to thirty minutes. He adds a word of caution in regard to the heating of the sponges, for if the temperature is allowed to go much above 130° the sponge is likely to be spoiled, for albumen begins to coagulate at 133° , and is cooked if it gets beyond 163° to 164° , and is then "not fit to be wrought into tissue." Sponges treated by this method can be kept for an indefinite period if placed in the above sterilizing fluid and excluded from the atmosphere.

The methods which he suggests for protecting sponge-grafts in the mouth from the dangers of being displaced by mastication or in cleansing the teeth, etc., is to form a splint from thin platinum plate, which shall cover the parts and be closely adapted, and at the same time free from pressure over the graft.

The class of operations in which Dr. Atkinson has been most successful, are closing the pus-pockets resulting from pyorrhea alveolaris, the reproduction of lost alveolar and gum tissue, and the healing of chronic alveolar abscesses.

Few operations in the mouth outside of these just mentioned, have yet been attempted, but there is every reason to believe that with care and skill, perforations of the hard and soft palates, the result of surgical operations, injuries, or specific disease may be successfully closed by it, and lost parts in other locations of the mouth and face, more or less completely restored by the same means.

The success of the operation, however, when made in the mouth will depend very largely upon our ability to prevent the contamination of the sponge with septic organisms. This in most cases may be accomplished by frequently and freely washing the parts with peroxide of hydrogen, followed by the bichloride solution, 1 in 1000.

Finally, allow me to direct your attention to the

OPERATION FOR HARE-LIP AND CLEFT PALATE

in early infancy, as performed and strongly advocated by Dr. D. H. Goodwillie, of New York. In these cases there has been a failure of union during inter-uterine development between the maxillæ and the lateral halves of the lip, and a cleft is the result. In this condition the anatomical relations of the parts are changed, both in form and dimensions. The maxillæ now separated cause an abnormal increase in their dimensions, and when extended forward producing a single or double hare-lip, there is also great distortion of the face.

Dr. Goodwillie's method is to replace the separated and distorted maxillæ and nose to their normal relations by *manual force* repeatedly applied. But in order to accomplish this with the least difficulty, it must be done as soon after birth as the conditions and circumstances surrounding the child will permit, and before ossification has had time to advance. When the bony frame-work has been restored to its anatomical position, then the operation on the cleft lip and soft palate should immediately follow. For the operation of staphylorraphy and uranoplasty the child is etherized and confined in a metallic jacket and head rest. The patient is then placed in a good light, and in such a position that the surgeon stand-

ing with the head of the patient against his breast, can, by looking over, command a full view of all parts of the palate. The arms of the operator rest upon the head of the patient and thus enable him to control his movements. The oral speculum is then placed in position and the assistant holds down the tongue by means of a hollow tongue-holder and etherizer combined, through which anæsthesia is maintained during the operation. This is a very great advantage, as it saves valuable time, which is otherwise lost by frequent halts in the operation to reapply the anæsthetic.

The divided uvula is then seized with the forceps, and with the small pointed knife the edges of the cleft are pared from the uvula forward to the anterior point of the cleft. The ligatures are then passed, beginning at the posterior part of the cleft, by means of a hollow needle and holder, armed with silk-worm gut; the point of the ligature is then pushed through the needle and grasped by the forceps and the needle withdrawn. The ends of the ligature are secured temporarily by means of small leaden clamps; this is repeated until the required number are passed. The ligatures are afterwards tied with the fingers, commencing, as a rule, with the posterior one.

If any point appears to be unduly strained by the ligature, a suture-pin clamp is adjusted to relieve the tension upon the sutures and is allowed to remain until union has taken place. The methods of dividing the levator palati and palato-pharyngeal muscles as those in common practice.

In uranoplasty, the soft tissue covering the hard palate is either lifted from the bone by means of periosteal elevators, or lateral incisions are made through the soft tissue and the bone drilled and split, and afterwards brought together and held in position by ligatures and clamps, which are permitted to remain for from six to twelve days.

To prevent the child from getting the hands to the mouth, leather elbow-pads are strapped upon the arms.

