the typical features of locomotor ataxy. When, however, all these cases of secondary ataxy are eliminated, and only primary ataxy of slow onset remains, a large proportion of the cases—from my own experience, I should say that nearly one-half—present a history of antecedent syphilis. The following cases are examples of this association.

James R., aged 43, had a primary syphilitic sore at twenty-one; a little time afterwards, double iritis, recognised as syphilitic. At thirty-nine, he began to suffer from rheumatic and "throbbing" momentary pains in the legs. Soon afterwards, he found walking difficult. When seen, he had a well-marked ataxic walk; no patellar tendon-reflex; loss of sensibility to touch, especially on the soles; not to pain; some loss of sensibility to heat; no marked retardation. The pupils were small, motionless. The sight of each was $\frac{1\frac{1}{2}}{2\frac{1}{2}}$ and $\frac{12}{12}$.

George W. had venereal sores before marriage; and, since, three children, born dead. There was well-marked ataxy, slight in the arms (especially left), great in the legs. The onset was gradual twelve months before, with "rolling about", especially in the dark. He had "shooting" pains. There was considerable loss of sensibility to touch, and pain as high as the knees. The pupils were small, not acting to light; power of accommodation was good. Vision, left, $\frac{1\frac{1}{2}}{1\frac{1}{2}}$ and $\frac{8}{8}$; right, $\frac{1}{1\frac{1}{2}}$ and $\frac{8}{8}$.

Alfred H., aged 45, had chancre and indolent bubo at twenty. Slight occasional unsteadiness on legs was noticed at the age of thirty; but, at thirty-five, he found difficulty in the dark, which increased. There was well-marked ataxy on the legs, with throbbing pains, considerable loss of sensibility; no delay. There was no loss of sexual power.

William R., aged thirty-seven, had a venereal sore at twenty-one. Three of his children were born dead without cause. The affection commenced with failure of sight three years before, and two years later, rapid failure of power of using the legs, with later shooting pains, always well marked. He was unable to stand with the feet nearer together than six inches. There was no patellar tendon-reflex. There was marked defect of sensation, especially in localisation. The pupils were small (.1 inch diameter*); they did not act to light.

Thomas L., aged 47, was transferred to my care in University College Hospital by Mr. Godlee, in August 1878, with locomotor ataxy. There was no neurotic family history. He had syphilis at twenty years of age, and subsequently sore-throat for several weeks. For two years before admission, he had frequent shooting pains in the legs. There was defective power over the sphincter vesicæ, unsteadiness of gait for eight months, and loss of sexual power for six months. Ataxic gait was well marked; he was just able to walk alone; he could not stand with the eyes shut, or with the feet together and the eyes open. There was marked diminution of sensibility to touch on the legs below the knees, and slighter on the soles of the feet. There was marked diminution of sensibility to pain; slight of that to heat. There was slight retardation of painful sensation. The arms were almost unaffected; merely slight unsteadiness of movement with the eyes shut. He had ptosis of the left eyelid (said to be, in part at least, the result of an old injury); complete paralysis of the left external rectus; the pupils were small; there was no action to light; there was slight contraction on convergence of the eyeballs, the condition described by Argyll-Robertson; the sight was impaired. Large doses (5j daily) of iodide of potassium, and subsequently mercury, were given without improvement.

I have not included acute myelitis among the diseases described; because, although cases, apparently the result of syphilis, have come under my notice, they have occurred earlier in the syphilitic history than the other neural consequences, and the probability is great that the softening of the cord is secondary to adneurial (e.g., vascular) disease.

