Annals of Neurological Surgery

Research Article
Published: 21 May, 2018

About Nosological Place of the Facioscapuloperoneal (The Same Disease as the Facio-Scapulo-Limb, Type 2) Autosomal Dominant Muscular Dystrophy. Historical, Clinical and Molecular Genetic Study

Kazakov V[1,2], Skorometz A[1], Rudenko D[1,2], Kolynin V[1,2] and Stuchevskaya T[1,2]*

[1]Department of Neurology, First Pavlov State Medical University of St. Petersburg, Russia

[2]University City Hospital №2, St. Petersburg, Russia

Abstract

Duchenne in 1855 described the gradually descending variety of FSHD with extension of the weakness from the facial, shoulder girdle and upper arm muscles with subsequent involvement of the trunk, pelvic girdle and thigh muscles. Latter, Erb in 1882 and Landouzy – Dejerine in1884 described another variety of MD in which after weakness of the facial and shoulder-girdle muscles the peroneal group (anterior tibial) was involved (descending with a "jump" variety). Davidenkov in 1962 confirmed the existence of this very special type of MD. We studied 142 patients from 21 autosomal dominant families with this very special MD using needle EMG, motor and sensory nerve conduction velocities, muscle biopsy, CT and MR of muscles. The new name of the disease was offered – "facio-scapulo-limb muscular dystrophy, type 2 (FSLD2) with initial facioscapuloperoneal or (facio) scapuloperoneal phenotypes". Among the observed cases we did not come across any having the autosomal dominant gradually descending variety of FSHD called "facio-scapulo-limb muscular dystrophy, type 1 (FSLD1) with initial facioscapulohumoral phenotype". Molecular genetic analysis of 12 Russian AD FSLD2 families in 35 affected members showed the probe p13E-11 detected EcoRI/BlnI of DNA Fragments Size (DFS) between 13 kb - 35 kb cosegragated with the disease and linked with 4q35. Data show that FSLD2 is a very special type of MD with «hard» static and dynamic patterns of muscle involvement, with a mild course of the disease and slight/severe affection of the facial muscles. We suppose that the detected DFS cannot be the criterion for establishing the genetic heterogeneity of FSHD and for confirmation the existing of FSLD1 and FSLD2 as a nosological entity.

Keywords: Facioscapulohumeral dystrophy; Facioscapulolimb dystrophy; Scapuloperoneal dystrophy; Clinical heterogeneity

OPEN ACCESS

Correspondence:
Valery Kazakov, Professor Clinical Neurology, Department of Neurology, First Pavlov Medical University of St. Petersburg, 197022 St. Petersburg, Russia, Tel: +7 812 388 9381; E-mail: valerykazakov@mail.ru

Received Date: *25 Jan 2018*
Accepted Date: *18 May 2018*
Published Date: *21 May 2018*

Citation:
Kazakov V, Skorometz A, Rudenko D, Kolynin V, Stuchevskaya T. About Nosological Place of the Facioscapuloperoneal (The Same Disease as the Facio-Scapulo-Limb, Type 2) Autosomal Dominant Muscular Dystrophy. Historical, Clinical and Molecular Genetic Study. Ann Neurol Surg. 2018; 2(2): 1014.

Abbreviations

Ph: Phenotypes; FS: Facioscapular; FSP: Facioscapuloperoneal; FSPF: Facio-Scapulo-Peroneal-Femoral (posterior group of the muscles); FSPFG: Facio-Scapulo-Peroneal-Femoro-Gluteal (gluteus maximus muscle); FSPFGH: Facio-Scapulo-Peroneal-Femoro-Gluteo-Humeral (biceps brachii muscle); FSPH: Facio-Scapulo-Peroneal-Humeral; FSPHFG: Facio-Scapulo-Peroneal-Humero-Femoro-Gluteal; FSPGF: Facio-Scapulo-Peroneal-Gluteo-Femoral; SDD: Severe Degree of the Disease; MoDD: Moderate Degree of the Disease; MDD: Mild Degree of the Disease; Pr: Presymptomatic; DS disease: Degree Severity of the Disease; DLWD (LD): Daily-Life Work Disability; № F: Number of Family; DFS: DNA Fragment Size; Kb: Kilobases; № in pedigree; A exam: Age of Examination; A reexam: Age of Reexamination; D yr: Duration (years) of the Disease before Re-examination; h: Data from Case History

