



Case Study

Effect of pain-free range exercise on shoulder pain and range of motion in an amateur skier

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Abstract. [Purpose] This study prescribed pain-free range exercises for a female amateur skier who complained of limitations in her shoulder range of motion, and pain caused by protective spasms; the tester evaluated the effects of such exercise on pain. [Subject and Methods] A 23-year-old female who complained of pain of 3 weeks in duration in the right glenohumeral and scapulothoracic joints was enrolled. [Results] After pain-free range exercises, the visual analog pain score was 2 and the shoulder flexion and abduction angles improved compared to the initial values. [Conclusion] Thus, this study suggests muscle-strengthening exercises within the pain-free range, rather than simple pain treatments, as therapy for acute muscle injuries in skiers.

Key words: Acute injuries, Pain-free range exercise, Skiers

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INTRODUCTION

Injuries occurring during skiing involve not only the lower but also the upper extremities¹⁾. Epidemiological data suggest that upper-body injuries account for 30–50% of all skiing injuries, and upper-extremity injuries for 20–35%¹⁾. The most common fracture among skiers is that of the clavicle, and the most common dislocation is that of the glenohumeral joint²⁾. The upper extremities engage in defensive mechanisms, protecting the trunk when the body falls²⁾. Some studies have suggested that the proportion of upper-extremity injuries increases over time^{1, 2)}. Skiing is associated with frequent falls³⁾. As a result, many shoulder muscles are subjected to continuous stress⁴⁾, which, if continuous, triggers responses such as protective muscle spasms^{3, 4)}. Excessive spasms can limit the range of motion (ROM) and cause serious muscle pain⁵⁾. In this study, the tester prescribed pain-free range exercises to a female amateur skier who complained of shoulder limitations in range of motion and pain caused by protective spasms. This study explored whether such exercise improved pain.

SUBJECT AND METHODS

A 23-year-old female who complained of pain in the right glenohumeral and scapulothoracic joints, developing 3 weeks prior, was enrolled. The study purpose and methods were explained to the subject, who provided informed consent according to the principles of the Declaration of Helsinki before participating. The subject was a female amateur skier aged 23 years, and was radiographically free of shoulder bone fractures or ligament injuries. However, she complained of pain (corresponding to a visual analog scale [VAS] score of 9) in the posterior deltoid area, and exhibited shoulder ROM limitations on initial evaluation; shoulder flexion and abduction were 40° and 70°, respectively. Because of her severe pain, she felt that massage and manipulation therapy were inappropriate. Also, she could not perform ROM exercises. During the first 2-week session, pain control featured application of hot packs, electrical therapy, and ultrasound. As a result, the VAS score fell to 8, but no significant changes were observed in ROM; shoulder flexion and abduction were 45° and 75°, respectively. Thus, the earlier treatment was discontinued and pain-free range exercises newly prescribed for 3 weeks. The subject attached a 3-kg sandbag

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to each wrist, and performed shoulder flexion and abduction within the range 0–45°, and semi-wall push-ups $\leq 90^\circ$ in terms of elbow flexion and $\leq 45^\circ$ in terms of shoulder flexion. Each sub-exercise was performed 20 times, and three sets of each sub-exercise were required over a 3-week period.

RESULTS

After pain-free range exercise, the VAS score was 2. Both shoulder flexion (175°) and abduction (180°) improved compared to the initial values.

DISCUSSION

More skiers complain of pain in excessively tense muscles caused by overloading of those muscles, or by exercise of defensive mechanisms associated with skiing, than of pain caused by serious skiing injuries (bone fractures and ligament problems)^{1–3}. This study considered that our patient should not be treated, initially, with massage or manipulation therapy because of her severe pain, and because she could not perform ROM exercises⁵. She did not complain of pain while performing pain-free range exercises. After these exercises, the VAS score was 2, and both shoulder flexion and abduction improved compared to the initial values. As the subject could exercise without pain, the treatment may have been rapidly effective. In addition, muscle-strengthening exercise within the pain-free range may have rapidly reduced hypertonus, maintained muscle strength around the affected region (which could have become weakened during recovery), and played a role in minimizing the decline in shoulder ROM (which could have occurred during recovery). In addition, the semi-wall push-up exercises may have strengthened the serratus anterior muscle and improved scapular stability. Therefore, this study recommends that muscle-strengthening exercises within the pain-free range, rather than simple pain treatments, should be used to treat acute muscle injuries in skiers. In addition, future studies should consider relationships between shoulder injuries and skier ability, physical strength, the equipment used, and environmental elements.

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