ushered in. Well-developed *tabes dorsalis* shows many curious or distressing varieties of paræsthesia, as do many other varieties of peripheral neuritis.

III. Reflexes.

We may distinguish:

1. *Pupil reflexes*.

2. *Deep reflexes* (tendon reflexes).
3. *Superficial reflexes* (skin reflexes).
4. *Sphincteric reflexes*.
5. *Sexual reflexes*.

1. *Pupil reflexes* have been described on page 15.

2. *Tendon Reflexes*.—Among the most important of these is the *knee-jerk* (quadriceps tendon); less important are the *ankle-jerk* (Achilles tendon) and *ankle clonus*, the wrist, elbow, and jaw reflexes.

To test the knee-jerk many methods are used; the following seems to me the best: The patient sits with his knees flexed at a blunt angle. The physician lays his left hand on the front of the thigh and strikes the tendon of the quadriceps, just below the patella, with the finger tips of the right hand or with a rubber hammer. The left hand feels the sudden contraction of the quadriceps whether the foot jerks or not. If no contraction is obtained we should try what is known as "*reënforcement of the knee-jerk*." The essence of this is concentration of the patient's attention on a voluntary muscular contraction in another part of the body. We may accomplish this by asking the patient to hook the fingers of his hands together, and at a given signal to give a quick pull upon them and then let go. The physician gives the signal (often the word "now") and strikes the patella tendon at the same moment.

The knee-jerk is often wanting or feeble in young infants. It varies a great deal in persons of different temperament; in high-strung or oversensitive persons and in the Jewish race very lively knee-jerks are often seen without disease.

Absence of knee-jerk is oftenest found in:

- (a) Peripheral neuritis (alcoholic, diphtheritic, lead, etc.).
- (b) *Tabes dorsalis*.
- (c) Anterior poliomyelitis (on the paralyzed side).
- (d) In the deepest coma from any cause.
- (e) In complete severing of the spinal cord.

Given a case without knee-jerks:

Neuritis is suggested by the history and etiology, by the presence of marked sensory symptoms (pain, tenderness), and the absence of symptoms pointing to the brain or cord.

In *tabes* the Argyll-Robertson pupil, the disturbance of the sphincters and sexual power, the "lightning pains" here and there, the presence of Romberg's symptom (see page 509), and later the ataxic gait are important confirmatory signs.

Anterior poliomyelitis presents a flaccid paralysis, usually of one extremity, coming on suddenly in a young child and wholly without sensory symptoms.

Comatose patients, if the coma is due to cerebral hemorrhage and is not of the profoundest type, often show increased knee-jerks on the paralyzed side; but in very profound unconsciousness all reflexes are lost.

Partial destruction of the cord often increases the reflexes, but total division usually abolishes them.

Increased knee-jerk is found in:

- (a) Cerebral paralyse (infantile, apoplectic, dementia paralytica, etc.).
- (b) Spastic paraplegia and the amyotrophic forms of lateral sclerosis.
- (c) Many cord lesions, localized above the lumbar enlargement (transverse or pressure myelitis).
- (d) In the earliest stages of peripheral neuritis (some later).
- (e) Multiple sclerosis.
- (f) Some forms of chronic arthritis.

DIFFERENTIAL DIAGNOSIS of cases with increased knee-jerks:

Cerebral paralyse usually manifest their place of origin by the presence of psychic symptoms (coma, idiocy, dementia) and by convulsions. The paralysis is usually hemiplegic and involves no wasting beyond the *atrophy of disuse*.

Spastic paraplegia is readily recognized by the gait (see page 506) and the absence of marked sensory or sphincteric symptoms. Its pathology is not known. If marked wasting of the muscles occurs it is termed "*amyotrophic lateral sclerosis*."

Transverse or diffuse cord lesions above the lumbar enlargement produce usually anæsthesia below the level of the lesion and almost invariably relaxation of the sphincters.

The *earliest stages of peripheral neuritis* are usually recognizable, despite a lively knee-jerk, by the predominant sensory symptoms and the etiology.

Multiple sclerosis presents, in typical cases, intention tremor (see above, page 44), nystagmus (page 16), and staccato speech. In atypical cases diagnosis is difficult and cases are often mistaken for hysteria.

Almost any *chronic joint disease*, except tuberculosis, may be associated with increased reflexes. Diagnosis depends on the absence of other causes for the increase.

Other Deep Reflexes.—The *Achilles reflex* is best obtained by having the patient kneel on the seat of a well-padded chair, with his feet unsupported, while we strike the Achilles tendon. The significance of its absence or increase is practically the same as that just given for the knee-jerk, but, since it represents a slightly lower position in the spinal cord, it may be affected earlier than the knee-jerk in any cord disease which begins at the bottom of the cord and travels up. Thus in *tabes* I have known the Achilles reflex absent when the knee-jerk still persisted.