Introduction

Data on the nosological place of the Facioscapuloperoneal Muscular Dystrophy (FSPD) and its relationship with Facioscapulohumeral Muscular dystrophy (FSHD) are extremely controversial. Some authors suppose that FSPD or (F)SPD is probably a variant of FSHD, and others that FSPD or (F)SPD is probably an independent form of muscular dystrophy [1,2].

Our investigations allow suggesting that FSHD is a heterogeneous form of muscular dystrophy [3-22]. The best name for it is "facioscapulolimb muscular dystrophy (FSLD)" [3-7]. On the historical and clinical data FSLD may be divided into two nosological entities, namely

1. Facioscapulolimb muscular dystrophy, type 1 (FSLD1), a gradually descending one with initial facio-sacapulo-humeral phenotype; DFS: less than 38 kb; at 4q35; autosomal dominant (Duchenne de Boulogne).

2. Facioscapulolimb muscular dystrophy, type 2 (FSLD2), a descending with a "jump", with initial facio-scapulo-peroneal or (facio)-scapulo-peroneal phenotypes; DFS: 13 to 35 kb (or equal 37 kb); at 4q35; autosomal dominant (Erb, Landouzy and Dejerine).

Historical Study

Many neurologists over a very long time (more than 100 years) hold the opinion that the famous discussion taken place between Erb and Landouzy – Dejerine in 1886-1891 was a pointless argument about priority in describing the disease, which Duchenne recognized and described in 1855.

It is difficult to imagine why Erb, Dejerine and Landouzy the great authorities in the myopathies had pointless arguments on the priority of describing a disease (FSHD) which Duchenne had described many years before, and they knew very well about this [23-27].

Analysis of the medical literature shows that Erb and Landouzy-Dejerine themselves saw the clinical heterogeneity of the FSHD patients then examined.

It is quite possible the idea of clinical heterogeneity of FSHD was one of main reasons why heated discussion arose between Erb and Landouzy-Dejerine concerning the priority in describing FSHD [9,11,15,16,20].

Analysis of case histories and scientific published from 1874 to 1891 by Landouzy, Landouzy - Dejerine and Erb showed that these physicians admitted the priority of Duchenne in the description of the FSHD (a gradually descending variety – author's note) in 1855-1868 under the name Progressive Fatty Muscular Atrophy of Childhood (PMACH) [23-27]. The famous discussion between Erb and Landouzy-Dejerine dealt with the priority of recognition and description of another variant of muscular dystrophy (a descending variety with a "jump" – author's note) in which, after involvement of the face and shoulder girdle muscles, the myodystrophic process "jump" to the peroneal group of the muscles, especially the anterior tibial [11,20].

It is necessary to confess that in the FSHD casuistry of Duchenne there were no cases with affection of the peroneal group muscles.

A new names [Facio-Scapulo-Humeral (FSH) type and Juvenile Shoulder-Girdle (JSG) form] were used by Landouzy and Dejerine in France, and by Erb in Germany, respectively, for this very special variety (a descending with a "jump") of muscular dystrophy. However, this variety was not differentiated from the gradually descending dystrophy (PMACH) of Duchenne. As a result of this, it happened that PMACH of Duchenne (a gradually descending variety) and JSG form of Erb (a descending variety with a "jump") were "absorbed" into the FSH type of Landouzy and Dejerine. Thus, it happened so that two various myopathies with different sequences of muscle affections were united into one group, now called FSHD.

