



# Neuropathy of the suprascapular nerve and massive rotator cuff tears: a prospective electromyographic study

Philippe Collin, MD<sup>a,\*</sup>, Tom Treseder, MD<sup>b</sup>, Alexandre Lädemann, MD<sup>c</sup>,  
Tewfik Benkalfate, MD<sup>d</sup>, Reda Mourtada, MD<sup>e</sup>, Olivier Courage, MD<sup>f</sup>, Luc Favard, MD<sup>g</sup>

<sup>a</sup>Saint-Grégoire Private Hospital Center, Saint-Grégoire, France

<sup>b</sup>Royal Melbourne Hospital, Parkville, Melbourne, VIC, Australia

<sup>c</sup>Division of Orthopaedics and Trauma Surgery, Department of Surgery, Geneva University Hospitals, Geneva, Switzerland; Faculty of Medicine, University of Geneva, Geneva, Switzerland; Division of Orthopaedics and Trauma Surgery, La Tour Hospital, Meyrin, Switzerland

<sup>d</sup>Clinique mutualiste la Sagesse, Rennes, France

<sup>e</sup>Clinique Saint Laurent, Rennes, France

<sup>f</sup>Hôpital privé de l'Estuaire, Le Havre, France

<sup>g</sup>Hôpital Trousseau, Chambray-lès-Tours, France

**Background:** An association between massive rotator cuff tear (RCT) and suprascapular nerve neuropathy has previously been suggested. The anatomic course of the suprascapular nerve is relatively fixed along its passage. Thus, injury to the nerve by trauma, compression, and iatrogenic reasons is well documented. However, the association between retraction of the RCT and development of neuropathy of the suprascapular nerve remains unclear.

We aimed to prospectively evaluate the suprascapular nerve for preoperative neurodiagnostic abnormalities in shoulders with massive RCT.

**Methods and materials:** A prospective study was performed in 2 centers. Fifty patients with retracted tears of both supraspinatus and infraspinatus were evaluated. This was confirmed with preoperative computed tomography arthrography, and the fatty infiltration of the affected muscles was graded. Forty-nine preoperative electromyograms were performed in a standardized fashion and the results analyzed twice.

**Results:** Of 49 shoulders, 6 (12%) had neurologic lesions noted on electromyography: 1 suprascapular nerve neuropathy, 1 radicular lesion of the C5 root, 1 affected electromyogram in the context of a previous stroke, and 3 cases of partial axillary nerve palsy with a history of shoulder dislocation. No difference or diminution of the latency or amplitude of the electromyographic curve was found in the cases that presented significant fatty infiltration.

**Conclusion:** This study did not detect a suprascapular lesion in the majority of cases of massive RCT. With a low association of neuropathy with massive RCT, we find no evidence to support the routine practice of suprascapular nerve release when RCT repair is performed.

Ethical Committee Approval No. C.0912-50.

\*Reprint requests: Philippe Collin, MD, Saint-Grégoire Private Hospital Center, Boulevard Boutière 6, F-35768 Saint-Grégoire cedex, France.

E-mail address: [collin.ph@wanadoo.fr](mailto:collin.ph@wanadoo.fr) (P. Collin).

**Level of evidence:** Level III, Cross-Sectional Design, Epidemiology Study.

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Isolated suprascapular nerve neuropathy (SSNN) is a condition that has been well documented.<sup>16,17,26</sup> Particularly associated with athletes, the condition includes acute and chronic shoulder girdle traction injuries as well as compressive lesions, such as paralabral cysts and compressive ligaments.<sup>1,15,18,27</sup> It may also occur idiopathically, either in an isolated form or in association with a plexopathy. SSNN can be associated with rotator cuff tear (RCT). In this situation, the proposed mechanism involves traction of the nerve caused by retraction of the supraspinatus against its fixed points on the suprascapular and spinoglenoid notches.<sup>2,4,31</sup> However, there is no proven “gold standard” method to determine whether SSNN is associated with RCT. Clinical diagnosis is beset with uncertainties as the potential symptoms of SSNN, namely, pain, weakness, and atrophy, are inseparable from those of RCT. Radiographic methods, especially computed tomography (CT) and magnetic resonance imaging, are often used to assess atrophy. However, there is little knowledge of the characteristic findings that would allow the separation of cuff disease from SSNN. Fatty infiltration and atrophy may be associated with both cuff failure and SSNN.<sup>11,27</sup> Electromyographic studies are often reported, even if there is significant variation in the diagnostic criteria used.<sup>3,9,19,20</sup> There is a lack of validation studies for the association of abnormalities detected by electromyography/nerve conduction study (EMG/NCS) with the diagnosis of SSNN in the setting of RCT.

Previous studies have reported a relatively high rate of SSNN in RCTs. If they are accurate, these findings may represent a significant development in the current treatment of massive RCT. Unrecognized, SSNN would be expected to significantly adversely affect the success rate of repair and may even exacerbate the pathologic process of massive RCT. Potentially, SSNN may be a causative factor in the pathophysiologic mechanism of fatty infiltration and neuropathic arthropathy.

The aims of this study were to document the prevalence of SSNN in a population of patients with massive RCT and to consider the effectiveness of release of the suprascapular nerve in management of massive RCT. The hypothesis was that SSNN associated with massive RCT is rare, and systematic release of the nerve in dealing with this condition is not routinely required.

## Material and methods

### Patient selection

Between January 2008 and January 2009, all patients who were seen for massive RCT by the authors were considered potentially eligible for inclusion in this prospective multicentric study. All patients gave a written approval according to the ethical approval agreement. The inclusion criteria were patients (1) aged 65 years or younger, (2) without previous history of shoulder surgery, (3) with a massive RCT, and (4) with a tendon retraction of grade  $\geq$ II according to Patte assessed by CT arthrography in the frontal plane (Table I).<sup>18,25</sup> Exclusion criteria were the presence of a known systemic neurologic disease, a subacromial space of  $<7$  mm as assessed by plain radiography, and radiologic signs of glenohumeral arthritis.

### Study variables

The outcome of interest was the prevalence of SSNN in the case of massive RCT confirmed by electromyography. The following baseline characteristics were assessed: age, sex, preoperative neurologic lesion, and atrophy and fatty infiltration of the suprascapularis muscle. Furthermore, SSNN was evaluated in relationship to fatty infiltration of the suprascapular muscle.

### Neurodiagnostic evaluation

Only 3 senior neurologists, blinded to the type of pathologic change, performed the electromyographic examinations, using the same method and protocol for each specific patient. The parameters that were used for the whole segment included (1) motor and sensory nerve examinations and nerve conduction velocity and (2) standard needle electromyographic examination with the patient in the sitting position by use of a concentric needle.<sup>30</sup> This included a search for abnormal spontaneous activity at rest (positive sharp waves, fibrillation potentials, complex repetitive discharge, and fasciculations), qualitative evaluation of motor unit action potentials, and recording of recruitment pattern at effort. The median and ulnar nerves were assessed bilaterally to rule out neuropathy. A vertical needle was inserted down to the bone in the supraspinatus fossa and then withdrawn slightly. The supraspinatus nerve was stimulated while the patient shrugged the shoulders. This was done to avoid interference from trapezius activity. Any abnormal activity at rest was documented. On electromyography, this included fibrillation, which indicated denervation, and high-frequency discharge potentials. Voluntary activity was evaluated with the patient attempting external rotation

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