Hypovitaminosis D-Related Myopathy in Immigrant Teenagers

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Abstract

Introduction: Vitamin D deficiency resulting in a limb-girdle muscle weakness was diagnosed in three veiled immigrant teenage girls.
Patients: Three girls had a progressive muscle weakness and pain during a period varying from 6 months to two years. On examination limb girdle muscle weakness, predominantly of the lower extremities, without other neurological abnormalities was found. Serum examination showed a decreased level of vitamin D and phosphate and an increased alkaline phosphatase, and in two girls decreased calcium and increased parathyroid hormone levels were found. After supplementation with vitamin D, the pain subsided and muscle strength increased within weeks. Serum examination of the female relatives revealed eight persons with hypovitaminosis D, without any complaints.
Conclusions: Vitamin D deficiency can result in a limb-girdle myopathy in veiled immigrant teenagers in the Netherlands. Vitamin D supplementation leads to rapid recovery of the muscle strength. The female relatives of these patients should be examined too.

Key words
Myopathy · vitamin D · immigrant · veiled

Abbreviations

CK	creatine kinase
EMG	electromyogram
MRC-scale	Muscle Research Council scale
25(OH)D	25-hydroxycholecalciferol

Introduction

Vitamin D deficiency can be caused by several disorders and conditions, including poor intake of dairy products and lack of sunlight exposure [2,3,8,9]. People with a pigmented skin who are wearing long-sleeved dresses and veils because of religion or dressing habits, are more prone to develop vitamin D deficiency [3,6]. The exact incidence of vitamin D deficiency in the Netherlands, and particularly in immigrant people, is not known. Deficiency of vitamin D may result in rickets or osteomalacia and muscle weakness [4,5,8,9].

We describe three veiled immigrant teenage girls, presenting with predominantly limb-girdle muscle weakness, caused by vitamin D deficiency.

Case

An 11-year-old, veiled, Somalian girl, living in the Netherlands for 3 years, was referred to our outpatient clinic because of increasing difficulty walking, running and climbing stairs for approximately 6 months. She was complaining of low back pain, radiating to her upper legs and knees, without complaints in her arms. There was no family history of neuromuscular diseases and her parents were non-consanguineous. Neurological examination showed decreased strength in the proximal leg muscles

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Table **1** Clinical features, diagnostic modalities, and treatment of three patients with a hypovitaminosis D-related myopathy

			Patient 1	*Patient 2*	*Patient 3*
Age (years)			11	13	10
Length (cm) (standard deviation)			145 (– 2)	162 (– 1)	138 (– 1)
Weight (kg) (standard deviation)			41 (0 ± 1)	52 (0)	34 (+ 1)
Neurological signs	Waddling gait		+	+	+
	Trendelenburg sign		+	+	+
	Gowers sign		–	–	–
	Muscle strength				
	MRC scale	MRC 1 – 5	L/R	L/R	L/R
	– Deltoid		5–/5–	4/4	4/4
	– Biceps		5/5	4/4	5–/5–
	– Triceps		5/5	4/4	5/5
	– Glutei		4/4	4/4	4/4
	– Quadriceps		5/5	5–/5–	5–/5–
	– Hamstrings		5/5	5–/5–	5/5
	Reflexes		lowered	normal	normal
	Serum	normal values			
Laboratory investigation	Calcium	2.2 – 2.6 mmol/L	1.92	1.86	2.47
	Alkaline phosphatase	150 – 350 U/L	1836	1024	617
	Phosphate	1.3 – 1.9 mmol/L	1.02	0.76	0.91
	Parathyroid hormone	1.0 – 6.5 pmol/L	not done	98.3	14.0
	Creatine kinase	< 170 U/l	114	72	42
	25(OH)D	10 – 39 ng/mL	1.5	< 1.0	4.8
Radiological pelvis/hand	Signs of rickets		+	not done	+
EMG			normal	normal	normal
Histological	Quadriceps muscle biopsy		small fibre diameter		excess in type I fibres
	Fibre diameter range	25 – 65 µm			
	– type I		29 – 42	not done	25 – 38
	– type II		17 – 42		25 – 33
Treatment	Vitamin D supplementation		3000 IU/day (6 weeks), followed by 800 IU/day	2000 IU/day (6 weeks), followed by 800 IU/day	2000 IU/day (6 weeks), followed by 800 IU/day
	Calcium		–	Calcium tablets 500 mg, t.i.d. (3 days)	–
Affected family members		N =	2	2	4

and to a lesser degree of the arm (Table **1**). She had a waddling gait and Gowers sign was negative. Sensory function was normal, tendon reflexes were decreased, and there were no skin abnormalities, such as seen in dermatomyositis. Laboratory examination results are presented in Table **1**. An X-ray of the hand showed irregular lining of the radial and ulnar metaphysis with widening of the epiphysial line suggesting rickets. Histology of the quadriceps muscle showed no structural abnormalities in light microscopy, but muscle fibre diameters were too small. The diagnosis hypovitaminosis D-related myopathy with rickets was made and she received vitamin D therapy. Five months later, she was able to run again without having pain. Muscle strength was normal and improvement of the X-ray of the hand was seen. Both of her female relatives had a decreased serum 25(OH)D without any physical complaints, and received vitamin D supplementation as well.