Many years later in 1962 Davidenkov confirmed the existence of this very special type of muscular dystrophy (a descending variety with a "jump") as a nosological entity which differs greatly from the classical FSHD [28]. He called this disease "scapulo-peroneal amyotrophy".

An analysis of Davidenkov's published works shows that his idea of the nosology of scapuloperoneal amyotrophy changed with the passage of time [28].

Up to 1934 Davidenkov considered scapuloperoneal amyotrophy to be an atypical form of the neural amyotrophy of Charcot-Marie-Tooth. Since 1935 Davidenkov has argued "scapuloperoneal amyotrophy was probably an independent disease with the features of both Charcot-Marie-Tooth amyotrophy and Landouzy-Dejerine myopathy but significantly closer to the latter". In 1962, when some patients were investigated with surface EMG and muscle biopsy and with his own new hereditary observations and critical analysis of some autosomal dominant families with scapuloperoneal amyotrophy described earlier by him, Davidenkov wrote: "scapuloperoneal amyotrophy cannot be considered a variant of the neural amyotrophy of Charcot-Marie-Tooth. It is a well outlined, peculiar form which belongs to a combined group of myopathies and approaches mostly to the myopathy of Landouzy and Dejerine, although it has some features that differ substantially both from the classical myopathy Landouzy - Dejerine and from the other variants of myopathy" [28].

In this manner Davidenkov isolated the (facio) scapuloperoneal type of muscular dystrophy as an independent nosological entity.

Our studies re-analyzed the material concerning some probands and their relatives whom Davidenkov has examined as patients with scapuloperoneal amyotrophy by detailed analysis of the pattern of muscle involvement at different stages of the disease, using needle EMG, motor and sensory nerve conduction velocities, muscle biopsy, CT and MR of muscles and DNA analysis [3-7,10,17-19,21]. This confirmed Davidenkov's view of the nosological independence of this form of muscular dystrophy.

At present we prefer to call this disease "facioscapulolimb muscular dystrophy, type 2 (FSLD2), a descending with a "jump", with initial facio-scapulo-peroneal or (facio)-scapulo-peroneal phenotypes; DFS: 13 to 35 kb (or equal 37 kb) at 4q35; autosonal dominant'; the short name is: facioscapuloperoneal muscular dystrophy".

Results

Clinical and molecular genetics study

We studied this problem by in an earlier investigation when 200 FSHD case histories were analyzed [3-5]. 145 cases (109 hereditary cases belonged to 45 families and 36 ones were "sporadic") were taken from the literature for the period 1855-1968 years. 55 patients from 17 families and one "sporadic" case were based on the author's personal observations. A new name of the disease was offered – "Facio-Scapulo-Limb Muscular Dystrophy (FSLD)". Two varieties of the disease were described: a gradually descending variety (in 58 hereditary cases taken from the literature and in two personal observation cases), and, more frequently, a descending variety with a "jump" (in 47 hereditary cases taken from the literature and in 42 own cases belonged to 15 families). In most our patients the FSP or the (F)SP phenotypes predominated in clinical picture on average for 11-16 years.

Only one of the two varieties of the disease (the gradually

descending variety or the descending one with a "jump") occurred in each family. The spreading of the muscular weakness in the members of the same kindred did not overstep the limits of the type of development of the disease. It was noted that the families which had one or another type of disease belonged to the population of different geographical regions. Genealogical analysis of 62 families suggests the existence of clinical and genetic heterogeneity in FSLD.

This idea was confirmed in our next work [10]. In 142 patients from 21 autosomal dominant pedigrees and three families including five "sporadic" cases, the phenotypes of muscle weakness at the different stages of the disease were established. Six pedigrees (24 patients) were reexamined after 24 years. Great similarity of clinical manifestation among those affected was noted. The clinical variability of the phenotypes was always close to the final phenotype of the disease, namely the facio-scapulo-peroneal-femoro (posterior group of muscles) - gluteo (gluteus maximus) - humeral (biceps brachii, not always weakened).