Ankle clonus occurs in spastic conditions of the legs or in any disease which increases the other leg reflexes. It is obtained by supporting the patient's leg in a state of such relaxation as can be obtained, then suddenly and quickly forcing the foot up as far as it will go toward the shin, and holding it in this position. A clonic spasm results, which in *true ankle clonus* persists as long as we choose to hold the foot in this position. *Spurious clonus* is obtained when only a few contractions occur, the muscle then relaxing. This spurious clonus can often be obtained in neurasthenic and hysterical states, and has not the significance of true clonus.

Kernig's sign is a reflex contraction of the ham-string muscles, obtained by flexing the thigh on the trunk at a right angle (as in the ordinary sitting position) and then attempting to extend the

lower leg. Its motion is arrested about half way between the right angle and full extension.

This reflex is of some value in the diagnosis of meningitis, though allowance must be made for the stiffness of old age. The sign is by no means pathognomonic, but is of some confirmatory value.

The *deep reflexes of the arms* (wrist, biceps, and triceps tendon) are obtained by snapping these tendons sharply with the finger. Decrease in these reflexes we cannot perceive, since they are *only obtainable when increased*. They are increased in practically the same diseases which increase the leg reflexes, and also in some chronic joint troubles.

The *jaw-jerk* is obtained by asking the patient to let the lower jaw drop fully, placing a finger on the chin and percussing that finger as in percussion of the chest.

3. *Superficial Reflexes*.—A "ticklish" person is one whose superficial reflexes (skin and muscles) are very lively. Among pathological reflexes of this type:

(a) The *Babinski reflex* is the most important. It is a modification or reverse of the normal plantar reflex, which crumples up the toes toward the sole of the foot if the skin of the foot is tickled.

To obtain the Babinski reflex, bare the patient's foot and draw the blunt end of a pencil along the inner side of the sole from heel to toe with moderate pressure. If the great toe cocks up toward the shin, Babinski's reflex is present. Sometimes one or more other toes follow the great toe.

The reflex is obtained on the paralyzed side in hemiplegia and other lesions involving the motor tract.

(b) The *cremasteric reflex* draws the testis tight up against the body (as after a cold bath) when the *skin and muscles* on the inner side of the thigh are gathered up and firmly grasped in the hand.

(c) The *abdominal and epigastric* "tickle reflexes" are excited by lightly and quickly stroking the skin of these parts with a pencil point or something of the sort.

The presence of cremasteric, abdominal, and epigastric reflexes indicates that the portion of the spinal cord in which they are rep-

resented (upper lumbar and lower dorsal regions) is functionally sound. The absence of these reflexes, however, signifies nothing, for in many healthy persons they cannot be excited.

(d) The reflex of *winking* excited by the ordinary stimuli signifies the approximately normal conductivity of the fifth and seventh nerves (trigeminal and facial).

4. *Sphincteric Reflexes*.—The sphincters of the bladder and rectum are kept closed in the normal adult by reflex contraction excited by the presence of urine and feces. If there is no awareness of feces at the anus or of urine at the neck of the bladder, owing to destruction of the conducting nerves or spinal nerve-centres, involuntary urination and defecation occur.

This is the case in transverse, diffuse, or compression myelitis above the segment (fourth and fifth sacral) where the centres for bladder and rectum are represented;¹ also in tabes dorsalis, dementia paralytica, and less often in other chronic spinal diseases. Peripheral neuritis and brain lesions rarely affect the sphincters.

In deep coma from any cause (epilepsy, cerebral hemorrhage) the sphincters may be relaxed, owing to the abolition of sensation.

5. *Sexual Power*.—Sexual power may be regarded as a reflex in the presence of a particular stimulus, and is diminished or lost in chronic cord diseases involving the first and second sacral segments (lumbar enlargement) or the nerves leading to them, *e.g.*, in tabes, some cases of myelitis and dementia paralytica, etc. Temporary increase of power may precede the diminution.

IV. Electrical Reactions.

In health a sharp contraction occurs if a faradic current is applied to a nerve or over a muscle, and a similar contraction can be obtained with the galvanic current just when the circuit is closed or broken, but not when the current is passing.

In contrast with these conditions is the *reaction of degeneration*.

¹It must be remembered that these nerves *arise from the cord* at the level of the first lumbar vertebra, though they do not *issue from the spinal column* till the fourth and fifth sacral foramina are reached.