

A Clinical Lecture

ON THE

VIBRATING SENSATION IN DISEASES OF THE NERVOUS SYSTEM.

DELIVERED AT THE MANCHESTER ROYAL INFIRMARY.

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WHEN the foot of a vibrating tuning-fork is placed over subcutaneous bony prominences or surfaces, in many parts of the body, a peculiar vibrating sensation is felt. To this sensation the names of "vibrating sensation or feeling," "bone sensibility," and "pallaesthesia" have been given. Though the sensations produced by vibrating tuning-forks had been studied by Rumpf and by Treitel in Germany many years ago, it was Egger, in France, who especially directed attention to the subject in 1899. Subsequently the vibrating sensation has been carefully studied by Seiffer and Rydel, by Goldscheider, and others in Germany, by Minor, and by Sterling in Russia, and by Marinesco in Roumania. Some tuning-forks produce a much better vibrating sensation than others. Many of the smaller English tuning forks produce very little of the sensation, and are almost useless in clinical work. Moreover, there is often considerable difficulty in comparing the results of different observers, owing to various kinds of tuning-forks having been employed. The ingenious tuning-fork devised by Gradenigo has been used for measuring accurately the sensibility for the vibrating feeling at various parts of the body. Also a footpiece is attached to many of the tuning-forks which have been employed. The tuning-fork which I have used has not been of the kind just mentioned; and, though it may not be the most suitable instrument for testing the vibrating sensation accurately, nevertheless it has the advantage of not being too delicate. Probably its vibrations would not be felt in some affections in which a sensation would be caused if a more powerful instrument were employed. I have used the same kind of tuning-fork in all my observations, both in health and disease. I have learned, by testing a large number of healthy individuals where the vibrations of this tuning-fork can and cannot be felt in the normal condition; and hence in disease I believe it is a reliable instrument as a qualitative test for the vibrating sensation, though it may not be satisfactory for accurately measuring the intensity of the sensation. For rapid clinical work, and for the detection of marked changes in the vibrating sensation, I believe the tuning-fork which I have employed is probably as useful *practically* as the more delicate and more powerful instruments. The tuning-fork (C³) is 9 in. long, and its prongs 5½ in. long.

In all healthy individuals whom I have examined the vibrations of this tuning-fork are able to produce a vibrating or trembling sensation when its foot is placed over the following points: The styloid process of the ulnar bone, the internal and external malleolus, the inner surface of the tibia, the anterior superior spine of the ilium, and the sternum. Usually it produces a vibrating sensation on the vertebral spines, and often on many other points. But I have only tested the bony points mentioned in diseased conditions, because I know that the vibrations of the tuning-fork I have employed are *always* felt at these points in health, whilst at many other points its vibrations are not always felt, even in the normal state.

The vibrations of the tuning-fork I have used also produce a vibrating feeling in all healthy individuals when its foot is placed (1) on the palm of the hand, over the heads of the metacarpal bones; (2) on the sole of the foot (at the heel and anteriorly at the region of the heads of the metatarsal bones); and (3) on the nails of the fingers and thumb and on the nail of the big toe. Often a better vibrating sensation is felt if a penny is placed on the palm of the hand, or on the sole of the foot, at the points just mentioned, and the foot of the vibrating tuning-fork held firmly in contact with the penny.

When the vibrating sensation is normal it is usually not necessary for the boots to be taken off when the feet

are tested. The tuning fork I have used produces a distinct vibrating sensation when its foot is placed on the sole of the boot over the points just mentioned (heels and at the region of the heads of the metatarsal bones), the vibrations being transmitted through the boot sole, unless it is extremely thick.

The tuning-fork I have used produces no vibrating sensation when its foot is placed on the bones of the skull.

In testing the limbs, I have found three points very suitable for clinical examination—the styloid process of the ulna, the internal malleolus, and the inner surface of the tibia, about the middle of the bone. In fifty healthy men the vibrating tuning-fork produced a vibrating feeling in every case, when its foot was placed at the three points just mentioned. The nails of the thumbs, fingers, and big toes, and the palms of the hands and soles of the feet are also very convenient points for clinical examination.

LOSS OF THE VIBRATING SENSATION IN DISEASE.

During the last four years I have tested the vibrating sensation in a large number of cases, and the following are the results I have obtained.

When there is marked impairment or loss of other forms of sensation, the vibrating sensation is usually also lost. But the point of chief interest is the fact that it is sometimes lost (or, at least, it is lost when tested with the tuning-fork, which I have employed) when other forms of sensation are felt.

