femora and least in the bones of the upper extremities. So softened was the osseous tissue, that a fine section was cut from the end of the tibia, and the patella was cut in halves with the scalpel, without the slightest resistance. The lower portion of the femur was so reduced in thickness as to be quite translucent. The brain, beyond some slight convolitional atrophy, showed no gross change. The spinal cord was smaller than usual. Prepared sections showed, in the brain, some thickening and irregularity in the course of the entering cortical vessels, while those deeper down were frequently seen surrounded with the remains of yellow exudation, or dotted with granules and nuclei, while irregularly edged spaces indicated where others had fallen out in the preparation of the specimen; the nerve-cells were more or less affected with pigmentary degeneration; some still preserved their outlines, though bereft of their branching processes and granular; while, again, large oval and but slightly coloured naked nuclei, surrounded by clear spaces, remained to testify to their once having formed part of now destroyed nerve-cells. The neuroglia superficially was coarse, and sparsely dotted here and there with fine brownish granules of hæmatoidin and leucocytes. In the spinal cord, the vessels were thickened; relatively more so than those in the brain. Throughout the cervical and dorsal regions, the nerve-cells of the anterior cornua were affected in different degrees, and unequally at each side. In several of the cervical sections, the majority of the cells had wellnigh disappeared or remained as granular rounded masses; in others, the latter condition predominated; while in the lumbar and sacral sections, beyond some yellow pigmentation and the occasional absence of the processes, the cells were intact. In several sections from the lower cervical and middle dorsal regions, the grey matter forming the junction between the anterior and posterior cornua was softened, and where frayed out presented a fibrillar appearance. The central canal was, throughout the entire length of the cord, completely obliterated by an agglomerated mass of nuclei (this condition is very frequently met with in many cords, and little if any pathological importance can be attached to it). The white columns were somewhat coarse, but presented no definite histological lesion. Sections of the right median nerve showed the intrafunicular connective tissue somewhat coarse, but the nerve-tissues, beyond being here and there diminished in size, presented no alterations of a morbid character. Similar examination of the right sciatic nerve revealed advanced degenerative lesions; to the naked eye, the different funiculi appeared widely separated from each other; and on staining with carmine, the intervening tissue became delicately coloured, and was found to consist of tracts of fine areolar tissue and clusters of adipose cells, with wide-mouthed vessels running through it, the walls of which were sclerosed and densely coloured; the funicular sheaths were much thickened and fibroid; and the funiculi themselves, which were in parts reduced in size, had shrunk from their sheaths. The nerve-tubuli composing the funiculi were for the most part normal in appearance, though many must have shrunk or disappeared to account for the reduction in size of the funiculi. The muscular tissue from the right biceps was but little altered, some of the fibres being here and there granular, and losing their striation; this condition was far advanced in the muscular tissue of the right semimembranosus, the fibres being reduced to granular masses, still preserving their outline, scarcely if at all coloured by carmine, while almost all trace of transverse striation had been lost. The fibres were separated from each other, and surrounded by adipose tissue, which gave to a piece of the muscle a greyish yellow appearance, and rendered it flabby and gelatinous and difficult to harden, while the biceps muscle quite retained its normal naked eye appearance, and this condition of the muscles thus corresponded, it will be seen, in the same ratio with the nerves and bones in the same situations.

Disease of the bones has been, as I have mentioned at the outset, now for a considerable period recognised as an accompaniment or complication of insanity. In the year 1842, Dr. Davey detected the existence of osteomalacia in those dying insane; and in a number of the *Medical Times* for that year, describes a case, occurring in a female patient, where six spontaneous fractures of the long bones had taken place; the same physician, in 1857, stated that he had met with six cases amongst the patients dying at Hanwell and Colney Hatch; and further, that the greater number of these cases were affected with general paralytic insanity. Drs. Clouston, Rogers, Brown, and Sankey have more recently (1870) called attention to a similar condition, directing attention especially to its presence in the ribs, thus rendering them excessively prone to fracture, and causing censure to be unjustly cast on attendants or others who may be in charge of such patients, and who may be blamed for using unnecessary violence where, in reality, the injuries received were, if not wholly, at least in great part, the result of disease and not external force. More recently still, Dr. Morselli of Florence has, in an able article in the *Revista Sperimentale di Freniatria e di Medicina Legale*, reviewed the entire literature of the subject, recording at the

