

any one segment (as Türck and others of the older physiologists taught), but every thoracic area is supplied by at least three segments, viz.: its own segment and the one above and one below. According to this view, a lesion located in the eighth thoracic segment would cause absolute anesthesia only in the lower half of its own skin area and impaired sensation in the upper half; this because the upper half is supplied from the seventh segment in part. If this holds true in this case, it tends to put the area supplied by the eighth segment in about the same location as given in the diagram of Head, who places the umbilicus at the lower margin of the ninth area. It also corresponds closely to the mappings out by Sherrington on the body of one of his monkeys.

It need not be insisted on here that the exact localization of the spinal sensory areas on the trunk is of great practical importance, both in neurology and in surgery. Hence the care taken to present this case.

DISCUSSION.

DR. WM. J. SULLIVAN, Lawrence, Mass., asked Dr. Lloyd whether in his opinion degenerative condition of the cord accompanying locomotor ataxia is due entirely to syphilitic poisoning? By some these changes are said to be due to syphilis in 85 per cent. of the cases, and by others in 100 per cent. of the cases, and that the history of syphilis is found in 100 per cent. of the cases.

DR. WILLIAM G. SPILLER, Philadelphia, referring to the level of the umbilicus and the sensory area said that some years ago he studied that question in fracture of the cord, and found it was in the tenth thoracic segment of the cord. I have seen in three cases the area of sensation was sharply limited in the trunk. Horsley makes mention of the same thing, and Sherrington's views would indicate that the edge should shade off gradually into the field of normal sensation.

DR. JAMES HENDRIE LLOYD, Philadelphia, closing, referred to the theory held by some that tabes is the result of leptomeningitis of the posterior nerve roots. He did not wish to say that he would commit himself to this theory, because he does not know how tabes is actually caused. He has gone over the subject very carefully recently, especially with reference to these syphilitic cases, and can not make out any absolutely satisfactory *modus operandi* in the case of tabes. It may be, he said, that it is merely an atrophy of the neurons of the posterior columns. In some cases of syphilitic leptomeningitis of the posterior aspect of the cord, there occurs a pinching of these posterior roots. That condition is very clearly shown in the present case. Dr. Lloyd sees a great many cases of myelitis, but the case which he presented is one that was of especial interest. The points in which it is of peculiar interest are (1) it seems to suggest the possibility of acute syphilis of the cord; (2) it shows secondary cavity formation very clearly; (3) it is sharply delimited in the eighth segment; therefore, it gives localizing data for the eighth segment of the thoracic portion of the spinal cord.

Serum Therapy.—R. Chiarolanza, in the *Policlinico*, June, 1907, reports the results of experiments with different anti-streptococcus and antipneumococcus sera in the corresponding infections. The experiments are described and tabulated; the results are stated substantially as follows: 1. Heterogeneous serum in small doses may exercise a preventive action in rabbits against microbes of slight pathogenic activity (e. g., mildly virulent streptococci). 2. The same serum in small dose has no preventive action against virulent streptococci and, also, if in larger doses, hastens the lethal outcome of the infection. 3. Antistreptococcic sera of different makers (Aronson, Tavel) have no preventive action against virulent streptococci, even when the dose is very small. 4. The specific heterogeneous serum against pneumonia (Pane) has a constant preventive action against pneumococcus infection, and this was observed when the infection was introduced after a traumatism (laparotomy) as well as when it was simply injected into the uninjured peritoneum.

FACIAL HEMIATROPHY.

STATISTICAL REVIEW OF ETIOLOGIC FACTORS AND PATHOGENESIS. REPORT OF A CASE WITH MORPHOLOGIC STIGMATA.*

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It has been suggested that facial hemiatrophy is primarily caused by arrest of development during the growing period or toward the end of it. As far as I have been able to find, there are no typical cases recorded that support this view, and as a prominent feature in the case that is the object of this paper which I offer as an apology for introducing a subject that has been thoroughly and repeatedly discussed and is perhaps not of special interest.