1. *Tabes Dorsalis.*

In a number of cases of early tabes (examined as already described) I have found the vibrating sensation lost on the legs (at the malleoli, inner surface of the tibia, or on the soles of the feet), when sensations of touch, pain, and temperature were felt distinctly. (In some of these cases there was no ataxia, in others ataxia was present.) The same results were obtained in some cases of suspected very early tabes, when the symptoms were very few. Hence the loss of the vibrating feeling is of value (though not diagnostic) as an additional symptom in favour of early tabes.

2. *Peripheral Neuritis.*

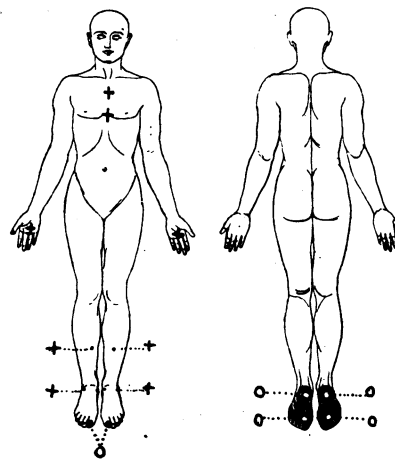
In slight cases of this affection the vibrating feeling may be lost when sensations of touch, pain, and temperature are felt.

CASE I.

History of great alcoholic excess and of well-marked symptoms of neuritis. Loss of power in muscles of the legs. Knee-jerks and tendo Achillis jerks lost. Great tenderness of calf muscles, sensation of numbness in the legs and feet; sensation as if walking on cotton-wool. Sensations of touch, pain, and temperature present on the feet and legs. Vibrating sensation lost on the soles of the feet; lost on the left internal malleolus, but felt on the left tibia and external malleolus; lost on the external and internal malleolus of the right leg, but felt on the tibia; felt on the palm of the hand and styloid process of the ulna on each side.

3. *Diabetes Mellitus.*

The vibrating feeling is lost at some part of the legs in many cases of diabetes mellitus and chronic glycosuria. It is often lost on the soles of the feet and big toe nails, and sometimes also on the tibia and malleoli. There may be no other nervous symptoms, or there may be also slight or severe symptoms of "diabetic neuritis."



Figs. 1 and 2.—Diabetes mellitus (Case II). Vibrating feeling lost at parts shaded and marked o; felt at parts marked +.

CASE II.

Man, aged 48. Severe form of diabetes. Vibrating feeling lost on the soles of the feet and on the big toe nails; felt on the malleoli and tibia. Touch with the head of a pin, prick with the pin point,

and hot and cold objects all recognized distinctly on the feet and legs. Knee-jerks and tendo Achillis jerks presents. Calf muscles tender. (See Figs. 1 and 2.)

CASE III.

Woman, aged 50. Mild form of diabetes; pruritus of vulva. Vibrating sensation lost on the soles of the feet and on the big toe nails; felt on the malleoli and tibia; sensations of touch, pain, and temperature recognized distinctly. Knee-jerks and tendo Achillis jerks present.

CASE IV.

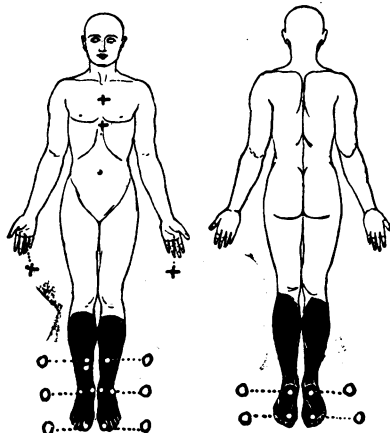
Woman, aged 34. Severe form of diabetes. Vibrating feeling lost on the soles of both feet at region of heads of metatarsal bones, lost on the nails of the big toes, lost at the left heel, felt slightly at the right heel; felt on the malleoli and inner surface of tibia; no other form of anaesthesia. Knee-jerks and tendo Achillis reflexes present. Cramps in the calf muscles.

CASE V.

Woman, aged 53. Diabetes of medium severity. Vibrating feeling lost on big toe nails, on the malleoli and tibiae, felt very slight on the soles of the feet. No loss of sensation to touch, pain, or temperature. Knee-jerks present, tendo Achillis jerks lost. Calf muscles very tender on pressure. Burning pain in the toes, with tenderness. Patient cannot bear the bedclothes to touch the toes; pain keeps her awake at night.

CASE VI.