same time five cases coming under his own observation in which fractures of the ribs had occurred or were found *post mortem*. Dr. Morselli states that his conclusions have led him to believe that there is, in insanity, a tendency to softening and atrophy of the cortical part of the bones, with hypertrophy of the medullary canals and fatty degeneration of the medulla, and that this condition is usually not recognisable during life. To the direct relation between morbid states of the osseous system and definitely diseased conditions of the nervous centres, much interest has attached since attention was directed to their causal connection by M. Charcot. At the Manchester Meeting of the Association, that eminent pathologist exhibited specimens of the bones from a case of locomotor ataxy; in these, however, the heads of the long bones were deprived of their cartilages, and worn away and eroded, but not softened; while in that condition with which we are now engaged no external deformity had become evident, the morbid alteration being confined to the degeneration and semiliquefaction of internal portions of the bones, leaving their surfaces unaffected. Hence it becomes a question whether there be any connection as regards causation or dependence on primary nervous lesions between the two conditions. M. Charcot is of opinion that the deformities of the articular ends of the bones in ataxy are due to a lesion of the anterior cornua of the grey matter of the spinal cord consisting in a disappearance or diminution in the numbers of the motor ganglion cells there situated. In the case I have just recorded, microscopical examination revealed the existence of a lesion of this nature, though not to such an extent; and further, there were accompanying it muscular atrophy and degeneration and atrophic changes in the peripheral nerves, disturbances of nutrition which are known to be consecutive to destruction or degeneration of the motor ganglion cells of the cord.

Looking, however, to the facts of the case, it may be asked if these different lesions, which microscopical examination has revealed, are not the result, together with the osteomalacia, of the functional inertia to which the members were condemned from the long-continued disuse. In M. Charcot's ataxic cases, a certain degree of motility had been preserved; hence, this argument did not there hold good to such an extent as it does in the present instance, where the immobility, at least as regards the lower extremities, was complete. That this functional inertia played some part in the causation of the degeneration of the osseous tissue is, I think, rendered highly probable when the correspondence between the distribution of the latter and the inutility of the limbs is taken into consideration. The bone-softening, as can be seen in the specimens, is much farther advanced in the lower limbs, which were perfectly useless, than in the upper, which still retained the power of movement; and, further, the fact that the spinal column, which rarely moved, partook in the disease adds weight to this; while the same consideration applies to the muscles and peripheral nerves, which were affected in a like degree to the bones. Further, I have seen many cases where the destruction of the motor ganglion-cells had reached to a greater degree without any evidence of this having led to degeneration of the bones. Against such a view, however, it must be borne in mind that of all the many cases of permanent loss of motor power from cerebral hæmorrhage or other causes, spontaneous fractures of the limbs or breaks from slight injuries are in the highest degree infrequent; and here, of course, the same functional inertia is in existence; hence it is possible, and even probable, that in such cases as I have been considering, the primary nervous disease may have played a causal part in the alteration of the osseous structure, though as to whether this depended in any way on the histological lesion in the spinal cord, or had its origin in a defective nerve-nutrition generally, is by no means easy to say. Further, I should like to have the opinion of those around me, as to whether the loss of virile power could have had any influence in the induction of the lesions which these bones exhibit.

In osteomalacia, lactic acid has been found in the medulla of the hollow bones, and Billroth thinks it highly probable that the bone is dissolved by this acid, the lime passing into the blood, and being often excreted in large amount in the urine as oxalate of lime; but the causes which influence this production are as yet involved in obscurity.

A CASE OF HEREDITARY TENDENCY TO FRAGILITAS OSSIUM.

By R. W. GREENISH, M.R.C.S.

FROM the scanty literature of this subject, so little attention appears to have been given to it, that I am induced to record the following case, which came under my notice during my residence as assistant house-surgeon to the Huddersfield Infirmary, for permission to publish which I am indebted to Messrs. S. Knaggs and T. Brewer, surgeons to the institution.