Since Parry¹ first described facial hemiatrophy, particularly since the investigations of Romberg,² Lande³ and Eulenburg,⁴ the number of reported cases has been slowly increasing; nevertheless the disease is still comparatively infrequent; for this reason, and from the fact that our knowledge of nerve influence on nutritive processes is incomplete with but one satisfactory post-mortem examination,⁵ the etiology and pathology of the disorder can not be definitely disposed of.

Neither time nor space will permit of the consideration of the various theories on the causation of facial hemiatrophy, and it will suffice to refer to them in the discussion of this case. Any attempt at a physiologic interpretation of the symptoms will reveal the fact that the disease can not be limited to any one system. The trophic, vasomotor and sensory and motor fibers are involved. I have collected 83 typical cases which are divided into two distinct groups according to the predominance of certain clinical features.

1. Those cases in which the atrophy is complete without functional disturbance of the facial muscles, with little or no disturbance of cutaneous sensation and no vasomotor symptoms.

2. Those cases presenting, in addition to the clinical picture of the first division, vasomotor symptoms, flushing or paleness, temperature differences and secretory disturbances.

In this classification I have eliminated those cases of unilateral facial atrophy associated with facial paralysis, facial asymmetry associated with congenital wryneck, facial atrophy in poliomyelitis and hemiplegia of infants and adults⁶ and that following nuclear lesions.

Of the 83 cases collected, 57 belong to the first division and 26 to the second. Of the 57 cases in the first division, 38 of the patients were women, and the percentage was about the same in those of the second division. In 29 of the 83 cases the patients were under the age of 10 years, 37 between 10 and 20, and 17 between 20 and 30. There are two cases, one of a patient at the age of 75 and one at the age of 81 years reported by Touche,⁷ that are not included in this list. These cases were associated with other conditions due to a widespread cerebral degeneration. Another case was re-

* Read in the Section on Nervous and Mental Diseases of the American Medical Association, at the Fifty-eighth Annual Session, held at Atlantic City, June, 1907.

1. Collected writings, 1825, i, 478.

2. Klinische ergebnisse, Berlin, 1846, p. 75.

3. Essai sur l'aplasie lamineuse progressive celle de la face en particulier, Paris, 1870.

4. Lehrbuch der funktionellen nervenkrankheiten, 1871.

5. Virchow-Mendel: Neurologisches Centralblatt, No. 14, 1888.

6. Oran: Jour. Nerv. and Ment. Diseases, September and October, 1850.

7. Revue Neurologique, 1892.

ported by Bannester⁸ of a patient at the age of 42, the condition following a severe trauma with cerebral symptoms, both physical and mental. While these cases are instructive, they are not true instances of this disorder. It is noteworthy that in 61 cases of the above group the atrophy was on the left side, in 23 some injury preceded the onset of the disease.

In one case, also reported by Bannester,⁸ a man suffered repeatedly from frost bites, which were followed by facial hemiatrophy. In another case first observed by Herdman, and a few years later by me, a severe frost-



Fig. 1.—The photographs, a, b, c, d, e and g are of the patient and show the various conditions described in the text. The photographs f and h are of the twin sister of the patient and show slight deformity of the fingers and asymmetry of the face.

The illustrations used in connection with this paper were made by Mr. V. J. Willy and Mr. Hale, to whom I am indebted for the great care they have taken in executing them.

bite in the supraorbital region of the right side was followed by severe neuralgic pains. A few months later there was a wasting of the soft tissues, with loss of hair of the inner third of the eyebrow, and on top of the head just to the right of the median line there was a deep

groove in the bone half an inch wide, extending upward and backward from the supraorbital arch for about five inches. Cutaneous sensation remained intact, motor function of the corrugator supercilii and occipitofrontalis were not impaired and no electrical differences were noted.

