Critical Digests.

RECENT OBSERVATIONS ON PROGRESSIVE MUSCULAR ATROPHY.

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THE great impulse given to the study of the disease, or rather group of diseases, known as Progressive Muscular Atrophy, by the researches of Erb, Charcot, Landouzy and Déjérine, Schultze and others, renders a review of the subject a desideratum. Such a review to date appeared in 1885, from the able pen of M. Charcot, but since then further advances have been made. The object of the present article is rather to place before the reader the most recent views of authors on the subject, than to criticise those views. It will be seen that recent anatomical observations tend rather to upset our preconceived ideas as to the causation of the disease. For instance, we have been taught to regard the existence of atrophy, commencing in the small hand-muscles, accompanied by fibrillar tremors, and late reaction of degeneration in affected muscles, as pointing certainly to some lesion of the cells in the grey matter of the anterior cornua. On the other hand, in an undoubted myopathy, such as pseudo-hypertrophic muscular paralysis, so called, we have never expected to find either fibrillar tremor or reaction of degeneration; and it is on those signs that diagnosis has hitherto been largely based. As will be seen, when studying Schultze's latest observation, we can no longer, apparently, rely with certainty upon these signs, and unfortunately we have not yet any to take their place.

There have always been authors who have maintained that all cases of idiopathic muscular atrophy are due to primary disease of the muscles, the nervous changes being, according to them, secondary. Such is the opinion of Friedreich, Schultze, Lichtheim, Liebermeister, and others. A fatal objection to the universal adoption of this theory is the fact, that we may have the most advanced atrophy of the muscles, with an absolutely normal condition of the nervous system.

It would appear to the impartial student that there may exist, under the comprehensive head of progressive muscular atrophy, a number of forms having the common characteristic of atrophy, but due to various causes. Thus we may have atrophies of *myelopathic* origin, due to disease of the anterior horns of the

spinal grey matter; or we may have *myopathic* atrophies, in which the seat of disease lies *solely* in the muscles themselves; or lastly, we may have *neuropathic* atrophies, in which we must look for the lesion in the *nerves* themselves. The cases hitherto recorded may most of them be classed under these three heads, but it must be admitted that there are still many anomalous cases.

There has not been added much that is new concerning myelopathies; but the recognition of the two other groups above mentioned has had the effect of considerably limiting their number, and at the same time of making their symptomatology more sharply defined. Thus the *thenar form* has become the type of a myelopathic atrophy, and though apparently in some true myelopathies the atrophy may commence in other than the hand-muscles, the number of such atypical cases is becoming less and less. The commencement of the disease in the small hand-muscles, at first sight so difficult to understand, has had great light thrown upon it by the work of Ferrier and Yeo[1] on monkeys, by which it is shown that the small hand-muscles are connected with centres in the dorsal cord at about the level of the second dorsal roots. Beevor[2] has illustrated the clinical bearing of this in myelopathies. From these facts we may speak of the thenar type of progressive muscular atrophy as a poliomyelitis, attacking first the anterior grey cells in the region of the upper dorsal roots and spreading upwards and downwards from that focus. It is, however, highly probable that a simple protopathic lesion of the grey cells, uncomplicated by any affection of the white matter, is much rarer than is usually supposed. This is Schultze's[3] opinion, and he goes so far as to assert that only two such autopsies are as yet recorded, namely those of Charcot and Gombault,[4] and Pierret and Troisier.[5] It is a fact that in many recorded autopsies there is coincident affection of the white matter.

It is in the class of atrophies in which the seat of the disease lies wholly in the muscles themselves, that the most important advances have been made. One of the earliest recognised myopathies is pseudo-hypertrophic muscular paralysis. It is needless to dwell on the symptomatology of a disease so well known, but it will not be out of place to mention the grounds on which the diagnosis of a myopathy from a myelopathy has hitherto been based.

As a rule, *fibrillar tremors* are not present in myopathies, it is true that in Schultze's[6] case, to be mentioned more fully later on

[1] Ferrier and Yeo, 'Proc. Roy. Soc.,' 1881.
[2] Beevor, 'Med. Chr. Trans.,' 1885.
[3] Schultze, 'Ueber den mit Hypertrophie verbundenen Progressiven Muskelschwund,' etc.: Wiesbaden, 1886.
[4] Charcot et Gombault, referred to by Charcot in 'Maladies du Système nerveux,' t. ii., p. 206, 4e éd.
[5] Pierret et Troisier, "Note sur deux cas d'atroph. musc. progr." —'Arch. de Phys. norm. et path.,' 1875, p. 236.
[6] Op. cit.

they were noted at an early period of the disease; but this is very exceptional, and when these little tremors are present, we may, with tolerable certainty, exclude myopathy pure and simple.

