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CHAPTER VI.

DISEASES OF THE AUDITORY NERVE.

THE auditory nerve emerges at the base of the brain, alongside of the facial, and takes with this latter a forward and outward course. After having entered the internal auditory meatus, it divides before reaching the cribriform plate, which separates the internal meatus from the internal ear, into two main branches, an anterior inferior and a posterior superior. These nerves pass as small filaments through the openings in the plate, to be distributed respectively to the cochlea and vestibule, and are hence called ramus cochlearis and ramus vestibularis.

The cortical centre of the nerve is probably to be sought for in the temporal lobe; the fibres are said to run through the last third of the posterior division of the internal capsule, through the middle geniculate body, through the brachia conjunctiva posteriora, the posterior corpora quadrigemina, and the inferior fillet (v. Monakow, Baginsky).

About the situation of the nuclei of the auditory nerve there seems still to exist a difference of opinion among the anatomists. Usually two nuclei are distinguished, an inner or principal nucleus and an outer one situated laterally from the first. In their structure these present material differences. While the former—the inner nucleus—only contains scattered, small, slender, ganglionic cells (15 to 20 μ long), the latter contains cells of considerable size (60 to 100 μ long and 15 to 21 μ broad). The situation of the two nuclei may be understood from the accompanying diagram.

Of the two roots, the superficial terminates in the internal auditory nucleus, while the deeper one passes between the restiform body and the ascending root of the fifth, and turns toward the outer one. This, also, the diagram, which is taken from Wernicke, and which demonstrates the views of Meynert, illustrates.

Although the diseases of the auditory nerve are not, as a rule, treated of in neurological text-books, they are found sometimes so closely connected with other nervous diseases, and

are, notwithstanding their comparative rarity, of such decided practical importance, that we feel not only justified but compelled to consider them here, at least briefly.

The nerve, as we have said, rarely ever becomes primarily diseased, but diseases of the middle and internal ear—that is, secondary affections—are by far the most common causes of

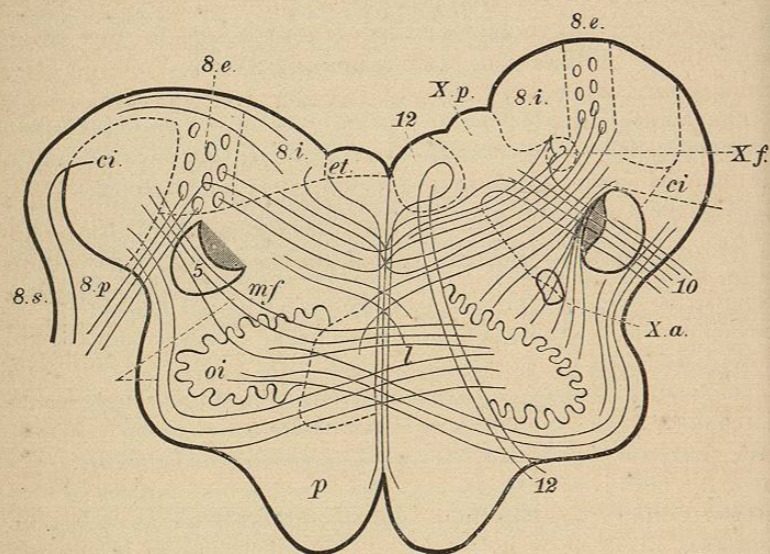


Fig. 17.—DIAGRAMMATIC SECTION THROUGH THE MEDULLA OBLONGATA IN THE REGION OF THE (LOWER) OLIVE. The right half represents a lower plane. *p*, pyramids; *oi*, lower olive; *l*, lemniscus; *mf*, motor region of the tegmentum; 5, ascending root of the fifth; *ci*, corp. restif.; *8.e.*, external, *8.i.*, internal nucleus of the auditory; *et.*, eminentes; 12, nucleus and root of the hypoglossus; 10, root of the vagus; *X.a.*, anterior, *X.p.*, posterior vagus nucleus; *X.f.*, combined root of the "lateral mixed system" (cf. p. 105); *8.s.*, superficial, *8.p.*, deep root of the auditory nerve.

diminution or loss of hearing. We may distinguish between conditions of irritation and those of paralysis, so that on the one hand we shall have hyperæsthesias, on the other pareses or paralyzes.

I. HYPERÆSTHESIAS OF THE AUDITORY NERVE.

We speak of a hyperæsthesia of the auditory nerve where the patient experiences a painful sensation in his ear when perceiving certain sounds or noises. For instance, in excitable and nervous individuals who suffer from hemicrania or tic douloureux, such a sensation may be produced by high musical

notes, whistling, and the like. Quite a different affection is an abnormal acuteness of hearing, which is extremely rare, the so-called oxyacoia of which we have spoken in the chapter on facial paralysis.

Frequently one hears nervous patients complaining of subjective auditory perceptions, roaring, buzzing, hissing, singing, humming, and the so-called nervous tinnitus aurium, which may persist during the whole life without a sign of any other disturbances of function. This symptom may be due to a purely functional disorder or it may be the forerunner of a middle-ear sclerosis.

