

Suprascapular Nerve Entrapment at the Spinoglenoid Notch By A Ganglion Cyst

A. Iossifidis¹, P. Mitra¹, M. Raza¹, N. Iossifidis²

1 Croydon University Hospital, London, UK;

2 Goldsmiths, University of London, UK.

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Correspondence to: Anestis Iossifidis, MD, FRCS Ed, FRCS Ed (orth.) Senior Orthopaedic Surgeon, Croydon University Hospital, 530 London Road, Croydon, London, CR7 7YE, UK.

Email: anestis.iossifidis@gmail.com

Telephone: +0044 (0) 7802404708

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ABSTRACT

Suprascapular nerve entrapment at the spinoglenoid notch by a ganglion cyst results in the paralysis of the terminal motor branch of the nerve, with isolated atrophy of the infraspinatus muscle, loss of strength in external rotation, and posterior shoulder pain. Increased awareness of this nerve compression is paramount in order to avoid the stage of irreversible infraspinatus muscle wasting and long term disability. Magnetic resonance imaging scan, electromyography and nerve conduction velocity studies can confirm the diagnosis and lead to an early arthroscopic nerve decompression and favorable functional results. We present a rare case of spinoglenoid ganglion cyst compression of the distal suprascapular nerve and discuss the recent developments in anatomy, aetiology, diagnosis, and review the treatment and current trends in the management of this condition.

Key words: Suprascapular nerve; Nerve entrapment; Spinoglenoid notch; Ganglion cyst

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INTRODUCTION

Suprascapular nerve entrapment (SNE) at the spinoglenoid notch (SGN) results in the paralysis of the terminal motor branch of the nerve, with isolated atrophy of the infraspinatus muscle, loss of strength in external rotation, and posterior shoulder pain. This condition is also known as infraspinatus syndrome. The compression may be secondary to a posterior ganglion cyst (PGC), spinoglenoid ligamentous dynamic compression and traction injury in sport and overuse activities^[1-3]. Spinoglenoid ganglion cyst compression of the nerve is a rare condition and was first reported in 1981^[1]. Two large magnetic resonance imaging (MRI) studies for posterior shoulder pain have reported a prevalence 1.3% to 1.5% of posterior ganglion cysts and 0.27% to 0.50% of PGC causing nerve compression^[4-5]. We present a rare case of spinoglenoid ganglion cyst compression of the distal suprascapular nerve and discuss the recent developments in anatomy, aetiology, diagnosis, and review the treatment and current trends in the management of this condition.

CASE REPORT

A 28 year old healthy male nurse presented with a six month history of insidious onset of posterior right shoulder pain. There was no history of injury. He also reported rest pain and weakness aggravated by reaching and overhead activities. On examination there was a visible isolated infraspinatus muscle wasting Figure 1, 2. Tenderness was elicited in the scapular spine area and there was a Medical Research Council Manual Muscle testing (MRC) grade 2 weakness of external rotation. Shoulder radiographs were normal. Magnetic resonance scan (MRI) revealed a 17.5 mm by 49.7 mm ganglion cyst

at the spinoglenoid notch extending in the infraspinatus fossa and signs of early denervation of the infraspinatus muscle Figure 3,4,5,6. Electromyography (EMG) and nerve conduction velocity (NCV) studies confirmed a severe block of the infraspinatus branch of the supra scapular nerve. The infraspinatus showed profuse fibrillation potentials at rest with a distal latency of 4.1 ms (3.5 ms on the left side). Arthroscopy of the glenohumeral joint showed no labrum pathology. Ganglion cyst decompression was achieved through the subacromial space Figure 7,8. Arthroscopic nerve decompression had a satisfactory outcome without complications. The patient had an uneventful recovery with resolution of pain within 8 weeks, and MRI showed no residual denervation signs. Figure 9. At 6 months, infraspinatus muscle strength had improved to MRC grade 3. At 7 months EMG and nerve studies showed significant recovery in nerve function and NCV showed no activity at rest, suggesting that full recovery was expected. At 9 months the patient remained symptom free, and had regained normal muscle strength. At 4 year follow up the patient remained asymptomatic with normal bulk of the infraspinatus muscle and normal strength of external rotation.



Figure 1 Visible isolated infraspinatus wasting within the infraspinatus fossa.



Figure 2 Comparative view with controlateral scapula.

