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Original Article

The diagnosis and treatment of familial hyperlipidemia combined with midsubstance Achilles tendinopathy in a young woman: a clinical case report

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Abstract: Background: Familial hyperlipidemia is primarily an inherited disorder characterized by an elevation of plasma low-density lipoprotein cholesterol and xanthomas at various sites. Achilles tendon xanthomas usually present as a swollen tendon, caused by both intratendinous lipid infiltration and local edema and inflammation. Previous research indicates that patients with midsubstance Achilles tendinopathy might benefit from eccentric loading exercises. However, no studies have yet evaluated the effect of eccentric exercises on patients with Achilles tendon disease associated with familial hyperlipidemia. Case report: A 32-year old woman with familial hyperlipidemia and midsubstance Achilles tendinopathy benefited from 12 months of therapy (including calf eccentric loading exercises and lipid-lowering therapy). US indicated blood flow changes with her symptomatic improvement. Clinical rehabilitation Impact: Lipid-lowering therapy and exercise therapy are effective for patients with familial hyperlipidemia and midsubstance Achilles tendinopathy.

Keywords: Familial hyperlipidemia, midsubstance Achilles tendinitis, eccentric loading exercises, ultrasonography

Introduction

Familial hyperlipidemia (FH) is a genetic abnormality caused by a lipid metabolism disorder, with evidence of familial aggregation. According to its clinical manifestations, patients with FH can be divided into two types, homozygous and heterozygous [1]. The diagnostic criteria of FH are as follows: serum total cholesterol (TC) >7.8 mmol/L in adults or >6.7 mmol/L in children under 16 or low-density lipoprotein LDL-C >4.4 mmol/L in adults, accompanied by a family history or xanthoma and other clinical manifestations [2].

Midsubstance Achilles tendinitis (MAT) is characterized by pain or stiffness 2 to 6 cm above the posterior calcaneus, impaired performance, and swelling in and around the tendon [3]. Strong evidence was found for the Alfred son exercise protocol, but no uniformity of protocols exists. Other exercise protocols achieved similar results, but many studies had some methodological shortcomings or lacked a detailed description of their training parameters. Ultrasonography (US) is increasingly used to assess tendon thickening and signs of more significant tendon pathology, Therefore, it can be used to help to distinguish between tendon injury and other pathologies [4].

The purpose of this case report is to demonstrate that eccentric loading exercises and lipid-lowering therapy are valid treatment options for patients with FH and MAT according to US assessment.

Case report

A 32-year-old female patient visited the authors' outpatient clinic from December 30, 2014, to March 7, 2016. Her initial visit was on December 30, 2014. The chief complaint was a three-year history of swelling of the bilateral mid-Achilles and a three-month history of pain while walking,

with the left side more serious. Her pain was worsening. In the morning, from the time she put her feet on the ground she felt obvious pain and stiffness. The symptoms deteriorated with decreased temperature. The patient also complained of pain in the left waist and hip. Before this visit, the patient had received physical modalities for several weeks (ultrasound, microwave, and low-power laser), but the symptoms had not improved significantly. The patient had a history of FH. However, she had not undergone a blood biochemical evaluation. Her medical history was reviewed and deemed to be non-significant. She may have had a sedentary lifestyle.

The physical examination results are listed in detail. Her height and weight were 162 cm and 55 kg respectively. Her abdominal circumference was 70 cm, and her BMI was 20.9. Her heart rate and blood pressure were normal, and there were no yellow fat tumors on her body or on the corneal bow. Right lower limb pseudo elongation was observed with a 2 cm difference compared to her left one, and the right iliotibial band was tense. The left pelvis was elevated, and she had tender points on her waist and right buttocks.

There was also tenderness when palpating along the mid-portion of the bilateral Achilles tendon. Both tendons appeared to be swollen, with the left side more swollen. The Numeric Pain Rating Scale (NRS) of the right tendon was 4/10 while the left was 6/10. The patient received the first US examination on October 28, 2014. The US results showed diffuse swelling in the left tendon (especially in the middle and lower part), the echo of the tendon fiber was reduced, and the texture was blurred. The thickest part of the tendon was 14 mm. The tendon had good continuity and an abundant blood supply. There was no obvious calcification in the tendon. The cortex of the end point of the calcaneus was smooth, and there was no obvious effusion in the posterior capsule (**Figure 1A**). The patient was diagnosed with bilateral MAT and myofascial pain syndrome in the lumbar spine and buttocks. We asked her to have her blood lipids checked and instructed her in a home exercise program (HEP). The HEP included eccentric calf training as described in the literature [3], which consisted of two parts. Each part contained three sets with 15 repetitions in each set. The exercise was performed as follows: The patient starts with a straight leg and the ankle with a plantar flexion. The ankle of the injured leg is then lowered to a full dorsiflexion and restored to its original position with the help of the upper leg. Bend your knees to about 45°C and repeat.

