HEAD-NYSTAGMUS IN HUMAN BEINGS.

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FROM the classical experiments on pigeons it will be remembered that vestibular irritation in these birds particularly manifested itself in definite rhythmical movements of the head, the so-called head-nystagmus. Movements of the eyes are also to be found, but less pronounced and noticeable than those of the head.

It is otherwise in human beings; here a head-nystagmus is of the greatest rarity. Mammalian animals occupy a middle position, head-nystagmus being found in rabbits and guinea-pigs, whilst it is absent in dogs, cats, and apes. E. Urbantschitsch, to whom we owe the above information, is of the opinion that the appearance of head-nystagmus depends upon the animals in question being adapted to monocular vision. Very circumscribed ocular movements are associated with monocular vision, fixation being principally performed by means of movements of the head. With binocular vision the movement of the eyes is much more free and is the principal means of fixation. Consequently, head-nystagmus ought to be especially distinct in birds, whose eyes turn each to its side with different fields of view. That head-nystagmus also appears in guinea-pigs, whose eyes look forward, is explained by Urbantschitsch by the circumstance that this animal cannot fix binocularly. This he considers proved because he was unable in guinea-pigs, and indeed also in rabbits, to produce any optical eye-nystagmus when he placed them in the middle of a revolving cylinder, the inner sides of which were covered with alternating black and white stripes. On the other hand, he could produce optical eye-nystagmus in cats, dogs, and apes, that is to say in animals in which no vestibular head-nystagmus can be produced. The experiments are impeded by the necessity of fastening the animals, thus causing counter movements. It does not, however, appear to me that this proves either that optical eye-nystagmus is dependent upon binocular vision, or that vestibular head-nystagmus is a consequence of the monocular vision.

There exists in literature some few observations of head-

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nystagmus in human beings. E. Urbantschitsch has observed in two patients suffering from labyrinth fistula that when the fistula was directly touched or compression applied (fistula test), not only did the usual optic movements appear (fistula symptom) but also a head-nystagmus corresponding exactly to them. In one case such movements of the head also appeared spontaneously. Ruttin has in like manner observed head-nystagmus in fistula tests in one patient suffering from labyrinth fistula. Further, Bárány and Neumann have seen head-nystagmus in a patient suffering from traumatic neurosis and giddiness, pronounced shaking of the head appearing after rotation. Further, Alexander, whose work includes observations on the vestibular reaction after rotation in 132 new-born infants, remarks *en passant* that one infant exhibited head-nystagmus after rotation to the one side but not to the other. Alexander has, however, seen two other cases of head-nystagmus in infants. Bárány, who recently investigated the vestibular reaction in infants, does not even mention head-nystagmus. Gatscher has examined one series of children aged six months, and another between one and two years. The first series consisted of twenty-three children and contained two cases of head-nystagmus. The phenomenon in one of them was only slight. In the second series head-nystagmus was also found twice. As Gatscher has not examined just that age class in which the reaction is typical, he has, however, failed to show that head-nystagmus is quite a normal vestibular reaction in human beings.

I have had the opportunity of examining fifty new-born infants in the lying-in hospital of Copenhagen. In these I found, as a rule, in accordance with former investigators (Bartels, Alexander, and Bárány), very distinct reactions of the head during and after rotation, which took the form of a turning of the head to the same side as the slow vestibular phase. In eight of these infants, all full-time, the head movements after rotation exhibited certain irregularities. Two of them after rotation in the horizontal plane made shaking or rocking movements of the head from side to side, but these movements did not resemble a nystagmus; one of these two children exhibited corresponding movements backwards and forwards after rotation in a sagittal plane (accompanying a vertical nystagmus). The same was the case with four other children, whose reaction after rotating in a horizontal plane did not exhibit any abnormality. In several of these cases it

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seemed as though there was a struggle between the force of gravity and the vestibular muscular innervation endeavouring to keep the head in position so that by degrees, as the muscles became weary, the head fell downwards after a couple of vain jerks. The movements were therefore slow, not in time with the movements of the eyes and often quite irregular. In only two infants did I observe anything like a head-nystagmus. In one case traces of head-nystagmus were recorded a single time after rotation in the sagittal plane (accompanying a vertical nystagmus). In the other case after rotation to the left (but not to the right), both in the horizontal and 'frontal planes, nystagmus jerks of the head to the right were observed, corresponding respectively to the horizontal and rotatory nystagmus to the same side. I do not consider myself justified from these few and uncertain observations in declaring that head-nystagmus appears in new-born infants.