Woman, aged 71. Diabetes for 10 years. Vibrating feeling lost on the soles of the feet, on the big toe nails, on the malleoli and tibiae; felt on the hands. Sensations of touch, pain, and temperature recognized well on the legs and arms. Severe gnawing pain in the legs, much worse at night. Pain and burning sensation in the toes and feet. Muscles, especially calf muscles, and skin of the toes and feet very tender (muscular and cutaneous hyperaesthesia and hyperalgesia). Knee-jerks present, tendo Achillis jerks absent (see Figs. 3 and 4.



Figs. 3 and 4 (Case vi).—Diabetes mellitus. Vibrating feeling lost at parts shaded and marked o; felt at parts marked +.

4. Spinal Syphilis.

In cases of spinal syphilis (Erb's syphilitic spinal paralysis and syphilitic meningo-myelitis) the vibrating sensation may be lost when other forms of sensation are felt quite well, or it may be lost over a more extensive area than other forms of sensation.

CASE VII.

Man, aged 60. Meningo-myelitis; syphilis six years ago. Pain in the lower dorsal region of the spine and girdle pain at the upper part of the abdomen, followed in six months by weakness of the right leg and afterwards of the left leg. On examination the following were the chief symptoms: Knee-jerks present, right greater than left; ankle clonus right side but not on the left; decided paresis of right leg, slight paresis of left; sensation for pain felt at all parts, but sensation for touch and temperature impaired in the legs (chiefly in distribution of sacral and last lumbar nerve roots), but not on the trunk. Vibrating sensation not felt on the sole of the foot, malleoli, tibia of both sides; not felt on the left anterior superior iliac spine, felt slightly on the right; not felt on the vertebral spines up to the last dorsal spine; felt on the vertebral spines above the last dorsal and on the arms quite well.

CASE VIII.

M. S.; man aged 23. History of gonorrhoea, syphilis very probable. Gradual onset of weakness of legs. Pain in the middle and lower dorsal regions; girdle pain. Spastic gait, rigidity of legs, weakness of movements, knee-jerks increased, ankle clonus and the Babinski type of plantar reflex on each side. Occasional dribbling of urine and difficulty in passing urine. No spinal curvature. Sensation to touch, pain, and temperature felt on both legs quite well. Vibrating sensation not felt on the legs, but felt on the iliac crest, sternum, and arms.

5. Compression Myelitis.

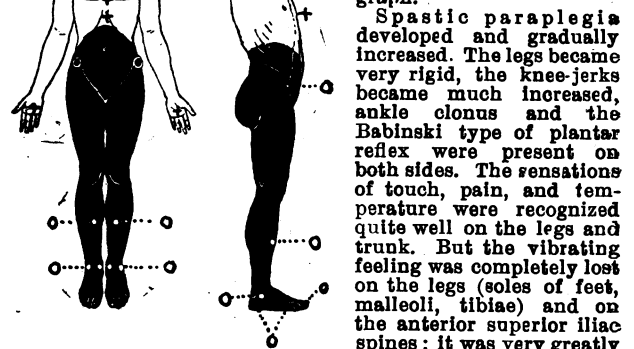
In compression "myelitis" from caries of the spine, at the early stage, there may be loss of the vibrating sensation when no other form of anaesthesia can be detected.

CASE IX.

Woman, aged 45. Lymphatic glands in the neck became enlarged and were removed by operation. Six months later she commenced to suffer from pain in the mid-dorsal region of the spine, followed in a few weeks by paresis of the legs. When first seen there was marked paralysis of both legs, the knee-jerks were increased, ankle clonus was present, and there was a slight Babinski's reflex on each side, and a marked Oppenheim's reflex. There was a well-marked projection of the fourth dorsal vertebral spine; at this point there was pain on movement (flexion and rotation of the spine), and pain on percussion and pressure. The vibrating sensation was lost on the legs (at the internal and external malleoli, on the tibiae, and on the right anterior superior iliac spine); it was lost on the lower vertebral spines up to the fifth dorsal; but above that point it was felt quite well on the vertebral spines; it was felt also on the sternum and arms. Sensations of touch, pain, and temperature were felt quite well on the legs, trunk, and arms. Paralysis of the bladder and rectum developed a week later, and a short time afterwards complete tactile anaesthesia developed on the legs, abdomen, and lower part of the thorax.

CASE X.

Man, aged 27. An enlarged gland was removed from right side of the neck three years ago. Pain in upper lumbar region of the spine for three months; tenderness on percussion of the lowest dorsal and upper lumbar region. Irregularity of the outline of the body of the first lumbar vertebra seen in x-ray photograph.