The facts given above suggest certain differences between these primary neural diseases and the common adneurial effects of syphilis. These differences might at first be supposed to furnish evidence against the neural diseases being consequences of syphilis; but it is clear that this question must be determined by the frequency of their association. If the frequent association of the two morbid states be established by wide and independent observation, there must be a causal connection between them; and as it is difficult to conceive that they can be effects of a common cause, it follows that the consequent must be regarded as in some way the effect of the antecedent; and any differences which are to be recognised between these and other effects of the same antecedent, suggest differences in the mode of causation rather than in the fact of the causal relationship. The first difference is the long interval

after the primary disease at which these neural changes occur. I have not seen them at a shorter interval than six years, and an interval of twenty years is very common. The ordinary adneurial changes, the growths, meningeal inflammation, and vascular disease, occur usually at an earlier period—may follow in a few months, and are rarely postponed longer than eight or ten years. The longer period is, however, no evidence against the activity of the syphilitic influence, since some of the later cutaneous manifestations of syphilis occur at as late a period. In one of my patients, who had had syphilis twenty years before, a characteristic syphilitic psoriasis was present. In these long intervals, the neural effects of syphilis remind us of many of the consequences of inherited syphilis, and the resemblance will be seen to obtain in other points.

A second difference is the frequency with which other causes act with the syphilitic influence in producing the neural disease. Although instances in which no other cause is to be traced are frequent, in many some other cause coexists. This is seen, for instance, in inherited syphilis, in which, in some cases, we have epilepsy without other traceable cause; in others, again, we have epilepsy associated with a double inheritance of syphilis and neurosis. Again, this is seen, curiously enough, in the disease, which is, I think, the most frequent primarily neural effect of syphilis, locomotor ataxy. Whatever it is which determines the occurrence of locomotor ataxy in men and very rarely in women, and which must be regarded as one of the causes of ataxy, operates in conjunction with syphilis in confining the syphilitic ataxy also to men. Other consequences of syphilis occur in women as well as in men; ataxy, in men almost exclusively. I have several times; it is true, seen ataxy in women who have had syphilis, but it has always been distinctly of the secondary form, the remnant of a wider damage from adneurial disease.

A third difference relates to the effect of treatment in these cases, and constitutes another point of resemblance to the late symptoms of inherited syphilis. As far as my own observation has gone, the cases of primarily neural disease, the sequences of syphilis, are not influenced by antisyphilitic treatment in nearly the same degree as are the adneurial syphilitic diseases, chronic meningitis, growths, etc. They require the treatment suited for other diseases of the same class, in addition to antisyphilitic remedies. The latter often help, but, of the two, the former are the more important. This has not, I believe, been the experience of all observers, but I am doubtful whether care has always been taken to discriminate between the affections which are primarily neural, and those which are secondary to adneurial disease. Observations on this point, to be of value, must be made early in the history of cases. In all syphilitic diseases of the nervous system, the good which is effected by treatment is, *ceteris paribus*, proportionate to the promptness with which the appropriate treatment is employed. As a rule, the opportunity for such treatment rests with the general practitioner and not with the consultant, who often only sees a patient, either in private practice or at a hospital, after the disease has existed for a considerable time. One object in bringing these facts before this Association is to impress upon practitioners the probability that many primarily neural diseases are due to syphilis, and to urge upon them the importance of employing, in all cases in which the probability exists, antisyphilitic remedies—for the sake of the patient, that all possible good may be effected, and for the sake of medical science, that we may learn whether, in these cases, antisyphilitic treatment promptly employed does or does not possess the power of relief which, in most cases, it has seemed to me to lack.

TREATMENT OF ANGULAR CURVATURE OF THE SPINE BY A PLASTER-OF-PARIS JACKET APPLIED IN THE RECUMBENT POSTURE.*

By THOMAS JAMES WALKER, M.D. Lond.,

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THIRTEEN years since, in the summer of 1865, I read before the Cambridge and Huntingdon Branch of this Association notes of a series of cases of Pott's Disease of the Spine treated by a gutta-percha jacket, applied in the recumbent posture, according to a method which I then described. This jacket I continued to employ up to the time when Dr. Sayre published the account of his treatment of curvature of the spine by a plaster-of-Paris jacket, applied while the patient was suspended by the head and shoulders. Until he demonstrated that the rigid jacket might with safety completely encase the body, I believed, as did Dr.