Till quite lately, it was believed that reaction of degeneration in the atrophic muscles was a sign of some nervous lesion, central or peripheral, and that it was never to be found in simple affection of the muscles. This, however, can no longer be relied on, for Zimmerlin, Schultze, Landouzy and Déjérine have shown that it may be present in pure myopathies. *Hypertrophy* of certain muscles is very often present in myopathies, but has never been seen in myelopathies or neuropathies. Very important points in forming a diagnosis are, the age at onset, the point of attack, the existence or non-existence of heredity, which is very common in myopathies and neuropathies, but not in myelopathies.

A myopathy nearly allied to pseudo-hypertrophic paralysis is the so-called "Juvenile Form," first recognised by Erb in 1884.[1] This form seems to have obtained general acceptance as a distinct type. It differs from pseudo-hypertrophic paralysis in the fact that hypertrophy is a very subordinate feature, while atrophy is a prominent one; in fact, hypertrophy may be sometimes absent, or so slight as to escape observation. The disease begins in early adolescence, and there is a strong tendency to heredity. The muscles first affected are those of the shoulder-girdle. As a rule, degenerative electrical reactions are absent, but this is not invariable. Fibrillar tremors are conspicuous by their absence. Erb's description is based on the clinical observation of twenty cases. Lichtheim,[2] however, has recorded a case rather closely resembling Erb's, in which absolutely no disease of cord or nerves were found.

Schultze's[3] cases are very interesting. There is a marked heredity. Maternal grandfather and grandmother were cousins, but quite healthy; of their children, one son had muscular atrophy of some sort; a daughter, who was quite free from any nervous or muscular affection herself, and was married to a man equally healthy, had five sons, three of whom have muscular atrophy; one died, and an imperfect record is given of the other two. In both the disease began at about eight years. The elder, in whom the disease was less advanced than in the younger, presented the "clinical picture" of pseudo-hypertrophic paralysis, that is to say, the disease began in the calves, which were much hypertrophied. He had the characteristic gait, and difficulty in rising from the ground. But there was also atrophy of other muscles, particularly about the shoulders. The younger brother showed a much more wide-spread atrophy, but without any hypertrophy, and presented the appearance described by Erb.

[1] Erb, "Ueber die Juvenile Form der progressive Muskelatrophie."—'Deutsches Arch. für Klin. Med.' Bd. xxxiv., 1884.

[2] Lichtheim, "Progress. Muskelatroph. ohne Erkrankung der Vorderhörner des Rückenmarks."—'Arch. für Psychiatr.,' 1878, p. 521. Abstract in 'BRAIN,' Vol. II. p. 142.

[3] Schultze, "Hereditäre Muskelatrophie und Pseudohypertrophie der Muskeln."—'Neurolog. Centralblatt,' 1884, p. 529.

Zimmerlin[1] records two families affected with myo-atrophy, much resembling Erb's form, but in one case there was reaction of degeneration in several of the atrophied muscles, and in another there had been fibrillar tremors in the earliest stage of the disease.

Marina[2] gives two cases of what he considers the juvenile form, but without heredity or hypertrophy. In one of his cases there is a partial reaction of degeneration (KCC = ACC) in the deltoid. Marie and Guinon[3] endeavour to show the close connection between the various forms of myopathy. Their first case is one which resembles pseudo-hypertrophic paralysis, but has no marked atrophy of muscles, nor any hypertrophy; but there was progressive weakness of leg-muscles, with the characteristic gait. At the same time the face-muscles seem to have been affected. The second case is one of Erb's form, and the last two belong to the "infantile form," to be described later.