The instruments used for these operations by Dr. Goodwillie are of his own designing, and meet a long-felt want on the part of oral surgeons, and convert an otherwise tedious and disagreeable operation into one of comparatively slight inconvenience.

ORIGINAL ARTICLES.

THE VALUE OF THE KNEE-PHENOMENON IN THE DIAGNOSIS OF DISEASES OF THE NERVOUS SYSTEM.¹

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Since the simultaneous publications of Erb¹ and Westphal,² in 1875, on this subject, the knee-phenomenon has attracted a great deal of attention on

¹ Read before the Medical Section of the American Medical Association, May 5th, 1886.

² Archiv. Psych. und Nervenkrankheiten, V, 792.

³ Ibid., 803.

the part of the profession, both as to its nature and its clinical significance. Erb termed the phenomenon the patellar-tendon reflex; Westphal the knee-phenomenon; while the English usually speak of it as the knee-jerk. Each of these terms is in common use, signifying alike the contraction of the quadriceps femoris muscle and the forward jerk of the foot, when a sharp blow is struck upon the *ligamentum patellæ*.

The question of the nature of this phenomenon need not detain us long. The views originally expressed by Erb and Westphal still divide the opinions of the profession. Erb believes it to be true reflex action, a peripheral impression being conveyed to the centre in the spinal cord, and thence a motor impulse transmitted to the muscle. Westphal believes that the contraction of the muscle is due to the direct irritation of its fibres, caused by their sudden stretching, the spinal cord having no cognizance of the act. He believes, at the same time, that certain conditions of the muscle and tendon are necessary; that is, a degree of muscular tonus, and a certain tension of the muscle and tendon, as well as a capability of free vibration of the tendon. The muscular tonus is maintained, in a reflex way, by the cord. The phenomenon is, therefore, affected by the condition of the cord, though it is not a true reflex act.

I will not occupy your time by giving the argument *pro* and *con* for either of these views. Neither can be said to be fully established, but that of Westphal appears to find most adherents at the present time. In either case it is true that, for a normal appearance of the phenomenon, a normal condition of the spinal centres and of the nerves emanating from them is necessary. Destruction of the lumbar portion of the cord, or of the nerves leading to or from it, will abolish the phenomenon.

The phenomenon gained its clinical significance when Westphal pointed out, as he did in his first publication, that it could be elicited in health, and that it was always absent in typical cases of locomotor ataxia. Its great diagnostic value is attached to the fact of its early disappearance in this disease, being, probably, often the first sign of disease. The phenomenon may also be abolished in anterior poliomyelitis, affecting the lumbar portion of the cord, and in neuritis, when the nerves issuing from the same part are affected, for in such instances the reflex loop is impaired upon whose integrity the normal manifestation of the phenomenon depends. It is also frequently abolished in cases of diabetes mellitus, and has been found temporarily absent in chronic alcoholism and subsequent to attacks of diphtheria.

Is its absence always of pathological import? The investigations which have been made to determine this question have differed considerably in their results. Berger examined 1409 healthy persons, including 900 soldiers, and failed to elicit the phenomenon in 22, or 1.56 per cent. of the cases. Eulenberg found it absent in 4.8 per cent. of healthy adults examined by him, and in over 5 per cent. of children. Bloch⁴ examined 694 school children and found it absent in five of them. While these figures represent the phenomena as absent in a small, but still

respectable, number of apparently healthy persons, Pelizaens⁵ examined 2403 school children, and though he failed to elicit the phenomenon at first in six, finally succeeded in eliciting it in all but one, in whom it was subsequently obtained by a special manner of examination;⁶ and Jendrassik⁷ examined 1000 persons, chiefly adults, with no manifest disease of the nervous system, and only failed to elicit the phenomenon in a single person, that being a case of diabetes mellitus.

