Rhabdomyolysis caused by knee push-ups with whole body electromyostimulation

Introduction

A 37-year-old woman visited the emergency room with complaints of swelling and pain in both upper arms, having started whole body electromyostimulation training 12 days earlier. She had noticed the arm swelling 3 days before admission. There was no evidence of erythema, local heating, or vascular or neurological abnormalities. Palpation revealed slight swelling and tenderness in both arms. She was admitted for the treatment of rhabdomyolysis and discharged uneventfully on her fourth hospital day.

Discussion

Electromyostimulation training (voluntary exercise combined with electromyostimulation) has been used to prevent muscle atrophy and restore injured muscle function (Lake, 1992). Although there are no significant differences in muscle strength acquisition between electromyostimulation training and voluntary exercise, similar muscle strength can be acquired with a lower workload during electromyostimulation training. Therefore, electromyostimulation training can be a useful method of exercise when time is limited (Currier and Mann, 1983).

However, electromyostimulation can induce muscle damage via similar mechanisms to those of voluntary exercise in experimental models (Jubeau et al, 2008; Nosaka et al, 2011). In addition, several cases of rhabdomyolysis after whole body electromyostimulation have been reported (Kastner et al, 2015; Kemmler et al, 2015).

The patient in this case performed exercises involving a reduced workload (i.e. 60 knee push-ups within 20 minutes). This case shows that electromyostimulation training can induce muscle damage even in light workload exercises.

There are several points to consider regarding electromyostimulation training. First, although the muscle damage caused by electromyostimulation training was higher than that seen with voluntary exercise, there were no differences in muscle soreness (Black and McCully, 2008). Therefore, the untrained person might not recognize the complications caused by muscle damage. Second, rhabdomyolysis induced by exercise has a low potential to cause serious complications in a healthy person (Landau et al, 2012). However, if the patient has an underlying disease such as diabetes, hypertension or chronic renal failure, severe complications such as acute renal failure might occur. Therefore, if muscle pain, muscle swelling and dark-coloured urine develop after electromyostimulation training, patients should be evaluated for complications such as rhabdomyolysis.

Since electromyostimulation training is widely used for fitness purposes, appropriate protocols for training and instruction by an experienced trainer are recommended to prevent complications. BJHM

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CASE REPORT

A 37-year-old woman visited the emergency room complaining of swelling and pain in both arms. She had started whole body electromyostimulation training 12 days beforehand, to lose weight. Her body weight was 73.15 kg, height was 155.9 cm, and body mass index was 30.1 kg/m^2. The whole-body EMS machine, Miha Bodytec (Bodytec Gmbh, Augsburg, Germany), was used during electromyostimulation training under the supervision of a certified instructor. Bipolar electric current was applied to eight muscle groups (both upper arms, chest, abdomen, upper back, lower back, latissimus dorsi, buttocks, both upper legs) with a frequency of 85 Hz with 6 s movement under stimulation and then 4 s rest.

During the first session, she did two sets of 15 knee push-ups over 20 minutes. She took a day off after the first session. At the second session, she increased the number of knee push-ups to 30. After the second session, she stopped training because she felt muscle soreness in both arms. Her arm pain continued for 10 days. She had noticed arm swelling 3 days before admission.

She had no specific past medical history, no medication history and no family history of myopathies. In addition, she had not experienced previous episodes of post-exertion severe muscle pain or swelling.

Her blood pressure was 115/71 mmHg, pulse rate 71 beats/min, respiratory rate 18 beats/min, and temperature 37.1°C. Her upper extremities were swollen from the upper arms to the wrists. Muscle soreness had improved slightly compared with that experienced 10 days before admission. However, it was not relieved completely, and palpation revealed mild tenderness in both arms. No mass was palpated. No skin colour change or local heating sense was found. Vascular and neurological examination of both arms revealed no abnormalities.

Laboratory examination of the blood showed elevated levels of creatine phosphokinase (5387 IU/litre), myoglobin (264 ng/ml), lactate dehydrogenase (299 IU/litre), alanine aminotransferase (120 IU/litre), and aspartate aminotransferase (118 IU/litre) (*Table 1*). Serum creatinine was 51 µmol/litre, and urine analysis was in the normal range. X-ray examination of the upper extremities and chest showed no abnormalities. The patient was admitted for conservative treatment of rhabdomyolysis, which included intravenous and oral hydration therapy.

Following treatment, her creatine phosphokinase level decreased to 922 IU/litre and her serum creatinine level was 50 µmol/litre. She was discharged uneventfully on her fourth hospital day.