Erb[4] gives an account of a case which he claims to be of the "juvenile form," but in which the muscular affection made its appearance after a fall on the back.[5] He excised a piece of muscle from the deltoid, which was hypertrophied, and another piece from the biceps, which was much wasted. In the former he found the muscle-fibres to be nearly all increased in size, very few showing signs of atrophy. The nuclei were much increased in number round the fibres, and there was also an increase of connective tissue. The vessels were thickened and had more nuclei in their walls than normal. The broadened muscle fibres showed no signs of fatty or granular degeneration, but their striæ were rather faint. In the atrophied biceps what fibres there were left appeared to be hypertrophied, and there was the same increase of nuclei as in the deltoid.

A most important study of muscular wasting is that of Schultze,[6] to which we have already referred several times. The work is divided into two parts, the special and general. The special part relates to a case which was one reported by Friedreich in his monograph on Progressive Muscular Atrophy. The history extends over a period of twenty years. There was a general widespread atrophy of the muscles of the upper extremities, including those of the hands, but also hypertrophy of some of the leg-muscles. There was affection of the diaphragm, but no bulbar symptoms. When

[1] Zimmerlin, "Ueber hereditäre (familiäre) progress. Muskelatroph."—'Zeitschr. für Klin. Med.,' 1884, p. 15. Abstract in 'BRAIN,' Vol. VII. p. 285.

[2] Marina, "Uno studio sulle amiotrophie."—'Lo Sperimentale,' 1885.

[3] Marie et Guinon, "Contrib. à l'étude de quelques-unes des formes cliniques de la Myopathie progressive primitive."—'Rev. de Méd.' 1885, p. 794.

[4] Erb, "Muskelbefund bei der Juvenilen Form der Dystrophia Muscularis progressiva."—'Neurol. Centralbl.,' 1886, p. 287.

[5] It is difficult to understand the connection between traumatism and the consequent occurrence of myopathic atrophy and hypertrophy. That such a connection does exist is shown by Eulenburg's case, recorded in the 'Deutsche Med. Wochenschr.,' 1885, p. 177, in which marked hypertrophy of the lower extremities, among other symptoms, followed a fall on the back.

[6] Schultze, 'Ueber den mit Hypertrophie verbundenen Progressiven Muskelschwund und ähnliche Krankheitsformen.' Wiesbaden, 1886. Abstract in 'Neurol. Centralbl.,' 1887, p. 13.

seen by Friedreich, fibrillar tremors were noted in the upper limbs, but none have been seen since. Reaction of degeneration was found in some of the atrophied muscles, such as the left deltoid, thenar muscles, and some interossei. The physical signs here are more in favour of the diagnosis of a myelopathy than that of a myopathy, and yet the anatomical appearances show that the case belongs to the latter class. Schultze found the nervous system, central and peripheral, quite normal, even the small intra-muscular nerves. The small blood-vessels in the nerves showed thickening of the intima, and in the brachial plexus and median nerve they were quite obliterated. The author does not claim anything peculiar to the disease in the occluded vessels, which he regards as due to general endo-arteritis. In the muscles important changes were found. He begins his description with the microscopical appearance of a muscle which appeared quite healthy to the naked eye. The muscle fibres in transverse section appeared angular, some were hypertrophied, but most of them were natural in size. There was an increase of sarcolemma and muscle nuclei, but, as a rule, very little increase of interstitial connective tissue. There was some fatty infiltration in the interstices between the fibres. Here and there were what looked like giant cells filled with smaller cells. These were the remains of muscle fibres, in which the true muscle substance was invaded by the proliferated muscle and sarcolemma nuclei. In muscles showing the highest degree of atrophy, and in which the reaction of degeneration had been made out, large infiltration of fatty tissue was seen, with a number of broad connective tissue fibres, in the meshes of which lay groups of nuclei, indicating the position of destroyed nuclei fibres. In a longitudinal section these nuclei appeared as long rows parallel to one another, sometimes consisting of a chain of forty nuclei.

In some of the muscles, especially the deltoid, the muscle fibres were undergoing a process of vacuolisation. Some fibres presented a sieve-like appearance from the numbers of small vacuoles, others had one large vacuole in the centre.

Dreschfeld[1] gives the results of an autopsy on a case which he believes to be Erb's myopathy. The brain and spinal cord were perfectly normal, as also were the intra-muscular and large-nerves. The muscles showed simple atrophy of the fibres, with some increase of muscle nuclei.