DISCUSSION

Anatomy of the suprascapular nerve at the spinoglenoid tunnel

The suprascapular nerve is a mixed nerve with two sensory branches. Within the suprascapular fossa it gives off motor branches to the suprascapular muscle and receives sensory branches from the acromioclavicular joint, and subacromial bursa^[6,7]. Just proximal to the entrance of the spinoglenoid tunnel, it receives further sensory

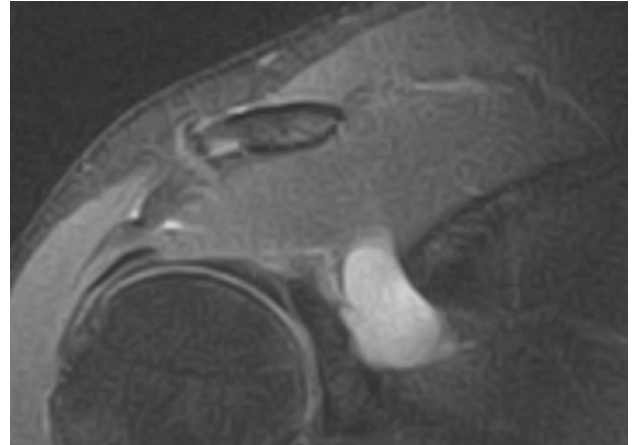


Figure 3 MRI view of the ganglion cyst at the spinoglenoid scapular notch.



Figure 4 Sagittal MRI with visible hyperintense Infraspinatus due to denervation.

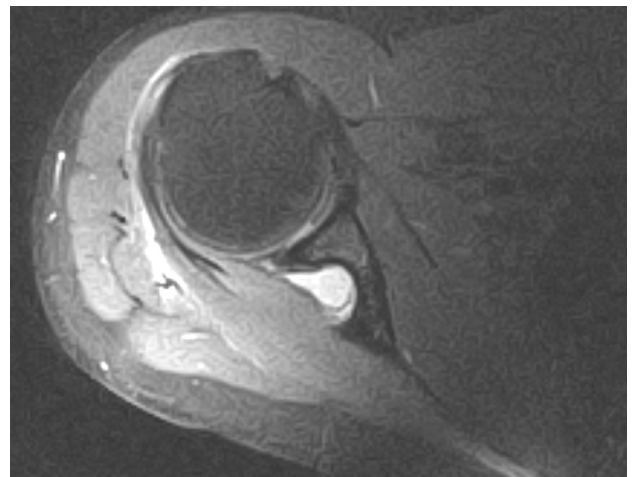


Figure 5 Axial MRI with visible hyperintense Infraspinatus due to denervation.

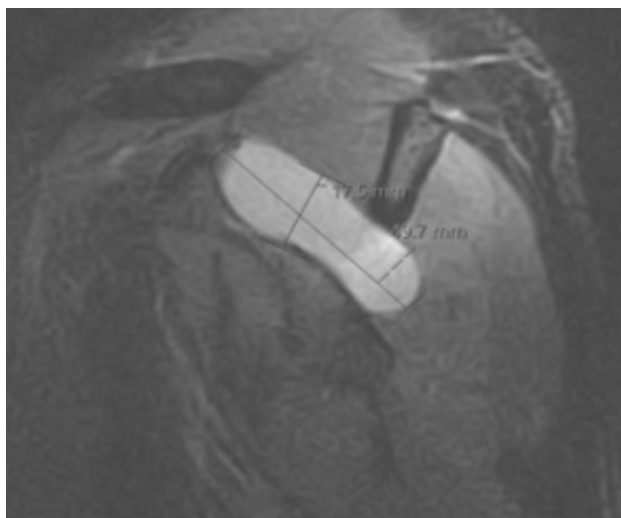


Figure 6 Sagittal MRI maximum measurements of the spinoglenoid ganglion cyst. (17.5mm x 49.7 mm)

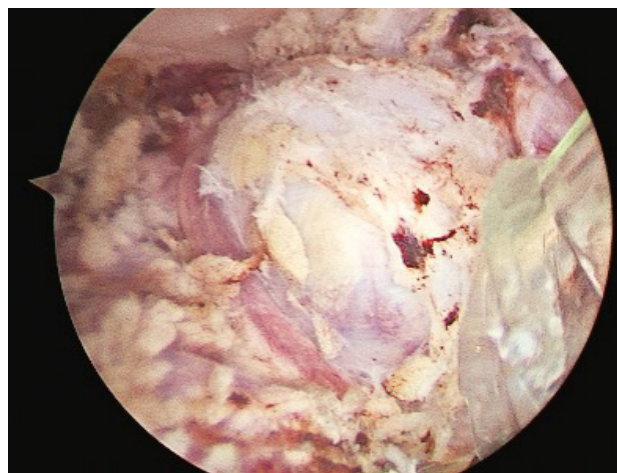


Figure 7 Subacromial view of the ganglion cyst at the spinoglenoid notch.

