ASSOCIATED MOVEMENTS OF HEAD AND EYES.*

WILLIAM CAMPBELL POSEY, M.D.

Surgeon to the Wills Eye Hospital; Professor in Ophthalmology at the Polyclinic Hospital.
PHILADELPHIA.

In order that the body may properly perform its functions and all the organs act in harmony, a certain reciprocity must be maintained between the different parts. Nowhere is this reciprocity, this association of action, better observed than in the movements of the head and eyes. Upon account of the protected position of the eyes and the direction of the plane of the orbit in the human skull, the field of sight is restricted much more in man than in some of the lower animals where the eyes are much more mobile, and were it not for the increase in the range of the field of sight which the rotation of the head affords, man would be unable to perceive many side objects without change of position of the entire body. Not only does the head, however, by its movements, augment the range of the field of vision, but it also supplements the action of the extra-ocular muscles in the delicate task of maintaining proper visual axes. To properly perform this two-fold task the head is provided with numerous and intricately acting muscles, and it is only when we remember that there is scarcely a position assumed by either the eyes or head in which the action of both parts do not enter, that we realize how intimate the relationship between the extra-ocular and cervical muscles is; indeed, it might be added the musculature of the entire body as well, for it is usual for the muscles of the trunk to be implicated in a greater or less degree in all vicarious positions of the head.

It is not the intention of the writer to approach the subject of these associated and vicarious movements from an anatomic or a physiologic standpoint, but rather to record some clinical observations which he has recently had an opportunity of making on several subjects who presented such movements. To facilitate this study the movements of the head and eyes which may occur in association have been classified into four groups:

1. MOVEMENTS WHICH ARE PHYSIOLOGIC.

Under the class of physiologic movements are included the many and varied movements which the head makes through the medium of the neck muscles in supplementing and augmenting the action of the extra-ocular muscles. Such movements are often involuntary and are almost constant; and though their mechanism is complicated and intricate by reason of the close association in the cerebral innervation of both extra-ocular and cervical muscles, both sets are enabled to act in perfect unison.

2. ABNORMAL INDEPENDENT BUT SIMULTANEOUS MOVEMENTS.

Movements which are abnormal and though simultaneous and having the same pathologic origin are not related in the sense of being dependent on one another, constitute the second class. Under this is included the accidentally simultaneous occurrence of nystagmus and head tremor in certain diseases of the cerebrospinal system, as, for example, in disseminated sclerosis and in paralysis agitans. As is well known, nystagmus is one of the characteristic symptoms of disseminated sclerosis, while head tremor is a comparatively unusual manifestation; yet both the movements in the eyes and the tremor

in the head may occur in the same subject at the same time, without either being responsible for the other, the associated conditions being due to sclerotic foci in the vicinity of the nuclei of both sets of muscles. In paralysis agitans the head not infrequently presents conspicuous tremor in consequence of contractions in the superficial and deep cervical muscles, but the muscles of the eye are but rarely affected. Debove, however, has noted in rare cases a retardation in the movements of the eyes which, if the patient was reading, occasioned a characteristic pause at the end of each line, and Galozowski also has observed imperfect movements of both eyes and head in this disease.

3. COMPENSATORY MOVEMENTS.

The third class is a vicarious position of the head, assumed to compensate for some imperfect action of one or more of the extra-ocular muscles. On account of the close physiologic association between the extra-ocular, the cervical and some of the trunk muscles, in the event of the failure of one of the eye muscles to properly perform its function, this latter may be assumed by some of the muscles of the other groups, but always at the expense of the proper head posture, for a deviation in one set of muscles can only be compensated for by a secondary deviation elsewhere. This act of compensation is well seen in paralysis of an eye muscle, where it is a known law that to avoid the diplopia and visual vertigo which such a palsy occasions, the head is turned in the direction of the affected muscle, thereby supplementing its action, so that for every variety of palsy there is a characteristic pose of the head. A similar deviation, though to a less extent, may be observed in cases of imbalance of the extra-ocular muscles which are latent, the so-called phorias.

An extremely interesting class of cases which the writer would include in this group, as an example of compensatory head movements, is the wry neck, which has been observed in a few cases after palsy of one of the muscles controlling the vertical movements of the eyes. Though this condition was first described by Caignet in 1873, this writer did not place quite the true interpretation on his observations, as he considered the ocular condition to be one of strabismus in association with hypermetropia, and credit should be given Wadsworth for first attributing torticollis to a paralysis of one of the eye muscles. The report of a case of this nature by this author may be found in the transactions of the American Ophthalmological Society for 1887, as well as brief mention by Risley of two cases of a similar character which had occurred in his practice. Since then five other cases have been recorded, all of which presented much the same features: paralysis of one of the vertical eye muscles and an obliquity of the head occasioned by spasm of the sterno-cleido-mastoid muscle.