In view of the considerable difference of the results of these various observers, I have deemed the matter of sufficient importance to institute further examination in this direction, the report of which is embodied in this paper. Not all the persons were examined by myself; many were examined by medical friends at my request, especially the insane cases. For the latter I am indebted to Dr. Richardson, of the Athens Asylum, Drs. Clara M. Ellsbury, Frank B. Wynn, and Crumley, of the Dayton Asylum, Dr. F. W. Harmon, of Longview Asylum, and Dr. O. Everts, of the Cincinnati Sanitarium. But in all instances, excepting those at Athens and two other insane subjects, I examined personally the individuals in whom the phenomenon was said to be absent.

The whole number examined was 2106, of whom all were adults. Of these, 1174 were inmates of insane asylums. Of the 932 remaining, 100 were patients in the medical wards of the Cincinnati Hospitals, and the others were, chiefly, men in apparently good health, inmates of the work-house, old men's home, on the police force, etc. All examined were males, excepting 275 women in the Dayton Asylum, who were kindly examined by Dr. Clara M. Ellsbury. Of the 2106 persons the knee-phenomenon was missing in twenty-eight. Five of these had fully developed locomotor ataxia, twelve were still in the earlier stages of the same disease, while in the eleven remaining there were no other symptoms of disease of the cord.

We will speak of the cases of insanity separately, because, as Westphal has shown by the report of some cases with post-mortem examination,⁸ the absence of this phenomenon in such cases is in itself strong presumptive evidence of the existence of disease in the posterior column of the cord, and because of the special value of the absence of this phenomenon in diagnosing the form of insanity. I had been of the opinion from previous observations that, in obscure cases of mental disease, the absence of the knee-jerk should direct our attention toward general paralysis, and that it would have some weight in establishing the diagnosis of this disease. This opinion is supported, though not very strongly, by the results of these examinations.

Of the twenty-eight persons with abolished knee-jerk, twenty-three were cases of insanity, and of these ten were cases of general paralysis, two were still doubtful cases, perhaps general paralysis, and eleven had other forms of insanity, mostly dementia of

⁴ Ibid., XIV, 402.

⁵ Neurologisches Centralblatt, 1886, No. 3.

⁶ Ibid., 1885, No. 18.

⁷ Berlin kl. Woch., 1881, No. 1, and Archiv f. Psych. u. Nervenkrankheiten, xij, 772.

⁸ Ibid., XII, 471.

many years' duration. So only about half of the entire number are cases of general paralysis, but when it is considered that at the time there were only a few cases of general paralysis in the asylums beyond the number here included, while there were over 1100 with other forms of insanity, the significance of these figures becomes much greater. Its diagnostic value becomes still greater when another clinical manifestation is considered with it, that is, the condition of the pupils.

In both locomotor ataxia and general paralysis there are often peculiar changes in the pupils, termed the Argyle Robertson phenomenon, or reflectory rigidity; they do not contract when light is thrown into the eyes, but contract during the act of accommodation. Moeli, Thomsen and Siemerling⁸ found in 4000 insane persons 492 with rigidity of the pupils, 85 per cent. of whom had general paralysis.

Of my ten cases of general paralysis with absent knee-phenomenon, nine had pupil symptoms; of the two doubtful cases such symptoms were present in one, while they were only present in two of the other eleven patients.

If we can draw any conclusion from such a small number of observations we may safely say that, in an obscure case of mental disease, if the history would not oppose the diagnosis, the absence of the knee-phenomenon is some indication that the disease is general paralysis, and the additional presence of rigidity of the pupils makes such a diagnosis highly probable.

In the 932 non-insane persons there were five with abolished knee-phenomenon. Of these, two had other symptoms of locomotor ataxia; one was an old man of 94, with considerable degeneration of all the tissues, and only two were apparently healthy. One of these was a colored man of 39, who had had a venereal sore, and suffered occasionally with pains about his trunk of an aching character, but had no other symptoms and was apparently in perfect health. The second was a man of 25, who stated that he had never had venereal disease, and was apparently in perfect health. Both were inmates of the work-house. Thus, in 929 persons only two had no knee-phenomenon. It is possible that in these there is some incipient disease of the cord, but whether this be true or not the number is so insignificant that, especially when we compare the results here obtained with those of Jendressik, we may boldly state that the absence of the knee-phenomenon is almost a pathogenic sign of disease, that disease being usually sclerosis of the posterior columns of the cord, locomotor ataxia.