Otto Buss[2] relates the case of two children, brother and sister, æt. 16 and 13 years, respectively. Father and mother are cousins. The author remarks that the boy has a stupid expression, but does not refer it to any affection of the facial muscles. Weakness was noticed first in the legs, æt. 10, but the shoulder girdle-muscles were soon found to waste. Hypertrophy was noted in part of the deltoid and triceps. No reaction of degeneration, or fibrillar

[1] Dreschfeld, "On some of the rarer forms of Muscular Atrophies."—'BRAIN,' July 1886.

[2] Otto Buss, "Zur Lehre von der Dystrophia muscularis progressiva."—'Berlin Klin. Wochenschr.' 1887, No. 4.

tremors. The girl showed a similar condition, but in a less degree. Some muscle was excised from the boy's biceps, and widening of the muscle fibres, together with increased sarcolemma nuclei, was noted. There was also increase of interstitial connective tissue.

Edgren[1] describes two cases, males, in whom the disease appeared at the ages of 16 and 22. They seem to belong to this type, but there was no heredity in either case.

This appears to be the best place to mention the conclusion of Roth,[2] based on autopsies of myopathies. He says that in excised portions of atrophied muscles he has long noticed that the individual fibres seem to end in long connective tissue fibres. This suggested to him the idea, that muscle fibres might atrophy in their length, perhaps, more than in their breadth. This, he maintains, is borne out by the clinical appearance of the atrophied muscles, the belly of the muscle becoming shorter and shorter. In one muscle that he examined, the zygomatic, he found that half the muscle consisted of tendinous fibrous material, the other half being natural. In a long muscle like the biceps, after suitable hardening processes a fibre could be stripped from one end to the other of the muscle, and then it was found that the part of it remaining of proper muscle tissue was only about 10–20 mm. long, while the rest was of pure fibrous tissue. He believes this to be peculiar to atrophies of myopathic origin.

Singer[3] gives an account of two complete cases, one of which belongs to this form, and the other to that of the type to be next described, showing how closely the two forms are allied. The first is that of a woman aged 34, single, with no heredity of a neurosis. The first symptoms were weakness of the lower extremities, with pseudohypertrophy of calves, and characteristic gait. This was followed by wasting of muscles generally. The shoulder girdle muscles were much atrophied, so also the upper arm muscles, but not the small hand muscles. No fibrillar tremors or reaction of degeneration.

Post-mortem.—The atrophied muscles showed general lipomatosis. There was some diminution in size of a small part of the lumbar grey matter on the left side, together with corresponding decrease in the number of ganglion cells, especially in the lateral bone, where on the right side there were twenty-six, and on the left three. Other nerves quite normal. The autological appearances of the muscles consist of increase in the interstitial connective tissue, splitting up of the fibres in a longitudinal direction, with also a tendency to split into plates horizontally, as occurs in every degeneration. The nerves were absolutely normal.

In the second case, the face muscles were affected on the left side, otherwise the case resembles the last, particularly in the

[1] Edgren, "Om den primära progressiva myopatin, etc."—'Nord. Med. Arkiv,' Bd. xix. Nr. 5.

[2] Roth, "Contribution à l'anatomie pathologique de l'atrophie musculaire progressive."—'Comptes Rendus de la Soc. de Biologie,' Dec. 17, 1886.

[3] Singer, "Zur Kenntniss der primären Myopathieen."—'Zeitschr. für Heilkunde,' Bd. viii. p. 229.

matter of the histological appearance of a piece of muscle excised for the purpose. Both these cases obviously are closely allied to pseudo-hypertrophic paralysis.

We now come to consider another distinct type of myopathy. Duchenne was well acquainted with a peculiar form of progressive muscular atrophy, in which the face muscles were early affected, and which so constantly appeared in childhood, that he called it the "Infantile form" of progressive muscular atrophy. The mode of attack is so characteristic, that instances of the disease may be traced in many of the descriptions of the earlier writers.

