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Case report

Exertional rhabdomyolysis of the bilateral adductor magnus

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Abstract
We present a case study of a person (63 year-old man), who has been using statins for 18 years, with rhabdomyolysis of the bilateral adductor muscles associated with strenuous and prolonged eccentric exercises (hiking) in a hot environment. Clinical examination showed predominantly on the right side muscle swelling and palpational pain of the bilateral adductor muscle groups and bilateral tibial edema. His serum creatine kinase (CK) level was 12218 IU/L. T2-weighted magnetic resonance (MR) images showed a high signal intensity in the bilateral adductor muscles of the hip. The patient did not develop complications and returned to his previous performance level in 30 days following adequate hydration and resting of the affected muscles. Strenuous eccentric exercise should be avoided during the course of statin use and clinicians should be aware of present observations when considering the significance of acute CK elevations in patients on statin treatment.

Key words: Rhabdomyolysis, muscle damage, statin.

Introduction

Exertional rhabdomyolysis is often seen following strenuous muscular exercise and is a response to intensive and severe exercise. It is associated with a damage to the muscle group predominantly involved in the activity (Clarkson, 2002; Hamer, 1997; Knochel, 1990; 1993; Line and Rust, 1995; Walsworth and Kessler, 2001).The causes of rhabdomyolysis are drug (Braseth et al., 2001; Sandhu et al., 2002) or alcohol abuse, use of statins (Thompson et al., 2003), intensive eccentric exercise (Clarkson and Sayers, 1999), crush trauma and high-intensity exercise in heat stress conditions.

Key clinical features are severe muscle pain, muscle swelling, muscle weakness and elevated creatine kinase (CK) level. CK>10.000 IU/L is accepted as diagnostic criterion of rhabdomyolysis. (Lemos, 2004)

Exertional rhabdomyolysis cases mostly involve individuals who were inexperienced exercisers, dehydrated and uneducated in fitness (Sandhu et al., 2002; Wirthwein et al., 2001). Two recently published case reports show that rhabdomyolysis can develop in individuals who are physically fit, exercise-trained and healthy, due to overexertion following exercise under the guidance of a trainer in a sports club (22y female and 37y male) (Springer and Clarkson, 2003). Exertional rhabdomyolysis localized to one muscle is not also a rare condition. Three cases have been previously reported, in which localized rhabdomyolysis developed in the biceps (Bolgiano, 1994), triceps (Goubier et al., 2002), and soleus (Watanabe et al., 2007) muscles. We present a case of rhabdomyolysis of the bilateral adductor muscles.

Case report

MK is a 63-yr-old male, height 1.81 m and weight 73 kg. He agreed to the use of his clinical data for this report. He applied to the sports medicine polyclinic with pain and swelling in the bilateral adductor muscle groups of the hip (predominantly in the right limb). He stated in his anamnesis that on Sunday (4 days ago) he was hiking in the mountains (30 km) for 6 hours, the weather was hot and they had a break for only 30 minutes and that the group of hikers took lesser liquid with them than usually was the case.

The same night he drank one bottle of red wine (70 cc, %12 alcohol). The next morning he realized a slight swelling in the bilateral adductor areas of the hip. He applied to our polyclinic on Thursday as the swelling and pain got more severe.

He did not pay attention to the color of his urine. He stated that he did not use any performance boosting substances (creatine, protein powder, steroids...) or any other medication. He had hypertriglycemia, an underlying chronic disease. He has been using simvastatin [Zocor ®) since 1991 for 18 years (20mg/day 1991-2002, 10 mg/day 2002-2007)]. Due to statin use MK underwent measurement for creatine kinase (CK) once in 6 months, the values of which were slightly above normal at approximately 300 IU/L. His CPK of 6 months before was 320 IU/L.

Aside from an active professional life he engaged regularly in sports activities. He was weightlifting regularly weekdays around noon in the fitness room of the hospital with his personal trainer for 8 months. His daily fitness activities consisted of the following sets: 5 min warm up cycling, 3×10 rowing, 3×10 chest press, 4×10 biceps curls, 4×10 triceps curls and several types of lower back/abdominal muscle exercises. MK was doing garden work in his backyard for 30 minutes during the last 5 years after work. He was hiking every Sunday for 2-3 hours (10 km) for the last 20 years. Clinical examination showed predominantly on the right side muscle swelling (no increase of heat on the affected area) and palpational pain of the bilateral adductor muscle groups and bilateral tibial edema. There was no echimosis and no sensory or motor deficit of the limbs. Distal pulsations were clear.