That the phenomenon is sometimes absent in other pathological conditions, scarcely detracts from its diagnostic value, for the other conditions can usually be distinguished. Anterior poliomyelitis can not be confounded with locomotor ataxia. Neuritis is often only a partial manifestation of locomotor ataxia. Diabetes mellitus and alcoholism scarcely need mention in this connection. Diphtheria occurs chiefly in children, where the question of locomotor ataxia scarcely arises; yet it might occasionally, in cases of

adults, be a source of confusion, as the knee-phenomenon is sometimes abolished without any diphtheritic paralysis, but it would reappear in time.

It does not appear to me that the phenomenon is as frequently abolished in diabetes mellitus as the results of some observers would lead us to infer. Rosenstein⁹ missed it in six of nine cases, and Bouchard¹⁰ in nineteen of sixty-six cases of diabetes mellitus. But I have recently had an opportunity to examine five cases, and found it present in every one of them. In one the phenomenon was very slight, but in this patient the presence of the peculiar lightning pains of locomotor ataxia, a considerable anæsthesia and greatly impaired gait make it very probable that there are structural changes in the cord.

The absence of the knee-phenomenon in chronic alcoholism is probably very rare. I examined 404 men in the work-house, many of whom are hard drinkers. I also examined quite a number of cases at the hospitals. In none of these was the phenomenon absent, although in two, at the Cincinnati Hospital, it was very difficult to elicit. It is said that in such cases the phenomenon is only temporarily abolished, and can be restored by the administration of strychnia, but this remedy has no such effect in locomotor ataxia. I have seen several cases of the latter disease, in consultation, in which strychnia had been administered, the knee-phenomenon, nevertheless, remaining absent.

We may then judge from the foregoing how significant is the absence of the knee-phenomenon, and how much it may aid us in diagnosing incipient locomotor ataxia. But in order that it should possess so much value, that it may not altogether mislead us, our examinations must be made carefully, and the phenomenon not pronounced to be absent when it can really be elicited. I have again and again had persons presented to me with the statement that in them the knee-jerk was absent, where I easily succeeded in eliciting it. Especially has this been true of physicians themselves, and in many instances it was with a sense of relief that they learned that their self-observations had been incorrect. Such errors are so common, and might be so misleading, that it is well to speak somewhat at length of the methods of examination.

The ordinary mode of examination, striking upon the *ligamentum patellæ*, while the subject is sitting with one knee crossed over the other, will suffice in most instances, for usually the phenomenon is easily elicited. But it is sometimes difficult to elicit, either because the subject can not altogether relax his muscles, or from mechanical difficulties, or from no assignable cause. Even in the same individual the phenomenon, while easy to get sometimes, may be very difficult to elicit at others. In such instances the individual should be seated on a table with the legs dangling, and the knee entirely bare, and then the patellæ tendon should be struck upon every part. The best instrument, in my experience, is the inner edge of the hand. In this manner the phenomenon can be elicited in the great majority of healthy persons. Perhaps the failures to be expected are prop-

⁸ Berlin. kl. Wochenschr., 1886, 37.

⁹ Ibid., 1885, 113.

erly represented by Berger's results, who failed to get the phenomenon in 1.5% per cent. of his cases.

But Jendrassik has quite recently suggested a method of examination which reduces this relatively large per centage to almost zero. This method enabled him to find the phenomenon in all of 1000 persons except one; it was the means of obtaining the phenomenon in the one child of the 2403 children examined by Pelizaeus, in whom it could not otherwise be obtained, and it enabled me to obtain the results reported in this paper. The method is as follows: The individual, seated as above, is requested to link the bent fingers of one hand into those of the other and pull energetically. During this effort the examiner strikes the patellar tendon. The effort heightens the muscular tonus, or increases the tension of the muscle and tendon, and makes the knee-jerk more marked. In sixteen of the 1000 examined by Jendrassik he was unable to obtain the phenomenon by the ordinary method, in fifteen of whom he easily obtained it by his own method. In my own examinations I succeeded in quite a number of instances in getting the knee-jerk with Jendrassik's method when I could not do so otherwise. Indeed, so striking was the difference in some instances that it occurred to me that this method might enable us to get the phenomenon in locomotor ataxia. For that reason I again examined a number of cases of that disease in which I had previously pronounced it absent, but in all of them, notwithstanding Jendrassik's method, the phenomenon still remained absent.