Of the six reported cases (those by Risley are excepted on account of insufficient data) Nieden summarizes that the torticollis followed a paralysis of the superior oblique of the left eye, with obliquity of the head caused by traction of the muscles of the right side in three cases; in two the same muscle traction followed palsy of the right inferior rectus muscle, and in his case alone paralysis of the superior rectus of the left eye caused a contraction of the sterno-cleido-mastoid muscle of the same side. Graefe, however, questions the accuracy of Nieden's diagnosis, and states that the palsy in Nieden's case could not have been of the left superior rectus, but rather of one of the muscles which pulled the right eye downward, i. e., the right superior oblique.

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To these cases of torticollis of ocular origin the writer desires to add another.

CASE 1.—L. D., aged 9, was sent to the writer in May, 1900, by Dr. Alfred Hand, Jr., with the following note: "L. D. was a patient of mine in his infancy. Even at that early date I noticed a wry neck and once in holding the head straight, for the muscle was not permanently contracted, I saw a downward deviation of his right eye, which I thought might be the cause of his holding his head to one side. The case passed from under my care for several years, but seeing him again and finding the same conditions still present, I am referring him to you for an ocular examination."

On questioning the mother, it was elicited that a few days after birth the attending physician noticed a peculiar winking of the right eye and that shortly after this it was remarked that the head was drawn toward the right shoulder. Labor had not been unduly prolonged and forceps were not applied. The peculiar appearance in the right eye soon took the form of a distinct "cast," and the head was held constantly crooked. The muscles of the neck were never rigid but the head could always be straightened without difficulty. Recognizing the importance of early treatment, the child was taken to the Jefferson and later to the University Hospital, and notwithstanding that the general condition, which was somewhat impaired by rickets, improved under general medication, the wry neck did not respond either to the systemic treatment or the local application of electricity. When 22 months old, the child developed a retropharyngeal abscess, for which he was successfully treated by Dr. Hand.¹ Between the ages of 4 and 6 years, the child had frequent attacks of dizziness and on several occasions received severe falls from stumbling. Neither the mother nor the child remember his ever having seen double. When six years old he was given glasses, with marked relief to the dizziness and stumbling but without effecting any change in the axis in which he held his head. The writer first saw the child when he was 7 years old, and noted at that time the following condition: Child is apparently well nourished, but persists in drooping his head upon the right shoulder while the face is turned toward the left, the position being that which is occasioned by contraction of the right sterno-cleido-mastoid muscle. With the head in this deflected position the eyes are apparently on a level, but when the head is straightened, which can be done without difficulty, owing to the ready relaxation of the muscle, it is at once remarked that the visual axis of the right eye is turned down and that the patient fixes with his left eye. Vision and accommodation were normal in both eyes, the pupils were of equal size and responded well to light and accommodation stimuli. On account of there being crossed diplopia in the upper field, and the image of the right eye being higher, as well as the restriction of the movement in the right eye upward, and especially up and in, it was thought that the superior rectus muscle in the right eye was the muscle at fault. An operation to bring the visual axes of both eyes on the same level being refused the hypertropia was partially corrected by means of vertical prisms, but though these lenses have been persistently worn during the past two years, they have exerted no apparent influence upon the position of the head, owing partly to the fact that the prisms were inadequate to correct sufficient of the hypertropia to establish binocular vision and partly also to the fact that the deviation in the head had been of such long standing that secondary deflection had occurred in the spine, which tended to fix the deformity.

The accompanying photograph (Fig. 1) illustrates the position of the head and shows the left eye fixing while the right is deviated on a lower level.

4. RELATED BUT NOT COMPENSATORY MOVEMENTS.

The last class includes movements of the head and eyes which are abnormal and bear a direct relationship to one another without being compensatory. Cases of this class are those in which the anomalous movements

of both head and eyes are probably the result of a central lesion. The most familiar instance of this class is the simultaneous movements in head and eyes which occur in conjugate deviations after the involvement of certain portions of the brain, as, for example, cases of brain abscess, and not infrequently during the attacks in parietic dementia.

Another type of this class is the cases of head jerking associated with nystagmus which occur in young children—cases of so-called spasmus nictans. In this disease the child moves its head rapidly, either from side to side or up and down—or at times with associated horizontal and vertical movements, while the eyes make rapid nystagmic movements. The direction of the head movements and those of the eyes may correspond, but this is not invariable, as the nystagmus may assume all forms and may be limited to one eye. Though, as a rule, synchronous movements of the globe are much more rapid than those of the head, at times the movements of the head and eyes are independent of one another. The nys-

Fig. 1.—Torticollis due to hypertropia.

tagmus is aggravated by holding the head quiet and by making the eyes fix. In addition to the jerking movements, the head is not infrequently turned to one side or thrown back, probably in compensation for a faulty-acting eye muscle, for in addition to the nystagmus marked deviation in the visual axes, with strabismus, has been noticed in a large number of cases.

The absence of any pathologic changes which has been noticed in the few cases which have come to autopsy and the invariable tendency which these cases have to recover, has led Haddon to the assertion that the head and eye movements in this class of cases are due to an "instability of the motor centers above the nuclei, in the spinal cord and fourth ventricle, presumably the cerebral cortex."