* To physicians, the catheter-gauge method of recording the size of the pupil recommended by Mr. Hutchinson is less convenient than to surgeons. The diameter in fractions of an inch or millimeters is a far more convenient mode of statement.

* Read in the Section of Surgery at the Annual Meeting of British Medical Association in Bath, August 1878.

Sayre up to 1873, that it must be divided down the front to admit of respiration; but, the material with which the gutta-percha jackets were laced being a stout inelastic stay-lace and not an elastic material such as Sayre used in his open jacket, my apparatus formed a more complete casing than his. In the paper to which I have referred, I said: "The jacket, when properly moulded by the many-tailed bandage and laced tightly up the front, must resemble two truncated cones, joined at the waist by their apices, the lower shallow one resting over the hips, the upper deeper one inverted, accurately adapted to the thorax and supporting the upper part of the body altogether, independently of the spinal column". Although such a jacket forms a very perfect support, retaining the spine in a proper position, and being readily removed and reapplied, it has the disadvantage of being made of a material requiring much nicety in its management and liable to be spoiled, if the surgeon be not practised in its manipulation. It is therefore only in exceptional cases that it should be preferred to the plaster-of-Paris jackets, the application of which I am about to demonstrate before you.

Of the great success which attends the treatment of caries of the spine by fixing and supporting the trunk in a proper position by a casing of plaster-of-Paris, gutta-percha, or some similar plastic material, my experience during the last seventeen years is most convincing, and fully confirms the opinions published by those who have of late adopted such plans; but, in order that such a jacket shall be effectual, it is a *sine quâ non* that it shall be applied when the spine is in such a position that the diseased vertebrae shall be free from all pressure, and the deformity, if any deformity exist, be reduced to a minimum.

This condition is found, it is true, when the patient is suspended by the head and shoulders, as recommended by Sayre, but it also obtains in an equal degree when the patient is laid flat on his back; and the same result as to increase of height, diminution of the deformity of the spine, and relief to pain and functional disturbance follows the application of the bandage, when the patient is in the recumbent posture as when he is suspended. This statement will surprise those who, experiencing brilliant results from Sayre's treatment, regard the suspension which forms a part of it as its essential element, instead of viewing it, as I do, as a hazardous complication of the method. I must direct your attention for a few minutes to the changes occurring in the spine in this disease, as confirming the view I propose.

The spine is a jointed column in which each vertebra in health rests evenly on that below it. The first effect of inflammation of a vertebra leading to softening of the bone is that, in consequence of the superincumbent weight, the diseased bone becomes attenuated at its softest anterior portion; and, as it were, a wedge-shaped piece, broad in front and tapering off behind, being removed from the jointed column, the portion above must fall forward; but, being *jointed*, it not only leans forward, as would a rigid column, but the relations of the vertebrae to each other being disturbed and the intervertebral substance admitting a certain amount of bending at each joint, so soon as the vertebrae cease to rest firmly one upon the other, the whole of that part of the spine above the diseased bones is bowed forward. In order to compensate for this curving forward of the upper part of the spine, and to preserve the balance of the body, the spine below the diseased bones is directed backwards, and the deformity now consists not only of the sharp angle formed by the approximation of the bodies of the vertebrae above and below the attenuated diseased bones, but of the additional bowing forward of the parts of the spine above; the latter curve being resisted, and yet another compensatory curve being established in the opposite direction, by the action of the erector muscles of the spine. As soon as this deformity commences in the slightest degree, the bodies of the diseased vertebrae are exposed not only to the direct downward pressure of the upper part of the body, but are squeezed in the angle of the curved spine, as is a nut in a pair of nut-crackers, by the weight of the body, which, acting through the long arm of the lever formed by the upper part of the spine, acquires the mechanical power of a lever of the second order, the fulcrum being at the articular processes of the diseased bones.

