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Case report: Reversible isolated infraspinatus weakness due to traumatic posterior shoulder instability

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Abstract
We report a case of isolated infraspinatus atrophy due to posterior instability of the shoulder after a traumatic fall. Once the glenohumeral joint was stabilized, the patient improved clinically and electrodiagnostic studies normalized. This may be a missed pathologic entity due to the infrequent nature of this type of problem.

Keywords: isolated infraspinatus weakness due, shoulder instability, electrodiagnostic

Introduction
Supraspinatus nerve entrapment at the suprascapular notch was first described in 1963 by Kopell and Thompson. Not until 1981 was a second point of entrapment described at the spinoglenoid notch by Ganzhorn. Reported sources of entrapment at the spinoglenoid notch have been related to fracture, ganglion, and mechanical traction. Entrapment of the suprascapular nerve (SSN) is an acquired neuropathy secondary to compression of the nerve, more commonly at the bony suprascapular notch, and less frequently at the spinoglenoid notch (Luo, Hsu *et al*. 2002) [6]. At the spinoglenoid notch, the SSN enters the infraspinatus fossa to innervate the infraspinatus muscle. Previous reports have described entrapment in association with ganglia, stab wounds, hypertrophied spinoglenoid ligament and idiopathic causes (Demirhan, Imhoff *et al*. 1998, Fernandes and Fernandes 2010) [2, 3]. However, there has not been a reported case of isolated infraspinatus weakness due to posterior shoulder instability due to an incompetent posterior labrum. Herein we describe a case of isolated infraspinatus weakness from traumatic posterior shoulder instability that improved clinically and by electromyographic (EMG) evaluation after arthroscopic stabilization.

Case Report
A 34 year old, right hand dominant male slipped and fell with his arm in an extended position. Subsequently he had shoulder pain with range of motion and weakness. One month later he presented to the office, atrophy of the infraspinatus was noted with pain upon abduction, forward flexion of the shoulder, and external rotation. Objectively he had 90 degrees of forward elevation, and 30 degrees external rotation with pain. Internal rotation was to L4 with a positive lift-off test and belly test. Furthermore, he had a positive posterior drawer and jerk test. He denied complaints of numbness and there was no Horner's sign. A magnetic resonance imaging (MRI) scan of the right shoulder was performed. There was minimal signal change of the entire infraspinatus muscle without abnormality of the spinoglenoid notch or quadrilateral space. A posterior labral tear was identified (Figure 1). A MRI of his cervical spine was negative for pathology. A nerve conduction study revealed decreased amplitude in the SSN innervating the infraspinatus, distal to the spinoglenoid notch (Table 1).
After failure of conservative treatment, the patient underwent posterior labral repair. Diagnostic arthroscopy of the glenohumeral joint did not reveal evidence of articular damage. The labrum was intact anteriorly and anterior-inferiorly. However, posteriorly, there was evidence of labral detachment and with posterior instability (Figure 2). The labrum was then repaired, and the capsule was shifted superiorly and medially stabilizing the glenohumeral joint. Postoperatively the patient was immobilized in a sling for four weeks, then physical therapy was initiated.

Improvement in his range of motion, and decreased pain was noted. Furthermore, the infraspinatus muscle had regained its bulk. A nerve conduction study performed 22 weeks after his procedure revealed normal amplitude and latency of the SSN innervation of the infraspinatus muscle.

Discussion

The infraspinatus supplies 90% of the external rotation power of the shoulder, therefore, residual weakness due to SSN entrapment may preclude the return to pre injury activities (Luo, Hsu *et al*. 2002) [6]. Entrapment of the SSN at the spinoglenoid notch is much less common than SSN at the suprascapular notch. A few clinical cases have been reported in association with ganglia, hypertrophied spinoglenoid ligament, stab wounds, and idiopathic causes. Furthermore, the inferior transverse scapular ligament or SGL has been described in volleyball players, throwing athletes and weight lifters (Ferretti, Cerullo *et al*. 1987; Demirhan, Imhoff *et al*. 1998; Ferretti, De Carli *et al*. 1998; Contemori and Biscarini 2019) [4, 2, 5, 1]. We report another possible explanation for isolated infraspinatus weakness-posterior instability of the glenohumeral joint.