Figs. 5 and 6 (Case x).—Spinal caries. Vibrating feeling lost in shaded area at parts marked o; felt at parts marked +.

the spines of the dorsal vertebrae, and on the sternum, and arms (see Figs. 5 and 6).

CASE XI.

Boy, aged 13. The chief symptoms were spastic paresis of the legs, spastic gait, increased knee-jerks, ankle clonus, the Babinski type of plantar reflex, and an irritable condition of the bladder. The sensations of touch, pain, and temperature were felt quite well on the limbs and trunk. The vibration sensation was lost on the malleoli (external and internal) of both legs, and at the left anterior superior iliac spine, but felt slightly on the right. On the arms and trunk the vibrating sensation was normal. The boy was very thin, and soon the temperature rose in the evenings. A loud pleuritic friction sound developed, and all the symptoms and signs of left-sided pleurisy, with a little effusion, rapidly followed. Recovery from the pleurisy occurred in a few weeks, and, after a prolonged rest in bed, the muscular power in the legs improved considerably. Though there was no spinal curvature, it was very probable that the nervous symptoms were due to a slight compression myelitis from tuberculous vertebral caries.

6. Nervous Disease Affecting only Motor Fibres or Cells.

There are many cases of disease of the nervous system in which the sensations of touch, pain, and temperature are felt quite well, and the differential diagnosis appears to be restricted to the diseases which are known to affect the motor structures only; but on examination with the vibrating tuning-fork it is found that the vibrating feeling is lost. This fact enables us to say that the disease is not one of the affections implicating only motor structures, and hence it may be of diagnostic value.

CASE XII.

Man, aged 60. Paralysis of both legs, of subacute onset; knee-jerks present, no ankle clonus, no Babinski reflex, no affection of bladder or rectum, no anaesthesia to touch, pain, or temperature. The disease appeared to be one affecting only motor parts of the cord, but examination with the vibrating tuning-fork revealed loss of the vibrating sensation in the legs. This fact showed that the disease affected other

parts beside purely motor structures. The course of the disease confirmed this view. In a few weeks the bladder and rectum became paralysed. Tactile anaesthesia developed, the legs became spastic, ankle clonus and the Babinski type of plantar reflex developed. The symptoms pointed to a sub-acute transverse myelitis. Partial recovery occurred.

In cases of amyotrophic lateral sclerosis, which is well known to affect only motor structures of the cord, I have found that the vibrating sensation was felt quite well on the legs, arms, and trunk, even at a late stage of the disease.

7. *Hysterical Hemianaesthesia.*

The vibrating sensation may be of service in the differential diagnosis between anaesthesia due to organic disease and anaesthesia due to hysteria, traumatic neurosis, and malingering.

On the sternum the vibrations of the tuning-fork are felt extremely well in the normal condition, even when the foot of the fork rests only on the margins of the sternum, the vibration being transmitted across the bone. Thus, in the normal condition, the vibrations of the tuning-fork are felt when its foot rests on the edge of the sternum at either of the points A or B in Fig. 7.

In cases of hemianaesthesia from organic lesions it appeared probable that, if the foot of the tuning-fork were placed in contact with the edge of the sternum on the anaesthetic side (A in figure), though it might not produce any sensation at the point of contact, the vibrations would be transmitted across to the other side of the bone into the area where the sensation was normal, and a vibrating sensation would be felt. The overlapping of the sensory nerve fibres of the two sides

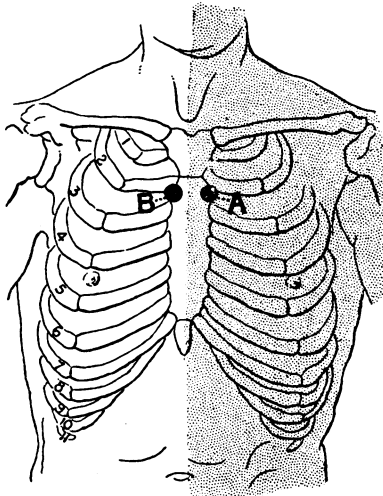


Fig. 7.—Anaesthetic side shaded.

in the middle line would also aid the patient in detecting the vibrations of the tuning-fork when it is placed on the edge of the sternum (as at A). But it appeared probable that in hemianaesthesia due to hysteria, neurosis, or malingering, the vibrating sensation would not be felt when the foot of the vibrating tuning-fork rested on the edge of the sternum on the anaesthetic side (A in Fig. 7). Cases which I have examined support this view.