It is this additional pressure which causes the rapid, almost sudden, development of the angular projection, in cases in which the inflammation of the body of the vertebrae may have existed for some time, without the wasting of the anterior part of the body of the bone which converts the direct downward pressure into the leverage described. A patient with such an angular curvature, if laid flat on his back, is speedily relieved from pain and distress. The spine above and below the diseased vertebrae being straightened out, the deformity is much relieved, the angular projection is less marked, and the patient's height is increased; at the same time, the carious bones are not only relieved from the downward pressure to which in the upright posture they were exposed, but are also liberated from the grip of the lever, while, the body being in a position of perfect rest, all abnormal muscular action ceases. This is the condition of the body most favourable to the cure of the dis-

ease, and this is the condition which we should maintain by the application of the plaster-of-Paris shell.

The same straightening of the spine by the opening up the curves above and below the diseased vertebrae may be obtained by suspension strictly carried out as enjoined by Sayre, only up to the point at which it gives relief and causes no pain to the patient; but, independently of other inconveniences and dangers, the favourable conditions described above as existing when the patient lies at rest cannot be obtained, even in an imperfect degree, by suspension, without some risk of disturbing and separating the diseased vertebrae. It is this risk which makes suspension in my opinion a dangerous as well as a complicated and inconvenient method of applying the jacket; and I will now proceed to demonstrate the manner in which I apply it in the recumbent posture; a proceeding for which I claim these advantages. The diseased bones are, at least, as perfectly relieved from pressure, the muscles are as completely relaxed, and the deformity is as much diminished when the patient lies flat on a bed as when he is suspended. These conditions are obtained without risk of injury, without terror, distress, danger of syncope, or any inconvenience to the patient; and a perfect jacket fixing the spine in the proper position for cure can be applied by the surgeon in his own consulting-room or in the patient's house, be it ever so small a cottage, without the help of any skilled assistant, and without a splash of plaster on his clothes, or even on the floor.

As I have elsewhere described, I formerly moulded the gutta-percha jackets by using a modification of the many-tailed bandage, and it is only on the same principle that a plaster-of-Paris jacket can be applied with the patient in a recumbent posture.

The best lining for the jacket is this closely fitting under-shirt recommended by Sayre. I have used occasionally a flannel bandage applied round the patient, or a sheet of cotton-wadding tacked like a shirt round the trunk, both of them being very imperfect substitutes for the vest. The bandage should be of muslin; those I generally use are torn from a piece of Victoria lawn, nine yards long; the width must vary from two to four inches, according to the size of the patient. Plaster-of-Paris mixed with water alone, sets too quickly to admit of the necessary proceedings, and we must, therefore, add some material to retard the process of setting; the best, I believe, is the ordinary gum, and the materials must be used in the exact proportions of one pound of freshly baked plaster, one ounce of mucilage of gum acacia (*B. P.*),* and eight ounces of water; with plaster mixed in these proportions, there is sufficient time to go through the details necessary to apply the jacket, and it will set firmly in from ten to fifteen minutes after it is applied. The most efficient, quickest, and cleanest mode of saturating the bandage with plaster, and that which I recommend you to adopt, is to use the simple machine which I have devised for this purpose, and which is represented here: *a* is a spindle carrying the dry bandage, the end of which

is passed under the fan roller *b b* to the spindle *c*. For a jacket for a full-grown boy, five pounds of plaster are gradually shaken into two pints of water, to which five ounces of mucilage have been added, the materials being well mixed; the bandage is now wound from the spindle *a a* on to the spindle *c c*, passing under the fan *b b*, causing it to revolve and stir the plaster, splashing it over both surfaces of the bandage; the box is wide enough to allow two full width bandages to be charged at the same time. It is necessary that all parts of the machine should work very easily that the bandage may be loosely rolled, or the plaster will be pressed out. This is the best method; but, not having my machine

* Some surgeons who saw this demonstration complain that the plaster sets too quickly. This is owing to there being insufficient gum, the mucilage not being thick enough.