Nevertheless head-nystagmus in human beings is a normal vestibular reflex. This is shown by investigations I have made on somewhat older infants. These investigations comprise altogether thirty individuals between ten days and two years old. These children were, in many cases, not so developed as is normal at their respective ages, as nearly all of them were patients or at all events convalescents. The diseases they suffered from were partly the usual infantile troubles, partly congenital syphilis; a couple of them had acute middle-ear suppuration. All the children were rotated in the horizontal plane, most of them also in the frontal and sagittal. Their respective horizontal, rotatory, and vertical nystagmus, and also the movements of their heads, were observed. As usual ten rotations were made in about eighteen seconds with instantaneous stoppage.

No head-nystagmus was observed corresponding to the vertical and rotatory eye movements. This weakens the supposition that the rocking movements observed in new-born infants, accompanying vertical eye-nystagmus, has anything to do with head-nystagmus. On the other hand, a head-nystagmus to the same side as the horizontal eye-nystagmus was observed in no less than twenty of the children after rotating them in the horizontal plane; in two cases, however, the reaction was so feeble that it was described as dubious. In several of the others the reaction was but slightly pronounced, so that it could easily have been overlooked. On the other

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hand, in several of the children the movements were as pronounced as those one meets with in rabbits, a quick and decided toss of the head appearing to the same side and synchronously with each quick phase of the eye-nystagmus, followed like the eye movements by a slow movement to the opposite side. All the movements were in the horizontal plane. The quick phase was the most marked, the result on the whole being that the head was held more to the side towards which the nystagmus pointed. In the distinct cases the head- and eye-nystagmus lasted an equal length of time, but in other cases the head-nystagmus did not last as long as the eye movements, or was confined to a few jerks immediately after the stoppage of rotation. As a rule head-nystagmus is strongest after the stoppage (after nystagmus), but it may sometimes be seen at the commencement of rotation; it then has, naturally, the opposite direction to the reaction on stoppage. Sometimes in the same individual a distinct head-nystagmus was seen on one occasion, while at the next it was absent. Sometimes one may find, especially in the youngest individuals, a head-nystagmus on one occasion corresponding to the rapid phase of eye-nystagmus, and on the next a turn of the head to the opposite side corresponding to the slow eye phase.

Head-nystagmus would seem to appear in a certain age class. I have found it earliest in infants a month old, excepting in the above-mentioned dubious cases of new-born infants. The oldest child was aged $1\frac{1}{4}$ years, but this case was somewhat dubious. Twenty-three children were examined between the ages of one and eight months and head-nystagmus was found in eighteen of these, *i.e.*, 78 per cent. Of five of these cases where no head-nystagmus was observed, two were very feeble and a third was only one month old. It seems that the stronger the child the more distinct the head-nystagmus, which naturally requires a certain muscular power. That the reaction is attached to a certain age class is probably explained by the circumstance that the necessary nerve tracts are first myelinised at this time.

But why does head-nystagmus disappear later on? Why is it that we only find a vestibular action on the muscles of the neck in animals? One can hardly imagine that nerve-tracts, once established, subsequently disappear. It is more reasonable to suppose that a vestibular tonisation of the muscles of the neck constantly takes place, but is not strong enough to produce

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a visible effect because certain other nervous influences of later origin have a counter action.