In four cases of hemianaesthesia, which were undoubtedly due to organic lesion, the vibrating sensation was felt when the foot of the vibrating tuning-fork was placed in contact with the edge of the sternum on the anaesthetic side (at A in Fig. 7). (In these cases there were symptoms of spastic hemiplegia, with ankle clonus, and the Babinski reflex on the side of the anaesthesia.) In two cases of hemianaesthesia, in which there could be no doubt that there was no organic disease, the vibrating sensation was not felt when the foot of the tuning-fork was placed firmly in contact with the edge of the sternum on the anaesthetic side (at A in Fig. 7), but it was felt quite well on the other side (at B in Fig. 7). In these two cases careful examination failed to reveal the slightest sign of organic disease. In one case the symptoms developed a week after a very slight accident, and there can be no doubt that they were due to traumatic hysteria (traumatic neurosis). In the other case careful examination did not reveal the slightest sign of organic disease; also Janet's symptom of hysterical anaesthesia was obtained. The patient's eyes were closed, and she was touched lightly with the finger, first on the normal and then on the anaesthetic side; she was told to say "Yes" when she felt the touch and "No" when she did not feel it. She at once said "Yes" when the normal side was touched, and "No" directly the anaesthetic side was touched. The other symptoms all pointed clearly to hysterical hemianaesthesia. This case

was under the care of Dr. Graham Steell, who kindly gave me permission to make the examination.

Further observation will be required to prove the value of the vibrating sensation in the diagnosis of hysterical hemianaesthesia. I think, however, that it is extremely probable that hemianaesthesia is due to hysteria or malingering if the vibrating tuning-fork produces no vibrating feeling when placed firmly in contact with the edge of the sternum on the anaesthetic side, but a definite vibrating feeling when in contact with the edge of the sternum on the other side. If the vibrating tuning-fork resting on the edge of the sternum on the anaesthetic side produces a vibrating feeling, the affection may be either organic or hysterical.

CONCLUSIONS.

1. The vibrating sensation is a delicate test for detecting slight impairment of sensation. The vibrating sensation may be lost when other forms of sensation (to tactile impressions, pain, and temperature) are felt quite well, or are only very slightly impaired. This is sometimes the case in early tabes, in slight peripheral neuritis, and often in diabetes mellitus.

2. In diabetes mellitus the vibrating sensation may be lost on the feet, or feet and legs, when there are no other nervous symptoms; but often the latter are present. In many cases of diabetes the nervous symptoms are chiefly (1) severe pains, tenderness, and hyperaesthesia in the legs; (2) loss of the tendo Achillis jerks; (3) loss of the vibrating sensation.

3. In diseases strictly limited to the motor structures, the vibrating sensation is not lost even at an advanced period of the disease. (Thus it is not lost at an advanced period of amyotrophic lateral sclerosis.)

In any case in which the disease appears to be one causing lesion only of the motor parts of the nervous system, if it should be found that the vibrating sensation is lost, this fact indicates that the disease is affecting also sensory structures; and thus it may be of diagnostic value.

4. In cases of paraplegia from spinal caries, and occasionally in spinal syphilis, the loss of the vibrating feeling may be the only objective symptom of affection or sensation, at an early stage of the disease.

5. In hemianaesthesia, if the vibrating feeling is lost when the foot of the tuning-fork is placed on the edge of the sternum on the side of the tactile anaesthesia, but felt on the other side, the case is one of hysterical or functional hemianaesthesia, or of malingering; whilst in hemianaesthesia due to organic disease the vibrating sensation is felt when the foot of the vibrating tuning-fork is placed on the edge of the sternum on the side of the tactile anaesthesia.

An Address

ON

THE SPA TREATMENT OF NEURASTHENIA.

DELIVERED AT THE ANNUAL MEETING OF THE BATH AND BRISTOL BRANCH,

By EDWARD J. CAVE, M.D., M.R.C.P.,
PRESIDENT OF THE BRANCH.

GENTLEMEN,—My first duty is to thank you for electing me to the honourable post which Dr. Davies has just yielded to me. When I look back on the roll of former presidents of this Branch, I can say with all truth and humility that, as I cannot hope to equal their success, so I feel all the more sensible of the honour that you pay me in inviting me to preside over your meetings for the coming year.

First, gentlemen, let me give expression to the sorrow that we all share in the recent untimely loss of one of the most distinguished occupants of this chair. While yet seemingly in the full vigour of life, and in many useful fields giving us the ripened fruits of his experience, wise alike in counsel and decision, the death of Dr. Markham Skerrett has robbed the Association of one of its most indefatigable workers and trusted advisers, and this