Thus, the clinically and genetically homogeneous group of patients with autosomal dominant of the descending with a "jump" type of muscular dystrophy was examined. We did not come across any patients having the autosonal dominant gradually descending type of muscular dystrophy, in which the pelvic girdle and thigh muscles weaken earlier than the anterior tibial muscles. We could not reveal the "pure" facioscapulohumeral phenotype of muscle weakness in 142 examined patients. On the other hand the scapuloperoneal phenotype with slight or minimal (or more rarely without) affection of mimic muscles is just in the early phase of descending with a "jump" type of muscular dystrophy.

Molecular genetic analysis (17-19, 21) of 13 Russian AD FSLD2 families in 41 affected members showed the probe p13E-11 detected EcoRI/BlnI of DNA Fragment Size (DFS) between 13 kb to 35 kb cosegregated with the disease and linked with 4q35. In 10 families DFS were less than 28 kb in all 28 patients [22 symptomatic and six presymptomatic (Pr)] and in two other families (№ 17 and № 24 with three symptomatic and two Pr) DFS were 32 and 35 kb, respectively. Within each family the disease is cosegregated usually with constant DFS, which was being transmitted from generation to generation. However, in F.5 and F.19 with DFS of 22 and 17 kb two Pr patients (without double restriction) had a DFS of 37 and 32 kb, respectively. As a rule, DFS differed between different families, excluding the five one in which DFS was similar.

The clinical study of 12 AD FSLD2 families with the same or different DFS ranging between 13 kb to 35 kb showed the similar variability of phenotypes (the static muscle pattern), the Severity of the Disease (SD) and daily-life work disability (LD) within and between families [19]. We did not find any relationship between DFS and dynamic changes after 24 to 28 years of the phenotype (the dynamic muscle pattern), SD and LD of seven patients belonging both to the same family and to the different ones 19). Statistical analysis, parametric and non-parametric, did not reveal a significant correlation between DFS and the phenotypes, DFS and age at onset of the disease, DFS and SD, DFS and LD [18,22].

The disease began with weakness (in different degree) of the facial and shoulder girdle muscles with subsequent involvement of the peroneal group (anterior tibial), proximal parts of the lower limb (posterior group of the thigh), pelvic girdle (gluteus maximus) and not always the upper arm (biceps brachii) muscles. In 21 of 25 symptomatic patients the biceps brachii muscles were preserved (11 men) or were weakened in a slight degree only on one side (10 men). As a rule, in all patients showed a different degree of atrophy of the stern costal part of pectoral, brachioradial and latissimus dorsi muscles.

The distribution of muscle weakness in the members of the families did not overstep the limits of the descending with a "jump" type of the development of the disease. In most patients the FSP or the (F)SP phenotypes predominated in the clinical picture at different stages of the disease. The clinical variability of phenotypes, within and between families, reflecting various stages of the disease was as a rule within the limits of the identical final phenotype, namely the facio-scapulo-peroneal-femoro (posterior group of muscles)-gluteal (gluteus maximus)-humeral (biceps brachii, often spared or slight affected).

Discussion

Data show that FSLD2 is a very special type of MD with "hard" static and dynamic patterns of muscle involvement, with a mild course of the disease and slight/severe and usually asymmetrical affection of the isolated facial muscles. The probe p13E-11 can be used for detecting DFS between 13-35 kb (or equal 37 kb) (double digestion) for FSLD2 which are assigned with chromosome 4q35.

However, in patients with classical FSHD the 4q35-linked EcoRI fragment detected by p13E-11 is usually shorter than 35 kb or equal 38 kb or shorter [1,2].

Thus FSLD2 was "absorbed" by FSHD again taking into consideration the DFS. Moreover, the sporadic scapuloperoneal forms of FSHD (if they exist) are associated with DFS ranging between 22 to 28 kb or between 28 to 35 kb (double digestion) at 4q35 [29,30].