with me, I now employ the bandages rolled with dry plaster as recommended by Sayre, placing them in the water and mucilage until they are sufficiently soaked. (Slips of bandage previously torn to the proper length may be steeped in the plaster mixed as directed above, then taken out, and, with the help of an assistant, smoothed and laid in position on the bed.) The bandage thus charged with wet plaster has now to be cut into slips of the length necessary to wrap round the patient's back, meet in front, and fold over for a few inches, and these slips have to be placed in proper position on the bed and in suitable layers for folding round the trunk of the patient so as to form a jacket reaching from below the crest of the ilium to the axilla. I, therefore, measure round the patient's chest, and take the depth of the jacket from the axilla to half an inch below the anterior spine of the ilium, and mark these dimensions on the bed, which I have protected by laying a few sheets of paper upon it. My assistant taking the end of the bandage, I rapidly unroll it across the bed, and with scissors divide it at the appropriate length, leaving the slip lying across the bed; the nurse again taking the end, places it so that the bandage as again unrolled shall overlap two-thirds of the slip previously laid down; I again cut it off at proper length, and we repeat the process until a layer of slips of bandage, each overlapping the other two-thirds of its width, is laid across the bed, of sufficient size to reach from the hip to the axilla. This will only give a jacket of the thickness of three layers of muslin, which is not sufficient; I therefore begin again at the bottom with the fresh bandages, first placing a narrow slip of paper across the bottom layer at each side, so as to prevent my confusing the ends of the bandages in the two layers during the next stage of the application. If I wanted a specially strong jacket for an active adult, I could repeat the process again, so as to form a third layer; but usually, if the bandage be well saturated with plaster, a thickness of six folds is sufficient, and, as each slip of bandage overlaps two-thirds of the one below it, this is obtained with two such sets of overlapping bandage.

The patient, who is stripped and clothed in the vest which is to form the lining of the jacket, will now lie down on the bed. I place him carefully, so that the edge of the jacket may come well below the crest of the ilium and not rest upon the bone; he raises his arms and lays them in such a position that the elbows shall just clear the top of the jacket (in the case of a female, the breasts must be held up, and pads of cotton-wool placed so as to mould the plaster in a proper form to receive the breasts when the pads are removed), and lies down on the strips of bandage; I now take one end of the last slip laid down, while my assistant takes the other, and bringing them smoothly round the side we cross them tightly over the chest; we repeat this with each slip until we come to the bottom of the first layer; then, lifting the slips of paper placed to distinguish the two layers, we commence again with the bottom stratum, smoothing the whole over with what wet plaster remains. I have never found it necessary to use what Dr. Sayre calls the dinner-pad. The patient may now put his arms down, that I may, if I find it necessary before the plaster has set, cut away or fold over the edge under the arms; in the same way, I fold up the ends of the lower slips of the bandage, and cut away the lower edge of the jacket if I find that it is so low that it will catch the thigh of the patient when he sits down. From the folding over of the slips in front, the jacket is at this part twice as thick as at any other; it has a strong wide rib down the front, which is the point at which it should be strongest to resist the tendency of the spine to curve forward; should it be thought desirable, it is easy to strengthen the back by placing a few strips of well-charged bandage vertically down the middle of the jacket before the patient lies down upon it, or by pouring in a little wet plaster between the layers of bandage.

You will observe that the addition of the mucilage has given me ample time to complete the jacket, but all must be done with a certain degree of rapidity, or the plaster on the first slips laid down, which are, of course, the last to be folded round, will be found to have set. In a few minutes, the lad will be able to get up, the jacket being completely hardened, and you will see that the spine is fixed in its straightened condition as completely as it would have been if the boy had been suspended by his head instead of resting easily on his back.

I do not propose to detain you by entering into any account of the cases to which the method I have demonstrated is applicable; but I may state that I believe it to be adapted to every case in which Sayre recommends suspension; the jury-mast can be fixed as well in this way as by suspension; and the direction in which the slips of bandage are laid and folded may be modified according to the situation of the disease. Even in lateral curvature, the spine is much straightened, and the twisting remedied when the patient is laid either supine or prone; and what is gained in straightness, and consequently in height, may be retained by such an application of the plaster-shell as I have shown.