Therapeutically, we may, after the removal of masses of cerumen or epidermis which may have obstructed the outer canal, with benefit make use of blisters, stimulating lotions applied to the mastoid process, subcutaneous injections of morphine, the bromides, digitalis, and atropine. If abnormalities of tension in the sound-conducting apparatus and consequent rise of pressure in the labyrinth be the cause of the disorder, then the inflation of the middle ear and the rarefaction of the air in the outer canal is to be recommended.

II. THE PARESES AND PARALYSES OF THE AUDITORY NERVE.

Analogous to the rheumatic facial paralysis we have a condition in the auditory nerve which manifests itself in either a decrease or a loss of the function of hearing, the so-called rheumatic acusticus paralysis. It is less frequent than the former, although the cause of both, namely, cold, is the same. Central paralyzes are always connected with decrease of hearing power on one side only. Absolute unilateral deafness, as a consequence of a focal lesion in one of the hemispheres, has up till now not been observed (Wernicke). Whether the disturbances in hearing observed by Baginsky in railway spine are of a central or peripheral nature remains yet to be studied (cf. lit.).

Next in order we have to mention in this connection the anæsthesia and paresis of the auditory nerve, which sometimes appear quite suddenly in the course of hysteria, and often as suddenly disappear again after a longer or shorter period of time.

Of interest from a pathological standpoint is the nervous deafness occurring after an epidemic cerebro-spinal meningitis. It is this form which has been so thoroughly studied by Moos.

There is hardly any doubt but that it is caused by the passage of purulent masses from the meninges along the sheath of the auditory nerve into the inner ear. The prognosis is unfavorable. A diminution of hearing, probably due to transitory circulatory disturbances, occurs sometimes after epileptic attacks. Although not common, this affection is certainly well authenticated.

Of especial interest ætiologically are the disorders of hearing which we find in engineers and firemen on the railroads as a consequence of their occupation. This must principally be attributed to the noise, aided, however, to some extent by the abrupt and severe changes of temperature and the exposure to all kinds of weather. We do not know anything positive about the relative frequency of this affection, which consists in a more or less pronounced decrease of hearing, but in the general interest of the public it certainly deserves as much attention on the part of the companies as the color-blindness which has for years been carefully looked into. Locksmiths, blacksmiths, and boiler-makers, whose auditory nerves are also being constantly overstimulated, suffer from similar disorders. In rare and exceptional cases it has been observed that mechanics who are "hard of hearing" hear better during the usual noise connected with their work than when everything around them is quiet—*paracusis Willisii*. This very remarkable phenomenon is probably due to a decrease in the vibratory power of the auditory ossicles, owing to which the sound is conducted with more difficulty, a condition which is obviated by a more forcible concussion (Buerkner, Roosa). We would not leave unmentioned the fact that an overtaxation of the auditory nerves lasting for years causes great nervousness, and may even predispose to mental diseases.

In the treatment, endermic inunctions of strychnine (0.1 to glycerin 10.0 (gr. jss.; glycerin, 3 ijss.)—sig., ten drops) over the mastoid process, and fumes of sulphuric ether conducted by a catheter into the tympanic cavity to act on the distribution of the acusticus, deserve recommendation. A beneficial effect from the galvanic current can be expected only if examination assures us that the current has a modifying influence on the subjective noises or upon the power of hearing. This treatment necessitates a knowledge of the investigations of Brenner on the galvanic reactions of the auditory nerve (cf. Hirt, *loc. cit.*, p. 109).

III. MÉNIÈRE'S DISEASE—MÉNIÈRE'S VERTIGO—VERTIGO AB AURE LÆSA—VERTIGO IN GENERAL.

When we speak of Ménière's disease we mean a combination of symptoms which is made up (1) of subjective noises in the ear, (2) a feeling of dizziness, accompanied with vomiting, (3) a gradually increasing difficulty of hearing, sometimes ending in deafness.

On account of the exceptionally practical importance which has to be attributed to the so-called vertigo (*le vertige, Schwindelgefühl*), we may be allowed to make some general remarks on this before considering the special form, viz., Ménière's disease.

By vertigo we mean a subjective feeling of motion appearing suddenly or gradually without any loss of consciousness, attended by a simultaneous sensation of loss of equilibrium. The subjective sense of motion is either referred to the body or parts of it, or to surrounding objects. The motion is in different directions, sometimes in horizontal or vertical circles, revolving with their convexity sometimes forward, sometimes backward, and the older observers distinguish accordingly a vertigo *tubans*, *fluctuans*, etc., from the *nutatio*—that is, subjective movements in a straight line. As concomitant symptoms we note headache, especially in the back of the head, anxiety, tremor, cold sweat on the face, nausea, vomiting; in grave cases, transient clouding of consciousness, as in the prodromal state of an apoplectic attack. If consciousness is completely retained, as happens in the majority of cases, the subjective sensation of movement often gives rise to objective voluntary movements, to be regarded in a measure as instinctive efforts against the threatening danger of falling. The patient plants his feet firmly on the ground, stretches out his arms into the air, seizes with his hand any object within his reach, etc., but, in spite of all, he may, notwithstanding the perfect retention of consciousness, fall, owing to the feeling of disturbed equilibrium—*vertigo caduca*.