It has been observed, however, chiefly by Randnitz and Caillé, that if the eyes are bandaged the motions of the head cease. Randnitz noticed also that the head movements were most influenced by the direction of the visual axes, that they ceased when the eyes were deviated

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in certain directions and started up again as soon as they were rotated from this position.

Though there is ground from Randnitz's experiments that the head motion may be compensatory to an initial eye lesion, the nature of the affection is still in doubt, and it is probable that the ganglion cells which innervate the muscles of both head and neck are simultaneously affected by an exhaustion or irritation process. Rachitis and other nutrimental disturbances are common in this class of cases, and occurring as they do at the age when the association between head and eye movements is being perfected, probably act as the predisposing cause.

Under this class would fall also the wagging of the head which occasionally accompanies the eye movements in miner's nystagmus, both the head and eye movements being due to motor exhaustion of the cortical centers which govern the muscles of the head and eyes respectively. The writer desires to report under this class a case which is not very dissimilar from those of spasmus nicitans.

Fig. 2.—Synchronous movements of head and eyes.

CASE 2.—In June last a colored child, aged 8, consulted him at the Polyclinic Hospital. The following history was obtained: The child had always been healthy, but when it was about 5 years of age the mother noticed that its head moved from side to side, especially when regarding near objects, and queer movements were remarked in the eyes also. These movements were quite constant, were never very rapid or violent and ceased when the child was told to control them. Glasses had been prescribed, without exercising any apparent effect upon the movements of either head or eyes. At the examination it was noted that when the child walks about or when her attention is not attracted, the head is turned toward the left and slightly down, and very perceptibly rotated from side to side. These movements are regular and rhythmical and quite under the control of the will.

Inspection of the eyes reveals that they are in motion also and that there is a convergent strabismus of pronounced degree in the left eye. In contradistinction to the movements of the head, those of the eyeballs are vertical and slightly rotary, this being the more pronounced in the left eye. The nystagmic movements of the eyes are more frequent than

those of the head in the relationship of five movements of the eyeball to two of the head. The head and ocular deviations are well shown in the accompanying photograph (Fig. 2).

With the exception of a high degree of far-sighted astigmatism, both fundi were normal and vision could be brought to $5/7\frac{1}{2}$ in each eye by the proper lenses. Notwithstanding this degree of visual acuity in both eyes, it was impossible to elicit double images, so that it could not be definitely ascertained which muscle or muscles of the left eye were at fault. As, however, the position of rest of the eye was constantly one of convergence, and as the upper and outer movements of the globe seemed to be most restricted, it was thought that the ocular condition could best be explained by a palsy of the inferior oblique muscle of the left eye, with perhaps a paretic condition of the superior and external rectus muscles.

The child was well-nourished and strong, playful and happy and gave no evidences of rachitis. There were three other children in the family, all of whom were healthy and none exhibited abnormal head or eye movements. With a view of determining the existence of any other nervous manifestations, the case was sent to the nervous department for examination. Dr. William G. Spiller, the professor in charge, reported as follows:

"The little girl, M. G., has no important symptoms other than the lateral movement of the head and the vertical nystagmus. I noticed that she shakes her head slightly from side to side at times, and that there is a tendency for the chin, more than the whole left side of the face, to be turned toward the left; a position that would be produced by the action of the right sterno-cleido-mastoid muscle. I have thought it possible that the vertical nystagmus—which seemed to me to be only in the left eye—might be the result of weakness in the ocular muscles to which you refer; and that the lateral movement of the head might have a similar cause, viz., slight weakness of the left sterno-cleido-mastoid muscle. I could not obtain any history of birth injury to this muscle, or of any subsequent injury, but it seems at least possible that if the left spinal accessory nerve were weak the sterno-cleido-mastoid muscle might be innervated incoördinately, and that in this way a lateral regular movement of the head might be established. This is offered merely as a possible explanation of the case. The knee-jerk is normal on each side. Sensation is normal and there are no hypersensitive zones."

THE PRESENT ASPECT OF THE TUBERCULOSIS PROBLEM IN THE UNITED STATES.

S. A. KNOPE, M.D.
NEW YORK CITY.

(Concluded from p. 1314.)

After this general comment I will take up some of the states individually. Dr. William Duffield, Phoenix, Ariz., tells me that there is no board of health in the territory. Just think of it! Arizona, the place which is perhaps more sought and visited by consumptive invalids than any other, has no board of health, and consequently no laws nor regulations concerning tuberculosis in man. No circulars nor ordinances are issued. The town of Phoenix has an anti-spitting ordinance, but the law is a dead letter and has never been enforced. There is no sanatorium or special hospital for the exclusive treatment of tuberculosis in Arizona and no society for the prevention of tuberculosis. In his letter to me, Dr. Duffield lays particular stress on the sad fact that there is not a single place in the whole territory where the poor consumptive can receive shelter and treatment, and he also says "thousands of patients are sent here annually, hundreds of whom have but a few dollars when they arrive." But the climax of all this, it seems to me, is reached by the report that "the most stringent and rigid laws to combat bovine tuberculosis with the very best possible execution of the same are