branches along the glenoid rim originating from the posterior glenohumeral joint capsule^[7]. The nerve continues inferiorly and passes through the fibro-osseous spinoglenoid tunnel, formed by the spinoglenoid notch medially and covered by the spinoglenoid ligament laterally. The spinoglenoid ligament attaches laterally to the glenoid rim and the posterior shoulder joint capsule. Previous studies have reported that the spinoglenoid ligament is present in 80% to 81.7% of cases^[8,9]. More recent clinical and fresh frozen cadaveric studies have shown that it is present in all cases^[10,11]. Within this tunnel the suprascapular nerve is purely motor and lies 4.6 mm from the spinoglenoid ligament^[12]. The measured distance of the nerve from the posterior glenoid rim is 18 mm with a surgical safe zone of 1cm^[13,14]. After traversing the spinoglenoid notch, the nerve makes an acute medial turn along the scapular body and supplies two or more motor branches to the infraspinatus^[14].



Figure 8 Release of ganglion cyst viscous content in the subacromial space.

Aetiology of suprascapular nerve compression at the spinoglenoid notch

Suprascapular nerve compression at the spinoglenoid tunnel results in isolated infraspinatus denervation and atrophy. Extrinsic compression is mainly due to a posterior spinoglenoid ganglion cyst (SGC). Intrinsic compression is secondary to either repetitive stretching of the nerve against the scapular spine in overuse and sport activities or dynamic ligamentous compression of the nerve^[1,2,8,11,12,14-17].

Intrinsic nerve compression by traction or entrapment

Repetitive overhead or overuse activities can damage the suprascapular nerve by traction or entrapment and result in a painless Infraspinatus atrophy as reported in 52% of female tennis players, 33% in volleyball players, 34% beach volley ball and 4% in baseball pitchers. Despite the infraspinatus atrophy, the effect on the athletes' performance is very limited^[3,18-22]. Recent studies report tightening of the spinoglenoid ligament during extreme range of motion particularly when internal rotation is combined with adduction or abduction, due to its insertion into the posterior glenohumeral joint capsule. The increased pressure within the Spinoglenoid tunnel results in a dynamic compression of the nerve^[11,12].

Traction injury to the nerve from retracted rotator cuff tears (RCT) has also been reported in 8% to 29% of cases^[16,23,24]. However, a recent study has shown only 1 neuropathy in 49 retracted RCT and found no evidence to support suprascapular nerve release in RCT^[25].

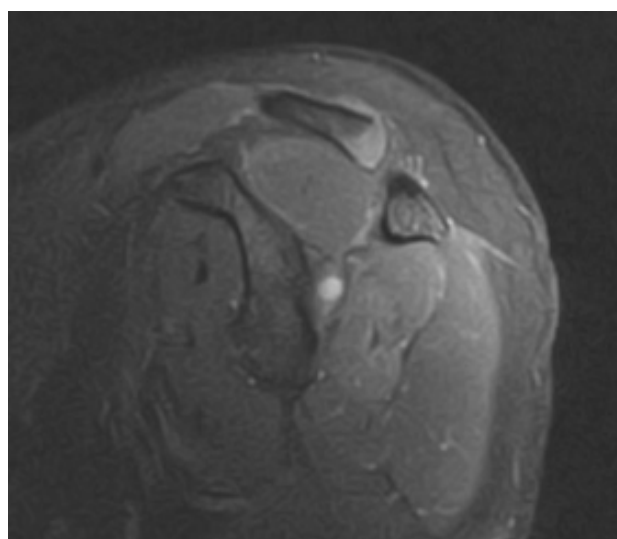


Figure 9 Sagittal MRI view at two months post cyst decompression.

Extrinsic nerve compression by a spinoglenoid ganglion cyst (SGC)

A ganglion cyst is delineated by dense fibrous connective tissue, showing characteristics of myofibroblasts^[26]. The cyst's content is very viscous and rich in hyaluronic acid and

mucopolysaccharides^[26,27]. It is formed either in isolation by myxoid degeneration of various periarticular connective tissues or by synovial fluid leak in the periarticular tissues through posterior labrum tears at the labral-glenoid junction via one-way valve mechanism^[5,12,28-31]. Posterior ganglion cysts are rare with a prevalence of 1.3%^[4,5]. Over the last 10 years, specialised shoulder units have reported a mean of 1.6 SGC per year^[11,32-36]. Cyst expansion into the spinoglenoid notch may lead to muscle denervation and isolated infraspinatus atrophy. Not all posterior ganglion cysts result in suprascapular nerve compression at the spinoglenoid tunnel. This occurs in 50% to 62% of cysts particularly when the cyst's average size is 3 cm^[4,5,36-38]. More importantly, not all cysts are associated with superior labrum anterior posterior (SLAP) tears. Although some authors have reported SLAP tears in 70% to 100% of cases^[32,34,39], most studies have showed SLAP tears in only 43% to 50% of cases^[36,38,40]. Other studies have reported only simple posterior labral tears in 48% to 55% of cases and no SLAP tears at all^[4,5,11,33].