If the patient is unconscious—e. g., asleep—then he experiences a sensation of falling down from a great height, down steps, or out of the window; he imagines himself sinking into an opening in the ground, etc. This so-called nocturnal vertigo (*Traumschwindel*) usually torments those who suffer from vertigo when awake. Two exquisite examples of this vertigo I have observed in Bright's disease.

By far most commonly the vertigo occurs in paroxysms which appear without regularity and are of variable duration. Between the first and second sometimes hours and days, more rarely months, and indeed whole years, intervene, and only exceptionally—e. g., in cerebellar affections—do the subjective sensations of movement persist uninterruptedly, and thus render the vertigo constant.

The position of the body has rarely any influence on the vertigo, for although at times some amelioration is felt on sitting down, there are cases in which the vertigo continues even when the patient occupies the horizontal position in bed. The pathogenesis of the trouble—that is to say, the organic changes in the brain which are necessary for the production of the sensation—are but little understood. It is generally supposed that changes in the blood-pressure, due, perhaps, to stimulation or paralysis of the vaso-motor nerves, are the chief cause of vertigo, just as a lasting decrease or increase in the amount of blood in the brain can probably give rise to attacks of dizziness. Until the conditions under which vertigo can appear in otherwise healthy people are more accurately understood, our knowledge of the pathological influences at work can be only imperfect. Of great interest are the experiments of Purkinje, undertaken seventy years ago, as to the influence of swinging, and especially of circular movements, in the production of vertigo. These were published in Rust's *Magazin für die gesammte Heilkunde*, part xxiii, 1827, and have been reprinted in Romberg's *Nervenkrankheiten* (*loc. cit.*, p. 118) with this addition by the author: "From all these experiments we see that, taking the head as a sphere, around the axis of which the true motion takes place, an imaginary plane through it determines in every case the apparent motion of the objects in the subsequent position of the head at rest. The same holds good in attacks of vertigo."

Johannes Müller also has made experiments on vertigo, and is inclined to attribute it to the after-effects of visual impressions on the retina. That this, however, is not always the case is shown by the fact that vertigo may appear in people whose eyes are closed, and even in the blind.

We have already spoken about its occurrence in the paralysis of the ocular muscles (p. 48). Here let us add that this ocular or visual vertigo disappears if the patient closes the affected eye or holds his head in such a position that the

paralyzed muscle does not come into play during the act of seeing.

In the present chapter we shall discuss more especially how far diseases of the internal and middle ear are connected with vertigo. It has repeatedly been observed that affections of the nasal mucous membrane, swellings of the erectile tissue, as well as affections of the mucous membrane of the larynx associated with violent cough (laryngeal vertigo), have produced it. If, then, we add that it has been claimed that the intestines (intestinal worms, *tænia*, *ascaris*) and the stomach are responsible for feelings of dizziness, which Trousseau calls "*vertigo a stomacho læso*," we can not fail to be impressed with the complexity and the lack of clearness in the ætiology of this affection. We must, however, always keep in mind, no matter where the remote cause lies, be it in the faulty movements of the ocular muscles, in the nose, in the ears, or in the stomach, etc., we must keep in mind, I say, that the influence of the cerebrum and the cerebellum is under all circumstances quite essential for the production of vertigo. Whether the characteristics of the vertigo vary or not with the different organs affected is not yet clearly known.

The disease described by Gerlier in Ferney, which shows itself by a very pronounced dizzy feeling, appearing in paroxysms—the so-called "paralyzing vertigo"—is accompanied by other symptoms, namely, a weakness, resembling a paralysis, in the extremities, drooping of the eyelids, and extraordinary lassitude without any loss of consciousness. This condition, which has been repeatedly observed in the canton of Geneva, where it occurs epidemically among laborers and herdsmen, is ætiologically mysterious. Gerlier attributes it to miasmata from marshes and stables, Eperon to the working in the sun which produces hyperæmia of the meninges (*Revue méd. de la Suisse romande*, 1889, ix, 1); but neither of these hypotheses explains the immunity of the female sex. For this new and as yet entirely strange neurosis Gerlier has proposed the name *vertige paralysant* (*Progrès méd.*, 1887, 26; *Ladame, Revue méd. de la Suisse romande*, January, 1887; *Deutsche Med. Zeitung*, 1887, 44, 1888, 24).

Middle life and moderately advanced age (especially in the female sex, and so in them the climacteric period) seem to predispose to attacks of vertigo, which chooses by preference its victims from among vigorous and full-blooded individuals. Its frequent occurrence in advanced old age will not surprise us if