Glenohumeral instability is common, affecting approximately 2% of the general population. However, posterior instability occurs in 2%-5% of this population with shoulder instability. Trauma is thought to be the underlying cause in approximately half of patients with posterior instability (Millett, Clavert *et al*. 2006) [7]. In a cadaveric study it was reported that the spinoglenoid ligament inserts into the posterior capsule and the ligament tightens with cross-body adduction and internal rotation such as follow through phased of throwing a ball or serving, compressing the nerve (Demirhan, Imhoff *et al*. 1998) [2]. Furthermore, with extreme abduction and full external rotation the medial tendinous margin of the infraspinatus and supraspinatus can impinge strongly against the lateral edge of the scapular spine, compressing the infraspinatus branch of the SSN (Sandow and Ilic 1998) [9]. We suspect the patient in this case report essentially sustained a traction injury of the SSN distal to the spinoglenoid notch due to recurrent posterior instability. Based on the cadaveric study by Demirhan *et al*., it is possible the spinoglenoid ligament tightens when a posterior force is placed on the capsule thus compressing the SSN. In this case report, posterior stabilization of the glenohumeral joint with capsular-labral repair, improved the patient's symptoms subjectively and objectively.

In conclusion, we report a case of isolated infraspinatus atrophy due to posterior instability of the shoulder after a traumatic fall. Once the glenohumeral joint was stabilized, the patient improved clinically and electrodiagnostic studies normalized. This may be a missed pathologic entity due to the infrequent nature of this type of problem.

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Table 1: Preoperative and postoperative summary of nerve conduction study results. The amplitude and latency of the suprascapular nerve innervating the infraspinatus muscle were documented. After the posterior shoulder joint was stabilized, the amplitude returned to normal.

	Amplitude (mV) (Norm)	Latency (mV) (Norm)
Preoperative	3.0 (>5)	3.0 (>4.2)
Postoperative	8.0 (>5)	3.8 (>4.2)

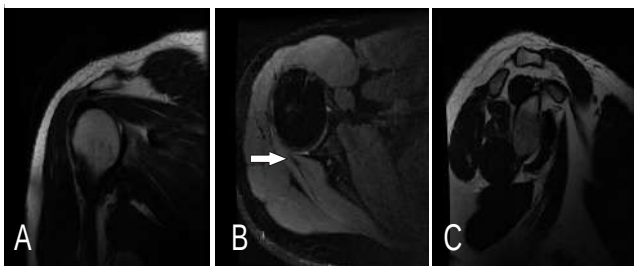

Fig 1: Representative A) coronal, B) axial, C) sagital views of the right shoulder. There is no evidence of a cyst that may be compressing the suprascapular nerve. The arrow in panel B indicates a posterior labral tear.

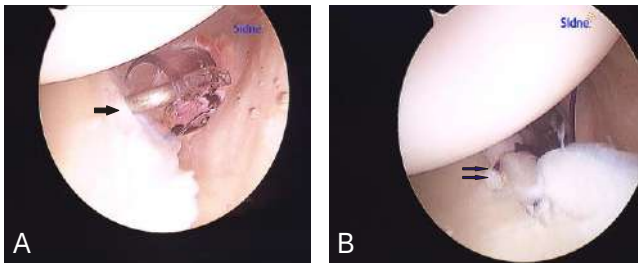

Fig 2: Intraoperative images. A nerve hook was used to assess the posterior capsulolabrum and reveals labral incompetence (single arrow) in panel A. Reestablished posterior capsulolabrum (double arrows) in panel B.

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