Two weeks later (Jan 16, 2015), she made her second visit. She felt that the pain in her AT, waist, and hip was significantly relieved (NRS was 4/10 on the left and 3/10 on the right). She also had a feeling in both tendons while performing the exercises that she described as a slow tearing of the scars. Physical examination indicated that the lower limb pseudo-elongation had decreased to 0.7 cm. The tenderness, swelling, stiffness, and thickening in the Achilles tendon also improved. Blood tests showed the patient had dyslipidemia (TC: 10.55 mmol/L [2.8-5.9 mmol/L], LDL: 8.75 mmol/L [1.30-3.7 mmol/L]). A medical consultation was requested, and she was prescribed rosuvastatin (5 mg QN PO).

Four weeks later, she made her third visit. Her morning pain and stiffness were alleviated. The symptoms no longer affected her basic daily activities, but long-distance walking such as shopping and traveling was limited. Physical examination showed that her right lower limb pseudo-elongation was reduced to 0.5 cm, and her symptoms continued to improve. NRS was 3/10 on the left and 3/10 on the right. Compared with previous US images (Oct 28, 2014), the Achilles tendon thickness and the local blood flow had also decreased (**Figure 1B**, Jan 2015).

Due to her symptomatic relief and the improvement of her function, the patient stopped training from time to time. In both April and October 2015, she had a relapse of her symptoms. Once she restarted eccentric training, her symptoms improved quickly. On January 26, 2016, her NRS was 2/10 on both sides, and the symptoms no longer affected her daily activities. After she had been taking rosuvastatin for some time, she had a serious headache and a small amount of epistaxis in the morning. Therefore, she stopped taking rosuvastatin after her blood lipids returned to normal (Mar 7, 2015: TC: 5.47 mmol/L, LDL: 3.93 mmol/L). In April, her blood lipids increased again (TC: 9.97 mmol/L, LDL: 7.05 mmol/L), and the physician adjusted her medications to