CLINICAL DIAGNOSIS

Patients with spinoglenoid ganglion cyst compression of the suprascapular nerve, typically present an infraspinatus syndrome: insidious onset of deep posterior shoulder pain, weakness of external rotation, and visible infraspinatus atrophy. It affects the dominant side mainly in male patients under 40 years of age (mean age 31)^[37]. Different studies have reported infraspinatus atrophy present in 78% of patients and external rotation weakness present in 84% of patients^[36,41]. The cross-body adduction test and thumb pressure over the spinoglenoid notch may elicit pain and are useful diagnostic tests for suprascapular nerve entrapment at the spinoglenoid notch^[3,12]. Magnetic resonance imaging (MRI) can detect the presence, location, and size of a ganglion cyst and can stage the degree of muscle pathology. A spinoglenoid ganglion cyst appears hypointense on T1-weighted images and hyperintense on T2-weighted images^[3,4,29]. Denervation of the infraspinatus muscle may not be seen in the acute phase. In the subacute phase however, denervation is characterised by diffuse muscle oedema and hyperintense T2 signal. With chronic denervation, fatty infiltration of the muscle and atrophy develop, manifesting as hyperintense T1 signal and decrease in muscle size^[42]. However, confirmation of the diagnosis depends on electromyography (EMG) and nerve conduction velocity (NCV) studies, which may detect active denervation of the infraspinatus muscle, and delay in the conduction time. EMG confirmation is important, as the presence of a ganglion cyst does not necessarily mean that nerve compression is present^[1,28,36].

Treatment and current trends

The average time from onset of symptoms to surgery is 8 months^[36,37]. In order to avoid the stage of irreversible infraspinatus muscle wasting, early diagnosis and treatment are important^[41]. Cyst aspiration is not indicated as it carries an 18% failure rate and 48% recurrence rate^[43]. The presence of pain, weakness of external rotation and MRI detection of a spinoglenoid cyst with EMG confirmation of nerve compression should lead to prompt surgical nerve decompression. The first arthroscopic decompression of the suprascapular nerve due to spinoglenoid ganglion cyst was reported in 1996^[44]. Over the last decade, advancements in arthroscopic surgery techniques allow to treat the cause of distal suprascapular nerve compression with no morbidity. Arthroscopy can address not only the spinoglenoid ganglion cyst, but also any associated labral lesion. The Intra-articular cyst decompression can be performed through the

labrum tear followed by repair of the labrum^[30,32,36,39,45]. In the absence of labrum tear, intra-articular cyst decompression may be achieved through a capsulotomy just above the labrum^[34,40,43,46,47]. Complete removal of these cysts may not be possible by the intra-articular approach due to a restricted field, the possibility of suprascapular nerve injury, and often because of large and multilobular cysts. Some authors therefore prefer intra-articular inspection and assessment of possible labrum injury, followed by extra-articular cyst decompression under direct vision in the subacromial space^[11,38,48-52].

OUTCOMES

Previous studies have reported that treatment of a labral defect with no cyst excision had 64% satisfaction, whereas surgical decompression of the cyst and labral repair gave 96% satisfaction^[43]. More recent studies have confirmed that better outcomes are achieved with a combined treatment of cyst and labrum lesions^[32,34-36,38-40,45-52]. Outcome comparability remains problematic, due to the use of different outcome measures. Gerber *et al* (2007) in a selective nerve block study has elegantly demonstrated that isolated infraspinatus palsy led to a loss of approximately 70% of external rotation strength^[53]. Some authors have included in their results the recovery of external rotation strength and have reported 85% to 100% recovery, following cyst decompression^[11,32,36]. We believe that all future studies should include an objective measurement of the shoulder joint external rotation strength, allowing outcome comparability of various surgical techniques.

CONCLUSION

Suprascapular nerve entrapment at the spinoglenoid notch by a ganglion cyst is rare. Increased awareness of this nerve compression is paramount in order to avoid the stage of irreversible infraspinatus muscle wasting and long term disability. MRI scan, EMG and NCV studies can confirm the diagnosis and lead to an early arthroscopic nerve decompression and favorable functional results.

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