J. G., aged 18, was admitted into the infirmary on August 23rd, 1878, with an ununited fracture of the left thigh. The following particulars were obtained from him. At the age of twelve, he broke his right thigh, and some years afterwards the fracture was repeated; in both instances uniting in the normal time. Both forearms had been broken, each three times, but he was unable to remember at what date. When very young, he broke his left thigh, which united and remained so till three years ago, when it was again broken, and this time did not unite till the expiration of a year. In a few months subsequently, it loosened again, but reunited shortly afterwards. Six months ago, it again broke, and it had remained ununited till his admission. Beyond this, he had never had any illness of importance. He had two sisters and two brothers; of the latter, one broke his arm and leg at the same time from a severe machinery accident. His father broke his thigh once. His grandfather broke his thigh several times, and was a cripple through the frequency of the fractures; he is said to have died from cancer.

The boy was somewhat stout, but flabby, pale, and very dull in intellect. There had been a fracture of the right thigh, which was firmly united. There was no evidence of fracture in the upper extremities. In the left femur, there had been a fracture a little above the middle; the fragments overlapped one another; no movement could be obtained between them, but the attempt gave rise to great pain; as far as could be made out, there was no bony union. As there was great wasting of the muscles of that limb, galvanism was resorted to, from which he seemed much improved, and was sent to a convalescent home.

On September 2nd, 1879, he was readmitted to the infirmary, with the left thigh again broken, and, so far as could be made out, in the same place. He stated that, while at the home, he was obliged to use crutches, but could put his foot to the ground. He was treated with long splint, weight-extension, and a gum and chalk bandage over the seat of fracture. He was discharged with the fractured bone quite firm.

R. G., aged 17, cousin to the above, was admitted on August 2nd, 1879, with fracture of the left femur. He stated that, ten years ago, he broke his left thigh; six years ago, his forearm (probably Colles's fracture); and three years ago, his forearm, about the middle. He had three brothers; two of these had had four fractures each, the other had had eight. His only living sister had been exempt from any. He had four other sisters, one of whom had three fractures. His father had had two fractures. Most of these occurred from slight accidents. The patient himself had enlarged submaxillary glands, but otherwise seemed quite healthy. The fracture united firmly.

In this family, the grandfather was an invalid from numerous fractures. He had three sons: one had one fracture; and of his children, one had thirteen and another two. His next son had two fractures; and of his children, one had four, another four, another eight, another four, and one that died three. The third son and two daughters had no fractures, nor had their descendants, as far as could be made out.

This case shows an hereditary tendency more decidedly than any case I have been able to find, and also very strikingly the early age at which it commences, the eldest in the latter case being only seventeen. Several other cases of fragilitas ossium are on record: thus Holmes, in his *System of Surgery*, quotes from Gibson (*Institute of Surgery*, vol. i) a youth of nineteen who had twenty-four fractures; and from Esquirol (*Practical Treatise on Fractures*) another with as many as two hundred. Earle (*St. Bartholomew's Hospital Reports*) records a case of eight fractures in a child of ten years; and Fleming (*Edinburgh Medical Journal*, vol. viii) fifty-three between the age of one and a half years and twenty-four. In all of these cases, union took place rapidly. Stanley (*Diseases of Bones*), however, quotes a case of five fractures, with subsequent yielding of callus, and the patient had to be discharged incurable. Savory also mentions a case in which yielding of the callus took place. In all of these cases, only one member of the family was subject to the disease in question; but there are a few on record in which it seems to have been hereditary. Thus Arnott (*Medical Gazette*, June 1833) mentions a case of a child, fourteen years old, who had thirty-one fractures; and her sister, six years old, with nine. Jones of Louisiana (*BRITISH MEDICAL JOURNAL*, January 1870) records a case of a mulatto that had fifty fractures, with a cousin affected in the same way; and Stanley (*Diseases of Bones*) quotes Dr. Pauli of Leipzig, with a case that ran through three generations, but no particulars are given.