Landouzy and Déjérine[1] contribute a very valuable addition to our knowledge of this form. The first-named observer was so fortunate as to have been able to watch two brothers for a period of ten years.[2] In another family affected with the same disease, the authors were able to make a post-mortem examination on one of the members, by which it was established that the disease is purely myopathic, the nervous system, central and peripheral, being absolutely normal. In this disease there rarely if ever occurs any hypertrophy of muscles, atrophy is the predominant feature. The group of muscles first affected are those of expression; then soon follows atrophy of the shoulders and upper arms, the small hand-muscles being affected very late in the course of the disease. The muscles of the lower extremities may be affected sooner or later. As in the type last considered, fibrillar tremors are almost never present, and degenerative electrical reactions are rare. As the facial affection is peculiar, it will be well to describe it here. The forehead becomes smooth and quite devoid of wrinkles, even during vigorous alterations of expression, such as laughing and crying. Owing to wasting of the orbiculares palpebrarum the eyes are never quite closed, even during sleep. The lips are everted from wasting of the orbicularis oris, and the levatores labii superioris, but the zygomatics and risorius seem to escape, so that in laughing the mouth extends laterally (*rire en travers*), the upper half of the face not sharing in the change of expression. The muscles of mastication and deglutition escape entirely. The whole appearance is termed the "facies myopathica" by the authors.

In Remak's[3] case, which appeared at nearly the same time as Landouzy's preliminary communication, the face muscles were affected after the shoulders and upper-arm muscles. He considers it to be one of the juvenile type of Erb.

Mossdoff[4] records a similar case to Remak's, but with asymmetry

[1] Landouzy et Déjérine, "Myopathie atrophique progressive, sans Neuropathie."—'Rev. de Méd.,' Feb. 1885. A preliminary paper by Landouzy appeared in 'Comptes Rendus de la Soc. de Biol.,' 1884.

[2] Landouzy, "Deux cas de l'atrophie musculaire progressive de l'enfance."—'Comptes Rendus de la Soc. de Biol.,' 1874.

[3] Remak, "Ueber die gelegentliche Betheiligung der Gesichts-Musculatur bei der Juvenilen Form der progr. Muskelatrophie."—'Neurol. Centralbl.,' 1884, p. 337.

[4] Mossdorf, "Ein zweiter Fall von Betheiligung der Gesichts-Musculatur bei der Juvenilen Muskelatrophie."—'Neurol. Centralbl.,' 1885, p. 1.

of the facial affection. Both these cases correspond to the descriptions of Landouzy and Déjérine.

Charcot's[1] case illustrates well the facial affection in this disease. He insists strongly on the close analogy between the three forms of myopathy, pseudo-hypertrophic paralysis, Erb's form, and the form now under consideration.

Westphal's[2] third case is one of facial myopathy, in which there is a marked atrophic heredity, younger sister, father, and uncle.

Cenas and Douillet[3] record three cases in the same family, two brothers and sister; the eldest appears to be a case of the type now under consideration. The next was the sister, in whom the atrophy commenced in the thenar muscles of the right hand, and that after suffering for six months or more from severe neuralgic pains in the arm. She had previously, some six years before being seen, had suppurative synovitis of the right index finger. This may have been the determining cause of the atrophy, but however that may be, the case reads like one of the Aran-Duchenne type. The last case, another brother, presented the facial appearances of a myopathy, but fibrillar tremors were seen in some of the muscles. The existence in the same family of myopathy and myelopathy is very interesting, and would point to a possible common origin for both. In this connection may be mentioned Philip's[4] observations. Here we have a family of eight children, four of whom were affected with pseudo-hypertrophic paralysis of the most marked description. On the mother's side there were a cousin and an uncle "paralysed." The father's family history was good, but he himself suffered from a form of spastic paralysis, with wasting and contracture of muscles, which seems to be undoubtedly of spinal origin, but which had probably connection with an accident.

In Ladame's[5] case, the grandfather on the father's side was said to have died of muscular atrophy. The patient was a young man in whom the disease commenced at the age of twelve, after typhoid. The muscles first affected were those of the shoulder and upper extremities, the face muscles being attacked later. Leg muscles were much wasted, knee-jerk abolished. There was no hypertrophy, or reaction of degeneration.

Westphal[6] records three cases, mother, daughter, and mother's

[1] Charcot, "Révision Nosographique des Atrophies Musculaires progressives."—'Progrès Médical,' 1885.

[2] Westphal, 'Berlin Klin. Wochenschr.,' 1885, p. 617.

[3] Cenas et Douillet, "Deux cas de myopathie atrophique, type Landouzy-Déjérine, et un cas d'atrophie musculaire, type Aran-Duchenne, dans la même famille."—'Loire médicale,' 1885, Nos. 7, 8.

[4] Philip, "Primary Spastic Paralysis, and Pseudo-hypertrophic Paralysis in different members of the same Family, with probable Heredity in both."—'BRAIN,' Vol. VIII. p. 520.