That is why we suppose that the detected DFS cannot be the criterion for establishing the genetic heterogeneity of FSHD and for confirmation the existing of FSLD1 and FSLD2 as a nosological entity.

This problem can be solved after the identification of the FSHD genes and characterization of the gene products. However, the opinion exists that in unrelated patients carrying the same mutation may be seen a discordant phenotype [31,32].

Acknowledgment

The authors are grateful Drs. Arahata and Sugita and their colleagues for molecular genetic testing of the DNA samples and Dr. Christopher Gardner-Thorpe for critical reading and proof of the manuscript.

References

1. Padberg GW. Facioscapulohumeral muscular dystrophy. Neuromuscular disorders: clinical and molecular genetics. In: Emery AEH. editor. Chchester: John Wiley & Sons. 1998:105-21.
2. Orrell RW, Griggs RC. Muscular dystrophies: Overview of clinical and molecular approaches. In Schapira AHV, Griggs RC. editors. Muscle diseases. Boston: Butterworth Heinemann. 1999:59-82.
3. Kazakov VM. Facio-scapulo-humeral myodystrophy (clinic and genetic). InAbstracts. 1971.
4. Kazakov VM, Bogorodinsky DK, Znoyko ZV, Skorometz AA. Facio-scapulo-humeral muscular dystrophy (a peculiarities of the clinic and genetic). Zh Nevropat Psychiat. 1973;6:801-9.
5. Kazakov VM, Bogorodinsky DK, Znoyko ZV, Skorometz AA. The facio-

scapulo-limb (or the facioscapulohumeral) type of muscular dystrophy. Clinical and genetic study of 200 cases. Eur Neurol. 1974;11(4):236-60.