In 7 cases of the above group scarlet fever preceded the onset of unilateral facial atrophy, in 3 typhoid fever, in 5 erysipelas, in 2 suppurative tonsillitis, in 2 suppurative otitis media, in 3 abscesses in the neighborhood of the ear. In the remaining 39 cases no obvious cause could be found; 3 of these were preceded by severe neuralgic pains. Turner⁹ states that direct heredity has been traced in a few cases; I failed to deduce this from the literature after eliminating the atypical cases. In the case which I am about to report there is a direct heredity of physical deviations occurring in successive generations, in the grandmother, in the mother and in two daughters, who are twin sisters. One of the twin daughters developed a complete unilateral atrophy of

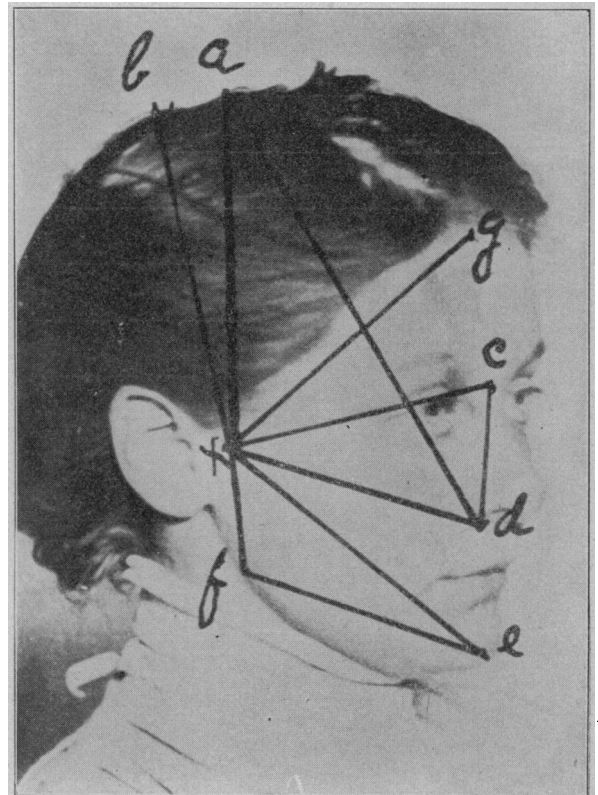


Fig. 2.—Photograph of patient showing lines of measurement as indicated in the text.

the right side of the face; the other has a noticeable asymmetry of the face and ears.

History.—The patient in question was 16 years old, a healthy robust-looking girl and very active. She was referred by Dr. Rowe, to whom I am indebted for the opportunity of seeing this patient repeatedly. She entered the University Hospital Nov. 16, 1906, where I first saw her. She stated that she came for the relief of headache, from which she had been a sufferer since her sixth year, and that she was obliged to give up her school one year ago on account of this disturbance; she further stated that her eyes had been examined by competent specialists, but she has found no relief from wearing of glasses. The patient complained of constant pain in the right occipital region radiating to the parietal and frontal regions of the same side. She also located the pain in the back of the neck between the third and seventh cervical vertebræ and in the

8. Jour. Nerv. and Ment. Diseases, 1876, iii, 539.

9. Albutt's System of Medicine, vi, 485.

right shoulder and arm. When she was 7 years old the mother first noticed the facial deformity, which had been steadily progressing. The parents were both living and in good health. There were two brothers and two sisters, all in perfect health. The paternal grandmother died at the age of 63 of paralysis (hemiplegia of the right side). Maternal grandfather died at 53 of pulmonary tuberculosis. The mother stated that the patient was a very nervous child, in direct contrast to her twin sister. There were no complications at the time of birth and labor was normal. There was nothing unusual in the development of the children until the patient was 6 years old. She had lung fever at the age of 3 months, measles, chicken-pox and whooping cough before she was 6 years of age. Menstruation appeared at 14. In her school work she kept up with her twin sister, completed the eighth grade when not quite 14 years old; at this time she did not attend regularly on account of persistent occipital and frontal headache. At about the age of 7 the mother first noticed a slight yellowish-brown discoloration of the skin in the supraorbital region on the right side and could feel a slight depression in the bone in that locality. She also noted a falling out of the hair on top of the head just to the right of the median line. The whole right side of the face became emaciated within a few months, a condition which steadily progressed. The patient thought that there had not been any notable change within the last two or three years.