A veiled 14-year-old girl from Iraq, living in the Netherlands for 4 years, was seen in our outpatient clinic. For 2 years she had difficulty in sports at school because of muscle weakness and leg pains. At admission, she was complaining of pain and loss of strength in her shoulders and arms as well. Her medical history showed a diet lacking in vitamin D and calcium-containing foods. Her parents were consanguineous and she had a cousin who had difficulty walking, but had never been formally diagnosed. Physical examination showed no abnormalities. Neurological examination showed a waddling gait, a negative Gowers sign and reduced strength in the proximal leg muscles (Table **1**). Sensory function and tendon reflexes were normal. Laboratory examination showed decreased serum calcium, phosphate and 25(OH)D (Table **1**). After the start of vitamin D and calcium supplementation, her physical complaints resolved in a couple of weeks. Two female relatives (all female relatives tested) also re-

ceived vitamin D supplementation because of decreased vitamin D in their serum. They had no complaints of pain or muscle weakness.

Another veiled girl immigrated to the Netherlands from Iraq 5 years ago. At the time of referral to our outpatient clinic, she was 10 years old. Since 2 years, climbing stairs, running and jumping had been difficult. There was no family history of neuromuscular diseases. Her parents were consanguineous. Physical examination was normal and neurological examination showed no abnormalities, except for a waddling gait and loss of strength in her proximal leg muscles, and loss of strength in her arms (Table **1**). Laboratory examination results are presented in Table **1**. An X-ray of her pelvis showed osteoporosis and rickets. An X-ray of the hand showed widening of the epiphysis of the radius and ulna and an irregular lining of the metaphysae site. Biopsy of the quadriceps muscle showed slightly increased numbers of type I fibres; the muscle fibre diameter range was too small for both type I and type II fibres. 5 months after receiving vitamin D supplementation, the pain in her legs had resolved. 7 months later the strength in her proximal leg muscles had increased. 10 months later the strength in her quadriceps muscle and shoulder muscles were normal. All three of her sisters and her mother were found to have a vitamin D deficiency without any physical complaints. They also received vitamin D supplementation.

Discussion

Vitamin D deficiency can ultimately result in a myopathy, in which predominantly proximal muscle weakness of the lower limbs is seen. Patients often complain about pain [5,8].

An important cause is limited exposure to sunlight [7]. Eighty-five per cent of vitamin D is formed by photoconversion of 7-dehydroxycholesterol in the skin [3], by the energy of the shortest wavelengths of solar ultraviolet light [4]. Holick suggests the exposure to sunlight of hands, arms and face to be adequate if received at least 2 – 3 times a week, for about 5 minutes, during the summer, spring and autumn, for people without pigmentation of the skin [7].

Our patients complained of muscle weakness and pain for several months to two years. Because two out of three had consanguineous parents, they were first thought to have a hereditary myopathy. Laboratory examination showed decreased serum levels of calcium in two and an increased level of alkaline phosphatase with a reduced level of 25(OH)D in all three patients. In hypovitaminosis D, alkaline phosphatase and parathyroid hormone are found to be increased [3,10], with a decreased [8,10] or normal [9] level of calcium. 25(OH)D, the compound which reflects the vitamin D body content [4,7], is reduced in vitamin D deficient patients [4,7]. EMG might show a lengthened relaxation phase of the muscle in myopathy in vitamin D deficiency [8]. The EMG might also be normal in a clinically affected muscle [8], as was the case in our patients. Histology of the quadriceps muscle, performed in two of them, showed a decrease of muscle fiber size. This is in agreement with results found in previous studies, in which non-specific atrophy of the muscle fibers was seen as well [8,10].

Radiological examination in our patients showed signs of rickets in two, namely irregular lining of radial and ulnar metaphysis with widening of the epiphysial line. This resolved after treatment.

The pathogenesis of the myopathy in hypovitaminosis D is not entirely known [1,2,4]. Hypovitaminosis D-related myopathy can be successfully treated by vitamin D supplementation [5,8]. The muscle weakness in our patients improved relatively rapidly after receiving supplementation of vitamin D. Consequently, it was not necessary to check blood levels. One patient received calcium supplementation as well, since a low serum calcium level (defined as a serum calcium level below 1.90 mmol/L) might lead to a severe hypocalcaemia after starting vitamin D supplementation. Previous studies note an improvement in muscle weakness, varying from two weeks [8] to six months [5] after the initiation of therapy, as seen in our patients as well.

Since female relatives also had a diet poor of milk, milk products and vitamin D-containing foods, and were wearing a headscarf, they were evaluated for 25(OH)D deficiency as well. All female relatives tested had a vitamin D deficiency, without any physical complaints, and received supplementation of vitamin D.

In conclusion, hypovitaminosis D-related myopathy can be diagnosed in immigrant, veiled girls living in the Netherlands, presenting with predominantly proximal muscle weakness, in combination with pain. This is easy to treat and consequently has an excellent prognosis. A muscle biopsy should only be obtained after exclusion of hypovitaminosis D, particularly when this combination of muscle weakness and pain is present. Finally, female relatives should be screened for low 25(OH)D levels as well, even if they do not have physical complaints, because of the similar manner of dress and diet.

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