Climb 6-hills in a coat with Popeye, you shall find facioscapulohumeral dystrophy - Going from phenotype to genotype

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Abstract
Facioscapulohumeral dystrophy (FSHD), is a rare muscle disease in clinical practice. Identifying the condition with its classic clinical signs helps in better managing patients early. This report is to shed light upon this condition and signs associated with it. We also try to elaborate a few genetic aspects and their pathogenetic mechanisms in the review.

Keywords: Polyhill sign; Popeye sign; coats disease; facioscapulohumeral dystrophy

Case report
A 27-year-old gentleman presented with a chronic history of weakness and thinning of both upper limbs and difficulty in blowing a whistle, sucking from a straw. There was no significant family history. There was no history of weakness of the lower limbs or involvement of any other part of the neuraxis. On examination he was found to have a classical pattern of weakness involving the trapezius, deltoid, biceps bilaterally but preserved forearm muscles. There was evidence of winging of scapula too. With a pattern diagnosis of facioscapulohumeral dystrophy (FSHD) certain we looked for interesting clinical signs in this patient described below:

Poly-Hill sign
This is due to the selective involvement and sparing of specific muscles all along the shoulder girdle and arm as described below [1]. It consists of a total of 6-Hills (Figure 1).
Poly-Hill sign due to:
1. Infraspinatus muscle hypertrophy, 2. Upward displacement of the superior scapular angle, 3. Abnormally prominent acromio-clavicular joint (seen from the front in our patient) – Due to the wasting of the trapezius muscle, 4. Partially preserved deltoid muscle – Preserved infero-lateral part due to wasting of the rest of the muscle, 5. Partially preserved biceps brachii muscle – Generally atrophied but some fibers in upper and mid third of the muscle give the appearance of a bump in the muscle, 6. Preserved forearm muscles – mainly the brachioradialis.

In addition to the above there is also “Scapular Winging” due to weakness of Serrati.

Popeye sign [3]:

*Interesting history to this sign:* The “Popeye sign” (Figure 2) is named after the beloved cartoon character, created by Elzie Segar in the year 1929. It is believed that Segar’s hometown was Chester, Illinois, USA. Here in this town there was a gentleman by name “Frank Rocky Fiegel” who is believed to be the actual inspiration behind the character “Popeye” (Figure 3).

It is interesting to note that the character Popeye, fits the clinical phenotypic description of a case of FSHD. He has classical facial features, wasted biceps and arm muscles and preserved forearm compartment, as shown in figure 4.

In addition, to these there was evidence of Beevor’s sign, which is due to asymmetric weakness of the truncal muscles. There is weakness of the rectus abdominis – lower part due to which the umbilicus gets pulled up.
Literature review of FSHD

Pattern recognition approach to muscle disease is the most important clinical skill needed while evaluating a patient with muscle disease. Facio-Scapulo-Humeral- Dystrophy is one such prototype patterned muscle disease [4]. It is an extremely rare condition with some studies estimating its incidence to be about 0.38-0.7/1,00,000 person years [5]. Some studies peg this figure close to 5/1,00,000. It’s a congenital disorder which has 2 genetic variants, but both do not differ much phenotypically. The first variant (FSHD-1) is caused due to mutation in the D4Z4 gene in the long arm of Chromosome-4. This variant is by far the most common one encountered, in approximately 95% of FSHD patients. The etiological factors FSHD-2 however, has not been clearly understood.

Phenotypic features of FSHD

This condition is characterized by Muscular involvement (already described above), extra-muscular involvement in the form of respiratory, cardiac, ophthalmic and ENT abnormalities (Table 1).

| Pulmonary | Cardiac | Ophthalmic & ENT |
|-----------|---------|------------------|
| 1. Respiratory muscle weakness | Pulmonary myopathy | 1. COATS disease - peripheral retinal telangiectasia |
| 2. Respiratory failure | Supra ventricular arrhythmias | 2. Hearing loss |
| 3. Kyphoscoliosis | Branch block | 3. Right bundle branch block |

Pathogenesis of FSHD [6]

Follow Up: After doing the literature search we got the genetic analysis done of our patient and he was found to have FSHD-1 genetic variant with a mutation in the D4Z4 region with expression of 8 repeats. It is worth to note that fewer than 11 repeats brings about the phenotypic manifestation of Type-1 FSHD (Figure 5). Also upon follow up for looking at extra-muscular features we also found that our patient had features of COATS disease which he was asymptomatic for. Unfortunately we were not able to get a fundus photograph of the same.

Figure 5: From genotype to phenotype - Pathogenesis of FSHD.

Prognostication

A younger age at presentation, wheelchair bound at an early age, fewer than 10 D4Z4 repeats, early pulmonary involvement are some of the poor prognostic factors in this condition.

Conflicts of interest

Authors declare no conflicts of interest.

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