Physical Examination.—Aside from the emaciation of the right side of the face, the patient's general appearance was good and she was well nourished. The thyroid gland was somewhat enlarged laterally, the musculature was well developed and of good tone, the skin was moist and elastic ex-

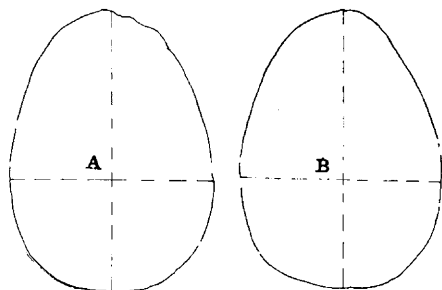


Fig. 3.—Cephaloscopic drawing of the horizontal circumference (A) of patient showing irregularity in the frontal line directly over the deformity; (B) of twin sister showing asymmetry.

cept over the right side of the face, there it was a little less elastic, most marked in the supraorbital region. On the right side there was a yellowish-brown discoloration of the skin in the same area. (Fig. 1, a.) There was a marked depression in the frontal bone, forming a groove 2 cm. ($\frac{3}{4}$ in.) wide, extending from the supraorbital ridge upward and backward over the vertex just to the right of the longitudinal suture. (Fig. 1, b.) A radiogram made anteroposteriorly showed increased density of bone on the right side of forehead, while one made laterally revealed deep grooves in the frontal and parietal bones. The scalp was bare in this area and the hair surrounding it was thin and continually falling out. The right side of the face was plainly less full than the left, the subcutaneous adipose tissue seemed to be largely lacking, the muscles did not seem to have lost their volume, but hollows between them were noticeable. (Fig. 1, a), more prominent when the patient smiles. The right eye was slightly less prominent than the other. Careful measurements showed an appreciable difference between the two sides of the face and cranium. The right ear was smaller than the left (right ear 5.2 cm. long and 2.6 cm. broad; left ear 6.1 cm. long and 3.2 cm. broad). The points of measurements of the face and cranium are indicated in Figure 2 and need no further explanation. Measurements of the right side of the face, distance between a-x 11 cm., b-x 10.5 cm., g-x 10.1 cm., c-x 8.4 cm., d-x 7 cm., e-x 9.6 cm., e-f 7.2 cm., a-d 15.4 cm., g-d 8 cm. Left side of face distance between a-x 12.5 cm., b-x 11.7 cm., g-x 12.4 cm., c-x 10 cm., d-x 9.3 cm., e-x 11 cm., e-f 9.4 cm., a-d 17 cm., g-d 8 cm. The circumference of the cranium measured

51 cm., anteroposterior diameter 17.5 cm. The greatest transverse diameter 14.6 cm., binauricular arc 30 cm., binauricular diameter, 13 cm., naso-occipital arc 22.5 cm., naso-bregmatic arc 15 cm., right auriculo-bregmatic radius 13 cm., left auriculo-bregmatic radius 14 cm. The extremities were symmetrical in length and size except the little fingers in both hands are crooked and much shorter in proportion to the other fingers, the right being slightly the shorter (Fig. 1, g.) The examination of the respiratory, circulatory, digestive and abdominal organs revealed nothing abnormal. The urine and blood analyses were negative. The right eye was less prominent than the left, the expression and movement of the eyes and eyelids were not peculiar, the pupils were equal, central and regular, they reacted to direct and consensual light and accommodation, the corneal reflex was present, the left visual field was markedly contracted, the right slightly so, there was 1.5 degrees hyperopic astigmatism in both eyes, exophoria 2.5 degrees, in accommodation exophoria 15 degrees, abduction 10 degrees, adduction 20 degrees.¹⁰ The hearing, taste and smell were not disturbed.

The tactile sense of the two sides of the face was normal. Pain and thermal sense were not disturbed, careful and repeated examination revealed no disturbances of the cutaneous sensibility in any part of the body. Deep pressure over the great occipital nerve just as it pierces the complexus and trapezius muscles caused the patient excruciating pain; this was slightly more marked on the right side; the same condition was present in the great auricular of the right side and to some extent in the superficial branches of the suprascapularis of the same side. Aside from this there was a marked nerve-tenderness in all of the spinal nerve trunks.