Jendrassik states that in his 999 cases he obtained the knee-jerk easily by his method. This was not my own experience. In some instances it was very slight and obtained with difficulty. Whether such a result always has a pathological significance I can not say. In some of these instances the persons examined seemed to be in perfect health; in others there were other manifestations of disease. The latter is especially true of some cases in my case book, and not included in this report, in some of whom there is undoubted locomotor ataxia, in its early stages; in others there is some reason for suspecting the presence of the disease.

Is the knee-jerk always absent in locomotor ataxia? Westphal stated in his earliest publication that it is always absent in typical cases, at least when the disease involves the lumbar portion of the cord. As the disease generally begins in this part, the loss of the phenomenon is usually its first manifestation. Since Westphal's publication, various cases have been reported in which the phenomenon remained present. Hirt¹⁰ recently reported a case in which the phenomenon remained during life, and the post-mortem examination revealed the characteristic changes in the cord; but he was unable to state from the examination of the fresh specimen whether those parts were affected, whose disease Westphal believes to be accountable for the absence of this phenomenon. Westphal¹¹ has shown in a case of his own that a skin reflex action may sometimes simulate the patellar tendon reflex, and cause us to suppose the latter is

present when it is really absent; but he also has reported two cases in which the phenomenon was still present after the ataxia gait was fully developed, and only disappeared in a very late stage of the disease.¹² But such instances are rare, so rare as to very little invalidate the worth of the phenomenon. I have seen quite a number of cases of this disease, and in only one of them was the knee-jerk in its normal condition. This case (which I reported in the *Journal of Mental and Nervous Diseases*, 1884), was not one of typical locomotor ataxia. There was considerable muscular atrophy, and the whole appearance of the case was that of a diffused myelitis, rather than of a systematic disease of the posterior column. In several other cases now under observation the phenomenon can be obtained slightly on one side, but in none of these has the disease advanced to the stage of ataxia.

In conclusion, we may summarize our results by saying that if, in any person, with no other assignable cause, we find an entire absence of the knee-phenomenon, we should look for other symptoms of locomotor ataxia, and if any other symptoms are presented the diagnosis is assured. But before pronouncing it absent the patient should be carefully examined, especially by the aid of Jendrassik's method. In some instances it would even be well to examine several times before pronouncing a final verdict, partly because there is sometimes such difference in the degree of response at different times in the same individual, partly because an unrecognized attack of diphtheria, or the like, may have caused its temporary disappearance.

It was my intention to speak also of the significance of excessive tendon reflexes, but on account of the length the paper has already assumed, I must forego further consideration of the subject.

In addition to those already mentioned in this paper, I am indebted to Dr. Kiely, Physician to the Work-house, Drs. Armstrong, Isham, and Dun, who are at present examining the city police, and Dr. B. F. Clark, Surgeon to the C., H. & D. R. R. Co., for valuable assistance in collecting the material here utilized.

INTUBATION OF THE LARYNX FOR DIPHTHERITIC CROUP.¹

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Some time ago I reported two cases of intubation of the larynx in children less than 3 years of age, both of which proved very satisfactory at first, but both died within two days. Shortly after that report I introduced the laryngeal tube in a child about 5½ years of age. There was immediate relief from dyspnea; the child expressed herself as thankful that it had been done; the friends and the attending physician (Dr. Creighton) were all much pleased, but the

¹⁰ Ibid., 1886, 153.

¹¹ Archiv. f. Psychiat. u. Nervenk., XII, 798.

¹² Neurologisches Centralblatt, 1886, No. 6.

¹ Presented to the Chicago Medical Society, June 21, 1886.