Exertional rhabdomyolysis in a 21-year-old, healthy female after performing three sets of the biceps curl exercise to failure with 30% 1RM: A case report

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Exertional rhabdomyolysis in a 21-year-old, healthy female after performing three sets of the biceps curl exercise to failure with 30% 1RM: A case report.

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Abstract

Background: The optimal resistance training program to elicit muscle hypertrophy has been constantly debated and researched. Although, 3-5 sets of repetitions at 70-80% of the 1-repetition maximum (1RM) have traditionally been used (6, 14) with bouts of high versus low intensity, the optimal protocol has been argued for decades. In the current study, the subject was diagnosed with exertional rhabdomyolysis after performing three sets of 10 repetitions with 70% 1RM resistance training. The subject completed a total of 343 sets of high-intensity, low-volume resistance training and was instructed to stop when they felt ready and were no longer able to complete the next consecutive repetition. The subject was then familiarized with the study protocol and given an overview for clinicians. The authors declare to have no conflicts of interest.

Case Report: Reviewed were the events leading up to and throughout the diagnosis of exertional rhabdomyolysis in a healthy, recreationally trained 21-year-old female that was enrolled in a study that compared acute inflammatory cytokine responses at baseline, low-intensity versus high-intensity, low-volume versus high-intensity, low-volume, resistance training. The subject was instructed to complete three sets of 10 repetitions with 70% 1RM resistance training visit (30% 1RM) and was briefly hospitalized and then discharged from the emergency room. The attending physician encouraged her to seek further testing and monitoring. Therefore, later on the 3rd day post-exercise (E), the subject received medical attention, which included a physician consult and a routine antecubital venipuncture blood draw. After receiving initial medical attention, she was sent home with instructions to take acetaminophen (rather than aspirin, ibuprofen, or naproxen) and drink plenty of water and await her blood test results. Several hours later, she was called and informed that her blood test results were available. The subject was then discharged from the emergency room, where she received two saline bags intravenously. Her CK concentration was tested again and reported at approximately 12,400 U/L. However, her kidney function, as indicated by blood urea nitrogen (BUN), creatinine, sodium, and potassium concentrations (still awaiting report from the hospital), was normal. Furthermore, her urine sample was not discolorated or darkened. Therefore, after being informed of this, the subject continued to follow up with her attending physician and self-reported that her CK levels returned to “normal” levels (Figure 3). Figures 2a and 2b show the echo intensity (EI) and muscle thickness data (cm) of Figure 1.

Figure 1. Case report timeline.

Figure 2. Bar graphs of the echo intensity (EI) and muscle thickness (I) measurements at various time points before and after the resistance exercise training.

Discussion

The subject of this case report is a 21-year-old, healthy female. She was accustomed to regular resistance and cardiovascular exercise, and she exhibited no unusual, predisposing risk factors for rhabdomyolysis. She had not been taking any nutritional supplements or regular medications. Yet, she was diagnosed with rhabdomyolysis after completing 3 sets of low-load, high-repetition, bilateral dumbbell bicep curl exercises with 30% 1RM (3 kg) for 144 total repetitions. As a result, her CK concentrations peaked at about 12,200 U/L. Other cases of rhabdomyolysis have been reported at concentrations of approximately 60,000 U/L or up to 200,000 U/L (2, 12, 13, 15). However, in this case the CK concentrations peaked at about 12,200 U/L. This subject's health was compromised. Our hope is that this information can be used to promote safe resistance exercise, even when the risk of exertional rhabdomyolysis in a healthy, young woman may seem relatively low. Low-load, high-repetition resistance exercise is performed with low weight, but when performed to failure, the time the muscle is under repeated tension is greater than the total work performed by the muscle is much higher than traditional, high-load, low-repetition resistance exercise (i.e., 3 sets of 10 repetitions) (20). It should also be noted that the subject had already performed 3 sets of 10 repetitions at 70% 1RM resistance exercise at a to greater length produce more muscle damage (15). This could have affected our subject as the elbow stabilizer ensured she completed the full range of motion of the elbow joint. In conjunction with our previous studies on this topic (10, 11, 13), this is the first study to approximately 48 subjects to be diagnosed with exertional rhabdomyolysis, but the fact that rhabdomyolysis is a possible outcome for an otherwise healthy, young woman is enough to warrant caution in prescribing this type of resistance exercise. Even when, low-load, high-repetition resistance training is used; similar muscle hypertrophy as traditional, high-load, low-repetition training the additional work performed by the muscle may cause significant cell damage. The subject did not report any history of exercise profession or awareness of this risk to hopefully avoid the outcome of exertional rhabdomyolysis. Conflict of Interests: The authors declare no have for this case report. Acknowledgments: The authors of this study would like to thank the subject for her willingness to share her experiences and medical information necessary to document this case report.

Figure 3. Ultrasound images taken pre-exercise (A), immediately post-exercise (B), four days post-exercise (C), 6 days post-exercise (D), 7 days post-exercise (E), 8 days post-exercise (F), and 14 days post-exercise (G).