The secretions, apart from slightly diminished perspiration on the right side of the forehead, were normal. The tears were said to be secreted normally on both sides, the same is true of the secretion of the mucous membrane of the nostrils. The salivary secretion was undiminished. The skin appeared more tense on the right side of the face, especially above the eye (Fig. 1, c.) The discoloration of the skin covered the narrow groove in the right side of the forehead immediately to the right of the median line. The temperature was carefully and repeatedly tested in both ears and over the surface of the face and no difference was found.

The deep reflexes were all active, not increased; the jaw reflex was not changed, the superficial reflexes were not disturbed, the corneal and pharyngeal reflexes were both present.

The motility of the facial muscles was not impaired, the tongue was protruded in the median line and there was no impairment of motion. In the muscles of mastication there was no difference in motion or strength of the two sides. The action of the occipitofrontalis and corrugator was normal, although somewhat restricted on the right side on account of the tenseness of the skin (Fig. 1, c.) The tongue, soft palate and muscles of the face presented no atrophy. Electrical reactions were normal in all of the muscles and nerves.

Examination of Sister.—The patient's twin sister declared that she was in perfect health and had been since childhood. She was a healthy looking individual and as far as the unaided eye could see there was no marked asymmetry of the face and head, as the photograph (Fig. 1, f) indicates. Careful measurements, however, revealed some differences. The same careful measurements were made in her case as in the patient. Right side a-x 11.5 cm., b-x 10.9 cm., g-x 11.5 cm., c-x 9.1 cm., d-x 8 cm., e-x 10 cm., e-f 8.5 cm., a-d 16.1 cm., g-d 8.1 cm. Left side a-x 12.3 cm., b-x 11.8 cm., g-x 12.7 cm., c-x 10.2 cm., d-x 9 cm., e-x 10.8 cm., e-f 9.3 cm., a-d 17.2 cm., g-d 8.1 cm. The circumference of the cranium measured 51.8 cm.; anteroposterior diameter, 17.8 cm.; the greatest transverse diameter, 14.8 cm.; binauricular arc, 30.6 cm.; binauricular diameter, 13.4 cm.; naso-occipital arc, 22.8 cm.; naso-bregmatic arc, 15.3 cm.; right auriculo-bregmatic radius, 13.2 cm.; left auriculo-bregmatic radius, 14.1 cm. In comparing the measurements of the two sides of the head a marked asymmetry was apparent; while the variations were not so great as in the patient's case, they were nevertheless noteworthy. There was no atrophy of the muscles nor loss of substance of the cutane-

10. The eye examination was made by Drs. Parker and Slocum.

ous or subcutaneous tissue nor bone, and the deviation was undoubtedly a defective development due to premature synostosis of the cranial sutures. The right ear was 5.8 cm. long and 2.9 cm. broad; the left measured 6.2 cm. long and 3.5 cm. broad; the appearance of the ears is not peculiar except the difference in size. The twin sister of the patient presented the same deformity of the little fingers that was noted in the patient herself, the shorter one being on the right hand. The mother and grandmother and one brother have the same defect. A careful and complete physical examination of the twin sister revealed nothing further of interest. The eye examination presented the same conditions that were found in the patient, but to a less degree.

In summing up the salient features of the case just described, I may briefly state that they are largely trophic in character; the discoloration of the skin, its diminished elasticity, the perceptible change in the perspiration and the atrophy of the subcutaneous tissue and bone, all point to a defective nutritive process. I may also mention that the persistent localized pain and marked nerve-tenderness are significant. An interesting condition is the cranial anomaly both in the patient and in her twin sister; this, however, can not be regarded as anything more than a developmental defect and possibly a predisposing cause and not as a condition resulting from the disease. Also the deviations of the ears and fingers are to be accepted in the same way.

In making careful comparisons of the measurements in the two cases it is evident where the evolutionary defect ends and the disease begins. The measurements of the right side of the face in the patient being out of proportion with those of the cranium on the same side and those of the opposite side, while in the twin sister they are uniformly diminished over the entire right side.

