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Rehabilitation of a College Football Player Following a Scapular Fracture with Suprascapular Neuropathy

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Abstract

Scapular fractures tend to occur at an infrequent rate, 0.7% of all fractures, and typically occur due to high-velocity trauma. Secondary pathology from a scapular fracture can include neurovascular injury to structures around the shoulder. To document a case of secondary neuropathy following a scapular fracture in an American Football college athlete. This case study documents the successful return to sport following a seven-month rehabilitation program of a college football player who sustained a scapular fracture with suprascapular neuropathy. Protecting the fractured scapula was the initial goal. Therapeutic exercise and manual therapy focused on improving scapula stabilization, rotator cuff strength, and function. Finally, a return to play program was introduced to prepare the athlete to return to the field. Seven-month post-injury, the athlete returned to play without restrictions after full strength returned. Secondary neuropathy following a scapular fracture resulted in prolonged weakness of the rotator cuff muscles and impaired scapular stability and scapulohumeral rhythm. These impairments affect an athlete's ability to protect them from high-velocity impact. Therefore, the athlete should not be allowed to return to play until these impairments are addressed.

Keywords: Scapular fracture; Suprascapular neuropathy; Athletic training; Physical therapy; American football

Case and Methods

Scapular fractures originate from a high impact trauma and account for 1% of all skeletal fractures [1]. Because of edema, a secondary injury such as a suprascapular neuropathy (SSN) can also occur following a traumatic scapular fracture [2]. According to Freehill, Shi, Tompson, & Warner, suprascapular nerve injuries account for 2% of all shoulder pathologies [3].

SSN can occur while performing overhead repetitive activities. SSN also reports in athletes participating in sports such as basketball, football, and wrestling due to excessive and traumatic contact both with other individuals and with the ground/mat [3]. Research by Jackson DL et al. supports that a suprascapular nerve injury exacerbates the scapular fracture and leads to severe shoulder dysfunction, which includes pain, weakness, and impaired scapulohumeral rhythm and glenohumeral instability [4]. Moreover, Jackson DL et al. conclude that suprascapular neuropathy may be misdiagnosed as a rotator cuff injury due to loss of motor function and stability of the Gleno-Humeral joint (GH) [4].

The patient is a 20-year-old male American college football player diagnosed with a scapular fracture coinciding with SSN. The patient injured his shoulder while tackling with an outstretched arm. And, a large contingency of athletes assisted the tackle resulting in a large pile-on. The patient reported a history of instability with dislocation of his right shoulder.

On-the-field examination revealed severe pain with Active Range of Motion (AROM) and Passive Range-of-Motion (PROM) of the Gleno-Humeral (GH) joint, muscle spasm of the left upper and middle trapezius muscles, and intact light touch sensation and circulation in the left upper extremity. The athlete did not return to play on the day of the injury.

Initial differential diagnosis by the athletic trainer included anterior GH subluxation, shoulder sprain/strain, and scapular fracture. Two-day post-injury evaluation performed by the team orthopedic surgeon found moderate pain (4 out 10), tender to palpation over the left scapula, and an active shoulder elevation limited to 45 performed with excessive scapular elevation.

The patient was unable to perform isolated active shoulder external rotation at 0° of abduction without an increase in pain. Standard radiographs revealed a non-dislocated fracture of the body of the left scapula just inferior to the spine. The team physician diagnosed the patient with SSN due to poor active shoulder elevation and lack of active shoulder External Rotation (ER) without an increase in pain and without an electromyogram or a nerve conduction study.

The patient wore a shoulder sling and performed shoulder elevation AROM to 90° to protect the fractured scapula and to maintain some mobility in the GH joint for two weeks. To improve Range of Motion (ROM) and motor unit recruitment while continuing to protect the injured scapula, the following two weeks allowed for Active-Assisted Range of Motion (AAROM) and submaximal isometric exercises of the shoulder. After four weeks, radiographs showed complete healing of the scapular fracture. The intervention now incorporated manual therapy to improve PROM and AROM shoulder exercises. This intervention regiment included resistance band exercises for the

shoulder with internal and external rotation performed at an abduction of 0°.

At week 8, shoulder internal and IR and ER external muscular performance exercises progressed to 90° of shoulder abduction. To continue to improve shoulder strength and stability, upper extremity (UE) closed chain exercises, such as wall push-ups progressed to floor push-ups, were introduced. At week 12, to improve power and explosiveness, UE plyometric exercises were initiated. These exercises integrated bilateral and single arm medicine ball wall slams at different shoulder ROMs, plyometric push-ups, and upper extremity ladder drills (Table 1).