[5] Ladame, "Contribution à l'étude de la myopathie atrophique progressive."—'Rev. de Méd.,' 1886, p. 817.

[6] Westphal, "Ueber einige Fälle von progressive Muskelatrophie mit Betheiligung der Gesichtsmuskeln."—'Charité Annalen,' xi., 1886. Abstract in 'Neurol. Centralbl.,' Jan. 1887.

sister, evidently of this type of myopathy. The face muscles were markedly affected in all.

Landouzy and Déjérine[1] add six more cases to the number.

Obs. I. is a very characteristic case of the disease. The facial peculiarities with atrophy of the shoulder muscles existed in the mother, the maternal grandmother, also in the younger brother.

Obs. II., a young woman, æt. 27, had the "facies myopathica" well-marked, but there was no heredity, no fibrillar tremors, or hypertrophy; but there was reaction of degeneration in the orbicularis oris, and the flexors of the left forearm. The interest in Obs. III. lies in the fact that his brother was seen, described, and photographed by Duchenne in 1872, as an instance of the infantile form of progressive muscular atrophy. In Obs. IV. the face muscles were affected late in the disease, and degenerative reactions were found in several muscles. Obs. VI. was one of the scapulo-humeral type, but without the facial characteristics. The author made a post-mortem examination on this case, and found that the nervous system, central and peripheral, was perfectly normal. In the muscles they found appearances closely resembling those described by Schlutze (op. cit.). They consider these appearances to be due to an "irritative myositis."

Kreske[2] records a typical case of this disease, the facial symptoms dating from three years old. No hypertrophy, or reaction of degeneration.

From the foregoing cases and opinions of writers, it is easy to see that a very close analogy exists between the three myopathies, pseudo-hypertrophic paralysis, the "Juvenile form," and the "Infantile form." The first and third are clinically very unlike each other, but the second stands as a transition form between the two. For instance, hypertrophy is the predominant feature in the first, a very subordinate one in the second, and absent in the third. The second and third may so resemble one another as to be undistinguishable but for the facial symptoms in the latter. All three are diseases of youth, and all are very strongly open to hereditary influence. As far as they have been yet studied, the same essential morbid processes are at the seat of each. And yet with all these points of resemblance, they are still distinct nosological types. It is to be hoped that in the near future they may receive some less clumsy and misleading names than they do at present; the name "facio-scapulo-humeral type of myopathy," suggested for the last by the French authors, scarcely recommends itself either on the score of elegance or brevity.

Among the hereditary forms of progressive muscular atrophy, it has long been noticed that the disease may commence in the

[1] Landouzy et Déjérine, "Nouvelles recherches cliniques et anatomo-pathologiques sur la myopathie atrophique progressive."—'Rev. de. Méd.,' 1886, p. 977. Abstract in present No. of 'BRAIN.'

[2] Kreske, "Ueber die myopathische Form der progressive Muskelatrophie Betheiligung der Gesichtsmuskeln."—'Münchener Med. Wochenschr.,' No. 15, 1886. Abstract in 'Neurol. Centralbl.' 1886, p. 302.

lower extremities. This has been observed by Bamberger,[1] Friedreich and Leyden. It must be remembered that pseudo-hypertrophic paralysis generally commences in that way, but the form now to be considered has no relation to that disease at all. This form was recognised as a distinct type by Charcot and Marie[2] in February 1886, and almost at the same time, and quite independently, by the writer of this review.[3] The latter proposed for it the provisional name of the "peroneal type of progressive muscular atrophy," because though it may attack any group of the lower leg muscles first, yet it seems to commence oftener in the peroneal group than in any other.

In this form heredity is a marked feature; the disease generally makes its appearance in childhood. Though the leg muscles are first affected, Charcot and Marie notice that the small hand-muscles are nearly certain to be affected sooner or later. A very common early symptom is the appearance of talipes varus, due simply to loss of power in the peronei, not to contraction of opposing muscles; this talipes is very gradual and progressive in its development, unlike that due to infantile paralysis. The affected limbs are cold, and often tend to become livid from disturbance of vaso-motor influence. Cramps and pains in the limbs are of frequent occurrence. Fibrillar tremors may or may not be present. Reaction of degeneration, as a rule, makes its appearance sooner or later. In the thesis above mentioned, the writer has collected some twenty recorded cases from various sources, which appear to be illustrations of this type. Among these are accounts of four post-mortems by Virchow,[4] Oppenheimer,[5] and Friedreich,[6] which show that disease of the cord is absent in two, and in the other two what disease there is, is probably secondary, being situated in the posterior columns. On the other hand, in three of these autopsies was found a well-marked interstitial neuritis affecting the nerves supplying the atrophied muscles. It is therefore probable that this type is a true *neuropathy*, using the term neuropathy in its restricted sense.