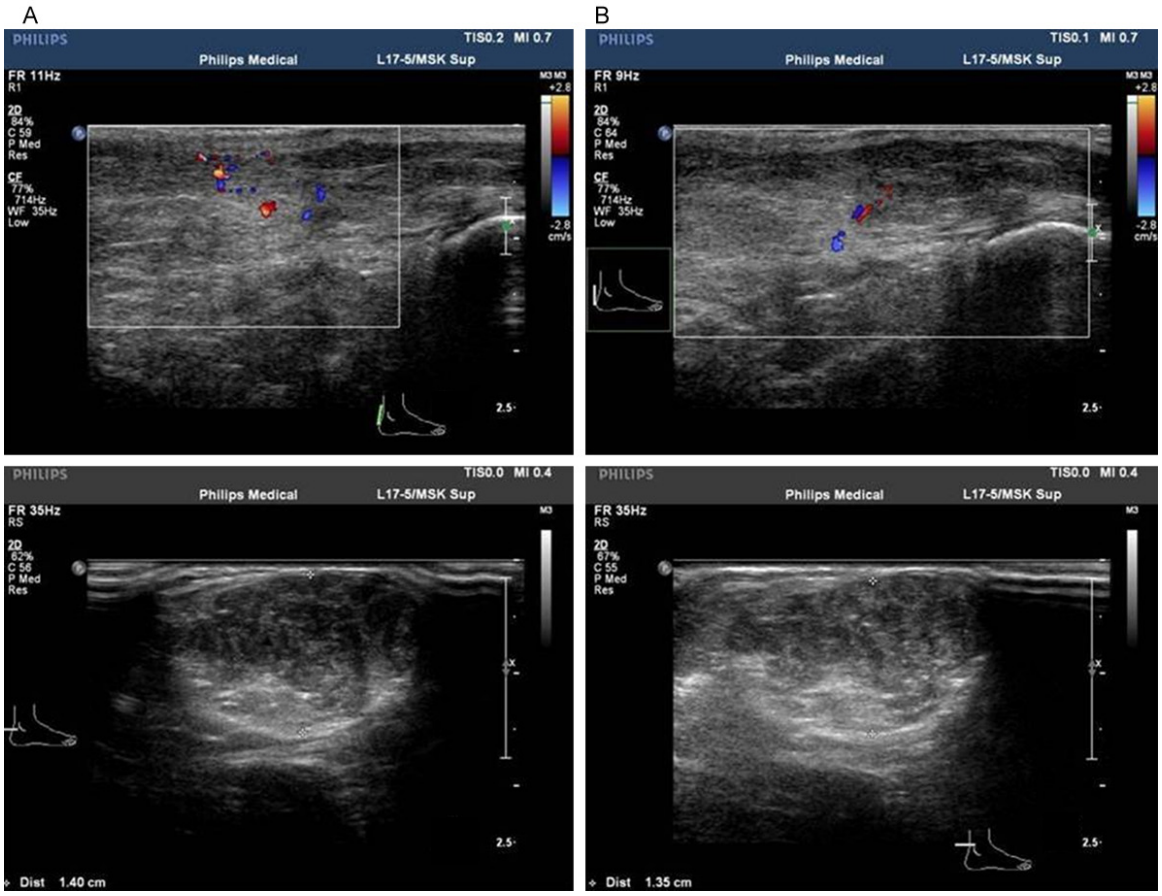

Figure 1. Ultrasound (US) imaging features of the patient at different points in time: the pictures above show blood flow in the Achilles tendon, while the corresponding pictures below display the degree of Achilles tendon swelling. A. US (Oct 28, 2014): The Achilles tendon appears to have diffuse swelling (especially in the middle and lower parts), the echo of the tendon fiber is reduced, and the texture is blurred. The thickest part of the tendon is 14 mm. The tendon has good continuity and an abundant blood supply. There is no obvious tendon calcification. The cortex at the end of the calcaneus is smooth, and there is no obvious effusion in the posterior capsule. B. US (Jan 25, 2015): Compared with previous (images from Oct 28, 2014), the thickness of the Achilles tendon decreased, and the local blood flow also decreased.

Ezetimibe (10 mg QN PO) and Wenstardin (a Chinese herbal medicine, 0.6 g QN PO). Since then she has adhered to her medications. From May to October 2015, her blood lipid levels were stable and remained normal (TC: 5.06-5.37 mmol/L, LDL: 3.34-3.63 mmol/L).

Discussion

This article presents a patient combined with FH and MAT. Through medications and eccentric calf exercises, the patient's symptoms were relived, and her function improved. The US changes were also in accordance with her signs and symptoms. Previous studies do not recommend a time frame for eccentric training. Considering the patient's FH history, she was asked to maintain continuous therapy.

FH is a genetic abnormality caused by a lipid metabolism disorder. This patient was a young woman with a family history of hyperlipidemia, and as not all her family members were involved, we speculated her FH was heterozygous. Her initial TC was 10.55 mmol/L, and her initial LDL was 8.75 mmol/L. According to the criteria, she was diagnosed with FH [2]. Xanthomas usually affect the Achilles tendon [5]. Although her Achilles tendon histopathology could not be obtained, it was suspected that the pathological changes might be tendinous xanthomas (TX).

It is beneficial for the patients with FH to maintain an ideal LDL level [6, 7]. Considering that the patient did not have other risk factors such as coronary heart disease, the guidelines rec-

ommend that in an adult with FH, the target LDL cholesterol concentration should be 50% of the initial level or be controlled under 2.5 mmol/L [8]. Previous research indicates that statins could effectively reduce the size of TX [9]. Through this study, it could be speculated that lowering LDL cholesterol levels helps to reduce local inflammation of the Achilles tendon and thus contributes to rehabilitation from the disease. However, whether Ezetimibe and Wenstardin affect TX needs further research. In conclusion, any lipid-lowering medications, if they do not damage the tendons, might help to control AT in patients with FH.

AT is characterized by pain, impaired performance, and swelling in and around the tendon [10]. Most of these conditions can be attributed to overexertion in patients with chronic symptoms (lasting more than six weeks) and often require rest, proper protection, changes in activity, and care for further complete recovery. Strong evidence was found for the Alfredson movement scheme [11]. An eccentric strengthening program was able to successfully treat AT for three possible reasons: 1) the length of the Achilles tendon changes: if the tendon stretches, its initial resting length also increases, for example, the stress of the exercise Achilles tendon will decrease correspondingly; 2) the weight-bearing: with practice, the stress of the Achilles tendon gradually increases, and the strength of the tendon also increases correspondingly; 3) the speed: The contraction of the Achilles tendon increases with speed, and the muscles of the lower limbs also strengthen. In our case, the patient's symptoms improved after eccentric training, which indicates that this exercise regimen might also be effective in patients with FH and MAT.

This patient's disease course was 3 years. During her first visit, on physical examination it was found that she had a right lower limb pseudo elongation of 2 cm, and the iliotibial band was tense with hip external rotation. The left pelvis was elevated, and there were tender points in the waist and buttocks. Therefore, it was speculated that these signs were caused by myofascial pain syndrome (the left AT was more severe), and she was administered acupuncture and manual therapy.

US is used in the diagnosis of soft tissue diseases such as tendinopathy. Past studies have revealed that increased tendon thickness and the presence of Doppler signals are correlated with the level of discomfort and dysfunction. US was also applicable to patients with FH [11]. Neovascularization was seen consistently in the symptomatic portions of the tendon structure. Bakkegaard's research demonstrates that tendon thickness, hypoechogenicity, and increased blood flow at any point in time were significantly correlated with pain and the patient's functioning [12]. However, other studies indicated that clinical symptoms might not be in accordance with Achilles ultrasonic morphology [13]. It is hoped that this patient has a long-term improvement in her symptoms and ultrasound findings.

Conclusion

This report showed a patient with FH and MAT who benefited from 12 months of therapy (including calf eccentric loading exercises and lipid-lowering therapy). US indicated blood flow changes with her symptomatic improvement. Therefore, it was speculated that exercise therapy is effective for patients with FH and MAT.

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Ethical approval was given by the Huashan Hospital, Fudan University. The patient provided written permission for publishing this case report.

Disclosure of conflict of interest

None.

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