Fixation must naturally act as a brake upon vestibular head-nystagmus, just as it restrains the vestibular eye-nystagmus. But even if one omits fixation of vision by closing or covering the eyes, there may be a quite unconscious tendency to fixation in the form of a constant endeavour to keep the head in the normal middle position, a reflex which has its source in the proprioceptive nerve tracts and is probably formed in the cerebellum. This theory is not a mere supposition, indeed it can hardly be said to be anything new. Such a reflex would seem to be the essential foundation for Babinski's *cataplexis cérébelleuse*, in which the part of the body in question is unable to return to its normal position. It would therefore seem to be this reflex fixation of the head which hinders the vestibular reaction and prevents it becoming visible.

How are we to explain the head-nystagmus which under some pathological conditions appears in adults? Of the four cases mentioned in literature, three exhibited labyrinth fistula. This can scarcely be accidental. When testing for the fistula symptom one produces the strongest movement of the endolymph, and therefore the most violent vestibular irritation which we are able to set up. This circumstance, however important, cannot alone explain the appearance of the phenomenon, for in that case a greater number of patients suffering from labyrinth fistula would exhibit head-nystagmus.

A closer analysis of Urbantschitsch's cases (Ruttin's reports are very summary and give no information beyond the otological examination) shows that all his patients were probably hysterical. Urbantschitsch himself says of the first case that hysteria could neither be proved nor excluded. There were, however, increased reflexes and slight hemianæsthesia; also attacks of unrest and terror. In the case of the second patient with labyrinth fistula, horizontal and sometimes vertical nodding movements of the head appeared, not only after compression-aspiration in the external auditory meatus, but also quite spontaneously. These spontaneous movements were not accompanied by movements of the head, which must give suspicions of a functional disturbance. The fistula test produced in this case very violent giddiness and malaise, which are comparatively seldom met with in cases of organic labyrinthine disease. Blowing air into the healthy ear, or the application of cold upon the healthy side

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of the face, increased the tremor of the head. The third patient suffered from traumatic neurosis.

I believe that these patients, on account of their hysteria, were over-sensitive to the vestibular influence upon the neck muscles—an influence which is also found in normal persons as a slight tonisation, but so feeble that we do not feel it. The reason that these hysterical patients are able to produce a head-nystagmus, can hardly be that they are able to eliminate the restraining innervation usually present in adults. The process which occasions the movements is hardly the same as in children. It seems more probable that it is a question of voluntary giving way to the vestibular impulse, a kind of exaggeration. For this reason also the patients easily make too much out of the reaction. In one of the cases movements, apparently without reason, appeared in an up and downward direction, and the patient, so to speak, fell out of his part, being able to produce head-nystagmus quite spontaneously without any influence being brought to act upon the fistula, and also without the accompaniment of eye movements. It is, of course, always somewhat daring to formulate a diagnosis based only upon published case records, but the attempt has in this instance been specially tempting, because it provided the only means by which one could explain the appearance of head-nystagmus in adults.

As we have seen that head-nystagmus may appear as a quite physiological vestibular reaction in human beings—even if only in a limited age class—there is hardly any reason for us to set up a connection between this phenomenon and the “monocular *contra* binocular” system of vision as has been suggested by Urbantschitsch. It seems to me also very doubtful whether optical nystagmus has anything to do with the individual in question fixating monocularly or binocularly. The fact that ocular nystagmus is produced with difficulty in dogs and cats and not at all in rabbits and guinea-pigs by the usual experiments with the rotating cylinder, can be explained by supposing that the attention of the animals is diverted because they are fastened up, or because they are occupied by the experimenter and his movements, or by the noise made by the apparatus, or because they are paralysed by the whole situation. Finally, we must remember that a certain degree of intelligence is required in order that the animal's eye may be caught by anything so indifferent as the passing

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of black and white stripes. From this point of view we can understand that optical nystagmus does not appear in rabbits and guinea-pigs in contradistinction to the better gifted dogs and cats. Even in the case of the latter the result does not seem to be absolutely satisfactory. In children a preliminary examination proved that it was easier to produce optic nystagmus in the somewhat older children ($1\frac{1}{2}$ years) than in the younger, who either do not look at the rotating cylinder at all or are occupied by quite other things; such children have apparently no optical eye-nystagmus, although they fix binocularly quite well.

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