In the family history we have evidence of neuropathic heredity and debilitating conditions. In the personal history there is but one condition that may be regarded as an inciting cause, and that may be found in the acute infectious diseases which preceded the hemiatrophy. It is always doubtful how far this may have been a direct excitant. While acute infections are frequently associated with facial hemiatrophy, these diseases are very common at this time of life, and the association may be only a coincidence.

PATHOGENESIS.

The most difficult problem before us is the correct interpretation of the symptom-complex. It is now generally conceded by physiologists and neurologists that the vasomotor and trophic supply of nerves reach the peripheral parts, the skin, subcutaneous tissue, muscle and bone mainly, if not entirely, through the sympathetic nervous system, and the fibers for the head are supplied by way of the cervical sympathetic. Schiff and Meltzer¹¹ demonstrated that the ear receives vasomotor fibers from the great auricular nerve, a branch of the third cervical nerve. Vasomotor fibers are also carried by way of the cranial nerves and spinal nerves and the sympathetic ganglia with which they are connected. It is also stated that these fibers reach the fifth cranial nerve by communicating branches from the superior cervical ganglion. These fibers have also been demonstrated in the seventh and hypoglossal nerves. We may assume, therefore, that a lesion in these paths, particularly in the fifth cranial nerve, being a compound nerve, may cause sensory, motor and trophic symptoms.

While it is difficult to understand how in some cases the trophic fibers could be affected so extensively without some implication of the sensory or motor fibers, it

is a clinical fact that in cases of neuritis of the nerves of the lower extremities a lesion in the sciatic may present various clinical pictures, motor and trophic disturbances without any change in sensation and *vice versa*. A very good illustration of this was presented in a case which I observed recently in a patient who suffered from pain, swelling and flushing of the left foot. There were no sensory or motor defects. It was found that there existed a marked tenderness of the sciatic at the point of exit; this was relieved and the disturbance in the foot disappeared.

Another case was that of a young woman 18 years of age, who complained of weakness and wasting of the left leg and pain in the left hip. The examination revealed marked tenderness in the sciatic at the emergence and along the course of the main trunk. There were no sensory disturbances, the temperature varied by two degrees in the two extremities. The left leg was much smaller than the right and the atrophy was at once apparent. The muscular tone and strength was much diminished in the calf muscles, but no marked paralysis was present and no reaction of degeneration. The condition in the sciatic was relieved and the patient improved promptly.

In cases of disseminated neuritis I have frequently noticed that the greatest severity of the trouble is on the left side and acute exacerbations are more common on that side. Why these variations occur depends on the particular fibers that are diseased in the nerve trunk, and in comparison I may state that all of the symptoms that have been observed in facial hemiatrophy have been presented in inflammatory conditions of the spinal nerves in other parts of the body. It may, therefore, be concluded that the wide variation in the symptoms is due to the extent of the lesion rather than to a difference in character.

From the statistical review it is evident that, in a majority of cases reported, the symptoms are those of disturbed trophic function, that the disorder is more or less acute and more rapidly progressive at the beginning of the disease and that the association with acute conditions is a close one, traumatism is not infrequent and infections are occasionally met with. In these points and in the close analogy of the symptoms with those occurring in neuritis there is evidence of a peripheral nerve lesion.

A MIXED INFECTION WITH TERTIAN AND QUARTAN MALARIA OCCURRING IN A PATIENT WITH SYMMETRICAL GANGRENE.*

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For many years the idea has existed among various observers that there is a relation between symmetrical gangrene and malaria. This relation was hardly appreciated by Raynaud¹ in his thesis, although several of his cases were malarious subjects. In Case 6, which was reported in 1837 by Marchand, the patient was a woman who had had an outbreak of the gangrene six weeks after an attack of tertian malaria. Likewise the patient in Case 7 had had a three months' attack of tertian ma-

* Read in the Section on Practice of Medicine of the American Medical Association at the Fifty-eighth Annual Session, held at Atlantic City, June, 1907.

1. De l'asphyxie locale et de gangrène symétrique des extrémités, Paris, 1862. Translation by Barlow for New Sydenham Society, London, 1888. Nouvelles recherches sur la nature et le traitement de l'asphyxie locale des extrémités, 1888.