This disease seems to be quite apart from the more malignant one generally termed "mollities ossium"; for, while the latter occurs almost without exception after puberty, the former has in nearly every instance begun before that age, and often very early in life. In mollities ossium, too, the fracture rarely united; while, in fragilitas ossium, non-union is the exception—in fact (as Holmes has pointed out) it very often occurs more readily than is normal. Another form of tendency to fracture has been shown to occur in asylums; but here there has been a marked

wasting of the bone tissue, and union is very rare. As regards the case I have given, there was no cause for the predisposition that I could find. Fractures were common in the Huddersfield district: thus, in twelve months, there were one hundred and thirty-three fractures attended at the infirmary, against fourteen dislocations, or 9.5 to 1.

AN ACCOUNT OF THE MICROSCOPICAL APPEARANCES IN A CASE OF ATHETOSIS.

By FLETCHER BEACH, M.B., M.R.C.P.,

Medical Superintendent of the Darenth Asylum.

SOME excellent microscopical drawings of the affected parts of the brain in the third case described in my recent paper (June 12th, p. 884), were made for me by my friend Mr. Marsh, of the Lincoln County Asylum. On examining them with No. 7 Hartnack, the chief changes noticed were, 1, great increase in the number of vessels; 2, distension of many of these vessels; 3, extensive infiltration of the tissue with leucocytes, especially in the perivascular sheaths of the vessels.

These changes were seen especially in the grey matter of the right inferior parietal lobule and first temporo-sphenoidal convolution. Examination of this part showed great infiltration of the white and especially the grey matter with leucocytes. The perivascular sheaths of all the vessels presented these bodies, which in some places formed a single layer, in others many layers, being in such quantity as to compress the vessel they surrounded. Generally they were rounded, but, where subjected to pressure, they assumed an oval or angular appearance. In several places, the vessels were much distended, and their sheaths filled with leucocytes, while further on the walls were absolutely crammed with these bodies, exerting pressure on the vessel, and reducing its lumen considerably. In two places, the leucocytes had escaped into the surrounding tissue. Here and there they were collected into dense masses, forming so-called "miliary abscesses". Very often the leucocytes were in such numbers as to entirely obscure the vessel, so that its course and distribution could only be seen by the direction taken by them. Many of the vessels contained clot, and in a few cases mixed with it were rounded bodies, which stained with carmine, showing their recent character. In some of the vessels, the blood-corpuscles had undergone a granular change, and in two specimens the clot appeared dark in the centre, the surrounding portions shading off gradually. In one vessel, the clot presented curved pressure-lines, with their long axes across the vessel, described by Dr. Gowers as being due to exposure to pressure by the blood-current. Many of the vessels were surrounded by spaces. The nerve-cells generally were unaltered. The grey matter of the left inferior parietal lobule and first temporo-sphenoidal convolution, and that of the left occipital convolution, showed excess of leucocytes, but no great excess of vessels. A few of these presented perivascular sheaths filled with leucocytes. In order to be certain as to the amount of change present, these sections were examined side by side with some from a man killed by an accident. The appearances described are very similar to those present in the medulla from a case of hydrophobia, exhibited a few years ago by Dr. Gowers at the Pathological Society. That the changes should be most marked in the right side of the brain, is no more than might be expected from the symptoms existing during the life of the patient.

EXPERIMENTS ON LIVING ANIMALS.—The report from the inspectors of the number of experiments performed on living animals during the year 1879 under licences granted under the Act 39 and 40 Vic., cap. 77, distinguishing painless from painful experiments, issued last week, shows that the total number of experiments performed under the licences and certificates was about 270. Dr. Busk says: "The number of experiments in which there is reason to believe that any material suffering was caused appears, from the statements received from the operators themselves, and from my own consideration of the nature and probable effects, as regards the production of pain, of the experiments under the certificates to have been about twenty-five. Of these, fifteen were cases in which disease followed the inoculation of infectious matter, but in which no painful operation was performed; and ten were experiments upon as many frogs, in which an incision of the skin was required for the introduction beneath it of a medical substance. In none of the other experiments under these certificates, as I am assured by the experimenters, was any appreciable suffering inflicted. As in all other experiments except those done under the above certificates, the whole proceeding is conducted whilst the animal is in an unconscious condition; no pain is inflicted if the provisions of the Act are duly observed, and this there is no reason to suppose is not in all cases carefully attended to."