Among the later recorded cases which appear to belong to this form are those of Osler, Schultze, Ormerod, and Charcot and Marie.

In Osler's[7] case heredity is remarkably shown, and can be traced backwards through three generations. The disease began unusually late in life, æt. 47, but the symptoms seem fairly

[1] Bamberger, "Bemerkungen über progr. Muskelatroph."—'Oesterr. Ztg. für prakt. Heilk.,' No. 7, 1860. Abstracts in Canstatt's Jahresb., 1860, p. 88.

[2] Charcot et Marie, "Sur une forme particulière d'atrophie musculaire progressive," etc.—'Rev. de Méd.,' 1886, p. 97.

[3] Tooth, "The peroneal type of progressive muscular atrophy." Graduation Thesis, M.D. Cambridge, 1886.

[4] Virchow, "Ein Fall von progr. Muskelatrophie."—'Virch. Arch.,' 1855.

[5] Oppenheimer, "Ueber progr. fettige Muskelentartung." Heidelberg, 1885. Abstract in Canstatt's Jahresb., 1855.

[6] Friedreich, "Ueber progr. Muskelatroph.," 1873. Cases I. and II.

[7] "On Heredity in Progress. Musc. Atroph., as illustrated in the Farr family of Vermont."—'Arch. of Med., N.Y.,' 1880.

characteristic. Schultze's[1] cases are those of two sisters and a brother, æt. 3, 5, and 9 years respectively. In them the disease commenced in the peronei, at 8 years, leading to very early and gradual appearance of talipes varus. In the eldest the thenar muscles were affected early.

There were no fibrillar tremors, no pains along nerves or in muscles, but complete reaction of degeneration in many of the muscles. Schultze himself considers the disease to be essentially due to a peripheral lesion. That it is not an ordinary neuritis would seem to be suggested by the collateral heredity.

Of Ormerod's[2] cases, two, a brother and sister, were affected with atrophy, and contraction of the peroneal and calf muscles, soon after measles; the hand muscles were attacked about four years later. There was reaction of degeneration in some of the muscles, but no fibrillar tremors. A very interesting fact concerning them is that the father has had atrophy of the right peroneal and calf muscles since three years old. He has been told that he had measles badly when he was a year old. The atrophic condition has not progressed in his case.

Charcot and Marie (op. cit.) contribute five cases, two of which are brothers. In all, the disease commenced in the leg muscles; peronei or calf, leading three cases to talipes. At a time varying from two to five years after, the hand-muscles were attacked. There was reaction of degeneration of some of the muscles in three of the cases, and fibrillar tremors in all. Cramps of the muscles were very common.

This form of muscular atrophy requires much more attention than it has yet received, and post-mortem examinations are particularly needed.

Seppili[3] tabulates amyotrophies as follows:

A. *Neuropathic.*—1. Peripheral (toxic, infectious). 2. Central (myelopathies). *a.* Progressive muscular atrophy. *b.* Amyotrophic lateral sclerosis. *c.* Deuteropathic spinal amyotrophies (from extension of disease into anterior horns).

B. *Myopathic.*—Progressive muscular dystrophy, or progressive primary myopathy. *a.* Infantile progressive muscular atrophy. *b.* Erb's juvenile form of muscular atrophy. *c.* Muscular pseudo-hypertrophy. *d.* Leyden's hereditary muscular atrophy. *e.* Transitional forms.

[1] Schultze, "Ueber eine eigenthümliche progress. atroph. Paral. bei mehren Kindern derselben Familie."—'Berlin. Klin. Wochenschr.,' No. 41, 1884.

[2] Ormerod, "Muscular Atrophy after Measles in three members of a Family."—'BRAIN,' Vol. VII.

[3] Riv. Sper. di Fren., p. 120, 1887.