His serum CK level was 12218 IU/L. Myoglobin levels were not assessed. The blood chemistry results for the days after the exertion are shown in Table 1. Statin was ceased. Muscle US and Doppler tests were normal. MRI and T2-weighted images showed a hyperintense

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Table 1. Blood chemistry results for days after exertion.

Chemistry	Day 4	Day 5	Day 6	Day 9	Day 11	Day 16	Day 20	Day 25	Reference Range
Blood urea nitrogen (mg/dL)	14	14	15	17	10	10	11	13	6–20
Creatinine (mg/dL)	1.3	1.3	1.3	1.3	1.2	1.2	1.3	1.3	0.6–1.3
Lactate dehydrogenase (IU/L)	415*	333*	254*	194*	208*	157	157	150	100–190
Aspartate aminotransferase (IU/L)	179*	155*	132*	52*	38	24	30	28	0–40
Alkaline phosphatase (IU/L)	29	29	30	30	29	30	31	30	38–126
Alanine aminotransferase (IU/L)	69*	57*	53*	41*	32	27	27	24	0–40
Creatine kinase (CK) (IU/L)	12218*	7829*	5714*	1394*	661*	272*	265*	317*	40-226

*asterixes indicate values higher than reference range.

signal in the bilateral adductor muscle groups of the hip (especially in the adductor magnus) with swelling (Figure 1a). All adductor muscle groups of both thighs showed an extensive edema pattern that was more discerned in the bilateral medial cutaneous and subcutaneous fatty tissues of the right thigh. T1-weighted images showed no specific findings (Isointens in the T1 sequency, hyperintens in the T2 sequency) (Figure1b).

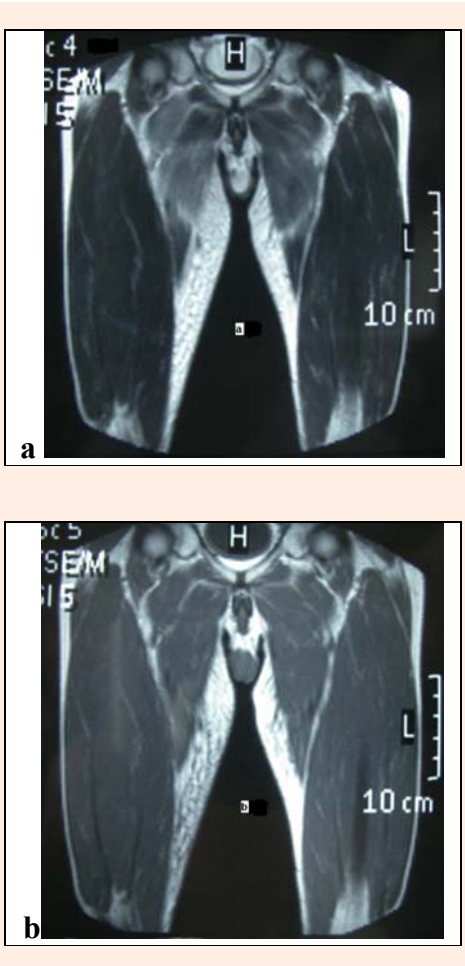

Figure 1. Coronal T2-weighted image (a) shows high signal intensity in the bilateral adductor magnus with slight swelling and subcutaneous edema at the medial thigh. Coronal T1-weighted image (b) shows an iso-signal intensity compared with other muscles.

Since the urinary output of the patient was normal, he did not receive intravenous saline infusion. At least 3 lt/day of oral isotonic liquid and resting of the affected muscle group were prescribed. On day 6 post-exercise the musle swelling and on day 15 the myalgia subsided. On day 20 he restarted statin use (10 mg/day) and on day 30 post-exercise he returned to his usual sports activity level.

Discussion

In this case, MK presented with classic signs of rhabdomyolysis. He had secondary factors that could exacerbate exercise muscle damage such as use of statin, prolonged exercise in a hot and humid environment, insufficient fluid consumption during exercise, use of alcohol and excessive eccentric exercise of the adductor muscle groups.