Although my demonstration is intended only to illustrate the applica-

tion of the apparatus in spinal cases, the practical surgeon will see at once that the method of applying by a many-tailed bandage plaster-of-Paris, the setting of which has been delayed by the addition of mucilage, may be available in many other cases where a solid immovable retentive apparatus is required.

In conclusion, I would thus summarise the points which I wish to impress upon you by my demonstration, and the remarks with which I have accompanied it.

1. The main object of the treatment of angular curvature of the spine should be the maintenance of the affected bones and joints in a state of absolute rest, and that in the position most favourable for the cure of the disease without deformity.

2. This position is found when the patient is placed comfortably in a recumbent posture.

3. By the application of a plaster-of-Paris jacket, as recommended by Sayre, the bones may be fixed in this position, so as to retain it when the patient rises and moves about.

4. The only way in which such a jacket can be applied with the patient recumbent, is by the method which I have demonstrated.

5. This method depends for its practical facility on the application of the many-tailed bandage and the use of plaster-of-Paris mixed as I have directed.

6. The adoption of the recumbent posture dispenses with the inconvenience and serious risks of suspension, while all the advantages of Sayre's method are secured for the patient at a minimum of trouble to the surgeon.

ON THE INFLUENCE OF WHOOPING-COUGH AS ONE OF THE CHIEF CAUSES OF INFANT MORTALITY.

By ROBERT J. LEE, M.A., M.D., F.R.C.P.,

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THE returns of the Registrar-General, during the past few years, and particularly during the spring months of the year 1878, indicate a great increase in the mortality which is caused by whooping-cough. The disease appears to be better recognised than was the case some years ago; and that peculiar symptom, from which it takes its name, is not now allowed the importance it once possessed in determining the nature of an illness where other symptoms, due to the same cause, are more prominently exhibited.

Exactly two centuries have elapsed since the term *chin-cough* was introduced into the Bills of Mortality (1678), London, and twenty-three years followed before the term *whooping-cough* appeared. Since the year 1701, when we find this return—cough, 3; *chin-cough*, 2; *whooping-cough*, 1, in a total mortality in London of 20,471—the disease has pressed itself more and more on public attention, until it has surpassed in importance any other of the zymotic class to which it belongs.

It is from the impression, or rather from the conviction, that it greatly exceeds its present supposed influence as a cause of death, that I venture to bring the results of observations upon this subject before the British Medical Association. There has appeared to be doubt among some authorities of its contagious nature, or rather of its specific origin and character; but, as this doubt is entertained by few practitioners, and is not supported by extensive observation, I shall defer its consideration for the present. The remarks which I published in 1876*, on the general laws which appear to determine the frequency of the peculiar laryngeal sound or whoop in this disease; the conditions which occasion a second attack; and the differences in symptoms, which are due to the age of those that suffer, were the conclusions arrived at from an analysis of nearly one thousand cases. Between then and the middle of last year, a period of two years, six hundred and fifty cases have passed under my notice and treatment, making a total of between fifteen and sixteen hundred. At the hospital where these cases presented themselves, all the forms of disease in children are met with, and the relative frequency with which whooping-cough occurs may be determined. From the first set of cases, it was calculated that this proportion was in the ratio of 10 per cent.; but, in the latter set, the six hundred and fifty occurred in a total of 3,409, or about 19 per cent. From the Registrar-General's Report for 1876, it is seen that, in a total mortality in England of 510,315, whooping-cough was returned as the cause of death, in ten thousand five hundred and fifty-six cases, or nearly two per cent. Of this number, 4,588 occurred under the age of twelve months

* *Whooping-Cough: Remarks on its History, Prevalence, Symptoms, and Treatment.* 1876. Smith, Elder, and Co.