6. Kazakov VM, Bogorodinsky DK, Skorometz AA. Myogenic scapuloperoneal syndrome – Muscular dystrophy in the K. Kindred. Reexamination of the Family. K described for the first time by Oransky in 1927. Eur Neurol. 1975;13:350-9.
7. Kazakov VM, Bogorodinsky DK, Skorometz AA. The myogenic scapuloperoneal syndrome. Muscular dystrophy in the K. kindred: clinical study and genetics. Clin Genet. 1976;10:41-50.
8. Kazakov VM, Skorometz AA, Kovalenko TM, Mikhaylov EP. Chronic spinal muscular atrophy simulating facioscapulohumeral type and limb-girdle type of muscular dystrophy. Report of a two case. Eur Neurol. 1977;16:90-98.
9. Kazakov VM. On the nosological place of FSH MD of Landouzy and Dejerine. Acta Cardiomiol. 1992:IV:11-8.
10. Kazakov VM, Rudenko DI. Clinical variability of facioscapulohumeral muscular dystrophy in Russia. Muscle Nerve suppl. 1995;S85-95.
11. Kazakov V. History of the recognition and description of the Facioscapulohumeral muscular dystrophy (FSHD) and on the priorities of Duchenne, Erb, Landouzy and Dejerine. Acta Cardiomiol. 1995;VII:79-94.
12. Kazakov V, Rudenko D. Clinical peculiarities and diagnostic criteria of autosomal dominant facio-scapulo-limb (or Facioscapuloperoneal) muscular dystrophy, type 2 in Russian families. Part I. Clinical Neuromusc Disord. 1996;S64.
13. Rudenko D, Kazakov V, Tutin LE, Shelkoplyas. MRI to evaluate muscle involvement in patients with autosomal dominant facioscapulolimb muscular dystrophy, type 2 (or facioscapuloperoneal). Neuro musc. Disord. 1997;7(7):443.
14. Rudenko D, Kazakov V, Tutin L, et al. Exposure of presymptomatic patients in families with autosomal dominant facioscapulohumeral muscular dystrophy, results of joint use of MRI and +H MRS. Neuromuscul Disord. 1998;8:250.
15. Kazakov V. On the name of FSHD and the famous discussion between Erb and Landouzy-Dejerine once again. Acta Myologica. 1998;II:70-4.
16. Kazakov VM. On the name of FSHD and the famous discussion between Erb and Landouzy-Dejerine once again. Part 2. Acta Myologica. 1999;III:172-4.
17. Kazakov V, Rudenko D, Sugita H, Goto K, Funakoshi M, Arahata K. Facioscapulolimb muscular dystrophy, type 2 (FSLD2) (the same as a facioscapuloperoneal form of FSHD) in Russian families. Clinical aspects of the phenotype/genotype. Preliminary data. Abstract of report. "The third International symposium on the cause and treatment of facioscapulohumeral muscular dystrophy". 2000.
18. Kazakov V, Rudenko D, Katsev E, Sugita H, Goto K, Funakoshi M, et al. Facioscapulolimb muscular dystrophy (facioscapuloperoneal form of FSHD) in Russian families. Phenotype/genotype correlations. Acta Myologica. 2000;XIX:69-79.
19. Kazakov V, Rudenko D, Katsev E, Sugita H, Goto K, Funakoshi M, et al. Facioscapulolimb muscular dystrophy, type 2 (the same as a scapuloperoneal form of FSHD with minimal affection of facial muscles) with EcoRI/BlnI fragment size between 13 and 35 kb (double digestion) detected by probe p13E-11 on chromosome 4g35. Phenotype/genotype correlations. Neuromuscul Disord. 2001;11:622.
20. Kazakov V. Why did the heated discussion arise between Erb and Landouzy-Dejerine concerning the priority in describing the facio-scapulo-humeral muscular dystrophy and what is the main reason for this famous discussion? Neuromuscul Disord. 2001;11(4):421.
21. Kazakov V, Rudenko D. FSHD in Russian families: pattern of muscle involvement, severity of the disease and DNA fragment size correlations. Neuromuscul Disord. 2002.
22. Kazakov V, Katzev E, Rudenko D. Muscle uptake of 99m technetium diphosphonates in patients with FSLD2 (the same disease as a facioscapulohumeral form of FSHD). Neuromuscul Disord. 2002;21(6-7):25-30.
23. Landouzy L. Note on two cases of progressive muscular atrophy in childhood. Gaz méd. 1874.
24. Landouzy L, Déjerine J. Progressive atrophic myopathy (hereditary myopathy beginning in childhood by the face, without alteration of the nervous systems). CR Acad Sci. 1884;98:53-5.
25. Landouzy L, Déjerine J. [Contribution to the study of progressive atrophic myopathy (scapulo-humeral type progressive atrophic myopathy).] G Masson. 1886.
26. Erb W. [Muscle finding in the juvenile form of the progressive muscular dystrophy.] Neurol. 1886;13:289-295.
27. Erb W. [Dystrophia muscularis progressiva.] German J Neurology. 1891;1(3-4):173-261.
28. Kazakov V. What is Davidenkov's scapuloperoneal amyotrophy: is it a myopathic entity or a neurogenic syndrome? What was Davidenkov's opinion concerning this knotty problem? Neuromuscul Disord. 2003;13(1):91-2.
29. Pou-Serradell A, Jimenez-Conde J, Royo I, Gallano P. Phenotype-genotype correlation studies in facioscapulohumeral muscular dystrophy. Eur J Neurol. 2005;12:282-3.
30. Attarian S, Malzac P, Azulay JP, Pellisier JF, Philip N, Pouget J. Phenotype-genotype correlations studies in facioscapulohumeral muscular dystrophy. Neurology. 1998;50(4):A187-8.
31. Zatz M, Vainzof M, Passos-Bueno MR. Limb-girdle muscular dystrophy: one gene with different phenotypes, one phenotype with different genes. Curr Opin Neurol. 2000;13(5):511-7.
32. Emery AE. Muscular dystrophy into the new millennium. Neuromuscul Disord. 2002;12(4):343-9.
33. Daniels L, Williams M, Worthingham C. Muscle testing. Techniques of manual examination. 2nd ed. Philadelphia: Saunders. 1956.