At week 20, as shoulder strength and stability improved, a return to sport program was instituted. This program included drills using football blocking sleds and tackling dummies. The rehabilitation routine is consistent with other reported non-operative scapular fracture and suprascapular neuropathy cases [1,4].

Weeks	Treatment
0-2	•AROM shoulder elevation to 90° (hand to forehead)
	•Left upper extremity in sling
	•Modalities for pain and swelling
2-4	•AAROM shoulder elevation
	•Isometric shoulder exercises in all planes
	•Sling discharged after week 2
4-8	•Manual therapy to increase shoulder and scapular motion
	•AROM shoulder exercises all planes
	•Band exercises (IR/ER) at 0° of abduction
	•Core and aerobic conditioning
8-12	•Scapular and shoulder resistance training with IR/ER exercises at 90° of abduction and specific eccentric rotator cuff exercises
	•Manual scapular stabilizing techniques
	•Closed-chain upper extremity exercises
12-20	•Initiate upper extremity plyometric program
	•Continue rotator cuff and general shoulder girdle strengthening program
	•Progress to normal resistance training program
20-28	•Return to sport protocol
Note: AROM: Active Range of Motion; AAROM: Active-Assisted Range of Motion; IR: Internal Rotation; ER: External Rotation	

Table 1: Summary of rehabilitation program.

Discussion and Conclusion

Although results vary based on type and significance of injury, the duration of the rehabilitation program of this case was lengthier than reported cases of an isolated non-surgical scapular fracture or suprascapular neuropathy [5-9]. Healing the scapular fracture and reducing pain and inflammation was the initial focus of the patient's recovery. The patient was pain-free at rest and without noticeable muscle spasms or edema one week following the injury.

At week 6 of the rehabilitation program, patient regained full pain-free PROM and AROM of the shoulder complex; and, at week 12 he demonstrated 5 out of 5 shoulder strength except for ER at 0° and 90°, for which pain was recorded as 4 out of 5. Normal scapulohumeral rhythm was observed at week 16 and the last in which 5 out of 5 shoulder ER strength was achieved at week 28. The patient returned to play without restrictions at week 29, which allowed his full participation in the following spring's football practice.

In isolation, scapular fractures and suprascapular neuropathy are uncommon in the field of sports medicine. Additionally, secondary scapular neuropathy following a traumatic scapular fracture is not well documented, and this is the first known published case documented with an athlete.

Solheim and Rosas describe an individual suffering from secondary suprascapular neuropathy following a fracture of the scapular notch caused by a motor vehicle accident [10]. The patient suffered from pain, weaknesses, and impaired mobility of the shoulder complex for 20 months before surgery was performed to decrease compression of the suprascapular nerve [10]. Although pain was reduced following surgery, the patient continued to demonstrate symptoms for several months [10].

A more recent study by Chan et al. documents an industrial accident involved a building worker who sustained multiple injuries, including a head injury and a contusion of the left shoulder when a steel plate fell on him [11]. Computed tomography revealed multiple

scapular fractures, nerve conductions studies (NCS) showed suprascapular nerve latency, and Electro-Myo-Graphy (EMG) confirmed active denervation change of the supraspinatus and infraspinatus muscles two weeks following the injury [11]. This case did not report its rehabilitation process or its patient's outcome [11].

Because of several distinguishing factors, the current case had better outcomes than the two previous cases identified in the literature. First, the patient had a single, non-displaced fracture of the scapula, which healed without further complications. Second, the patient was pain-free one week following the injury. Third, the patient is a college athlete and in excellent health without comorbidities. Furthermore, as a collegiate athlete, the patient had daily access to healthcare professionals that facilitated the rehabilitation process. Although his injury was not as disabling as in the other cases, it took seven months for the patient to return to prior level of functioning.

The lack of diagnostic tests (NCS and EMG) to confirm a suprascapular nerve injury was the major limitation with this case study. Because of the slow and steady improvement of the injury and lack of pain experienced by the patient, these diagnostic tests were not ordered. As reported in Solheim and Rosas, these tests are not always accurate, especially when the EMG examination concluded negative results 15 months following the injury [10].

Conclusion

Rehabilitation guidelines for an individual who suffered a scapular fracture with secondary suprascapular neuropathy are scarce, especially in sports medicine literature. A rehabilitation guideline must initially allow the scapular fracture to heal. The protocol includes progressive manual therapy and therapeutic exercise program improving the ROM, strength, stability, and power of the shoulder complex, thus allowing a safe return to sport. Non-operative treatment of a secondary suprascapular neuropathy following a traumatic scapular fracture in a collegiate football player can be successful. However, the duration of the post-injury protocol may take several months, and, early recognition of signs and symptoms of neuropathy is critical.

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