In this case, strenuous exercising seems to be the primary factor inducing this condition. However, other peers (15 person) participating in the same hiking activity did not present with similar complaints and none of them used statins. This is why the use of statins may be an underlying cause. The other members of the hiking group were subject to the same climatic conditions and similar fluid uptake levels. The difference may be due to use of statins. Use of statin is reported to increase the impact of the exercise (Thompson et al., 2003; Thompson et al., 1997). There are hypotheses about statins and the mechanism that causes rhabdomyolysis (inhibition of the synthesis of CoQ10, isoprenylated proteins and cholesterol), but this mechanism could not be elucidated (Pasternak et al., 2002; Sinzinger et al., 2002; Thompson et al., 2003). About the effects of eccentric exercises on muscle damage the following can be said: upward and downward running/walking (mountain hiking) can be given as examples of eccentric exercises of the lower extremities, especially the leg muscles. Straight walking and slight ups and downs (inclinations) do not put much weight on the adductor muscles. The quadriceps, hamstrings and the gastrocnemius-soleus muscles assume the actual weigt under the above conditions through concentric and eccentric contractions.

On the return, MK said he had to descend a very steep section of 7 km they had never passed before and he had to move his body sideways to align it with his steps. To balance his body during the descent he had to move one leg after the other to the sides away from his upper body, whereby the adductor muscles were contracted eccentrically. This explains why the adductor muscles had been affected.

Eccentric muscle damage response can be more stressed in individuals that are susceptible toward exertional rhabdomyolysis (high responders). As a result of eccentric exercise per se (in the elbow flexor muscle group) CK levels can be as elevated as during rhabdomyolysis, (range: 55-80550 IU/L, mean:7713 IU/L on 4rd day) however the renal system may not be affected (Clarkson et al., 2006).

In our case, we did not find any evidence of renal insufficiency as can be seen from his stable creatinine values (Table-1). It is difficult for the amount of myoglobin released from the muscles in localized cases to induce severe renal insuffiency. Probably, the small mass of affected muscle is not sufficient to produce renal damage.

Until to date, three localized rhabdomyolysis cases were defined. In the first, Bolgiano (1994) reported a case of localized acute rhabdomyolysis (40 y, male) following a session of weight-lifting. The subject had severe pain of the biceps muscle. He denied use of anabolic steroids or other drugs. The total serum creatine kinase level was 76,080 IU/l. He did not develop renal failure and his symptoms resolved after two weeks. Bolgiano's case report did not discuss the use of any imaging technique.

Goubier (2002) reported bilateral rhabdomyolysis of the long head of the triceps following intensive exercise in a 30 year old male weightlifter. In this case, the patient did not have any of the risk factors for rhabdomyolysis. Total serum creatine kinase level was 13260 IU/L. Renal function was normal and there were no biological signs of dehydration. MRI (magnetic resonance imaging) showed a hyperintense signal over the long head of the left triceps.

The last report of localized rhabdomyolysis was an unusual case of a 54 year-old man in the left soleus muscle induced by a lightning strike (Watanabe et al., 2007). Partial and thick burns were presented on the right side of the head and the dorsal aspect of the left foot. Total serum creatine kinase level was 29304 IU/L. No signs of acute renal failure were seen. T2-weighted images showed a high intensity only in the left soleus muscle with light swelling and subcutaneous edema of the medial calf. Tc-99m HMDP scintigraphy showed abnormal uptake only in the left soleus muscle. On day 9 biochemical markers and soreness of left calf were negative.

Conclusion

In summary, exertional rhabdomyolysis localized to one muscle is not a rare condition. Statin use can be one of the causes of the rhabdomyolysis following a strenuous eccentric exercise. Clinicians should be aware of present observations when considering the significance of acute CK elevations in patients on statin treatment.

MRI imaging can be useful for a regional evaluation of the affected sites. In the absence of complications, complete rest to the affected muscle and maintenance of adequate hydration until the disappearance of clinical and biochemical abnormalities can be sufficient for recovery.

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Key points

- Statin use can be one of the causes of the rhabdomyolysis following a strenuous eccentric exercise.
- Elevated CK levels and MRI imaging are important for the diagnosis.
- The treatment consists of complete rest and adequate hydration.

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