The Effects of Suprascapular Nerve Block on Humeral Head Translation

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INTRODUCTION

Shoulder impingement and rotator cuff tears are among the most common chronic shoulder injuries in the general population [1-3]. Although there are clearly underlying biological factors involved, many clinicians feel that abnormal mechanical forces may lead to a progression from impingement syndrome, or tendonitis, to rotator cuff tears. Since patient data are rarely available before the development of rotator cuff tears, it is not known whether abnormal decentralization of the humeral head is causal or compensatory in nature. Since the suprascapular nerve innervates both the supraspinatus and infraspinatus, which functions to centralize the humeral head, a suprascapular nerve block was utilized to achieve dysfunction of these muscles. The specific aim of this study is to examine the effects of a suprascapular nerve block on superior translation of the humeral head during dynamic shoulder abduction.

METHODS

Eight healthy subjects, 5 males and 3females (age 23 ± 3.3, weight 65.8 ± 13.8 kg, height 171.5 ± 6.2 cm) participated in this study. Subjects were asked to stand while performing normal shoulder elevations in the scapular plane prior to and following a suprascapular nerve block. Scapular plane orientation was defined as approximately 30-35 degrees anterior to the coronal plane. Prior to each collection the investigator positioned the arm in the correct plane, with the help of fluoroscopic (GE (OEC) 9800) image and returned the arm to the subject's side (Figure 1). Shoulder elevation trials were collected using fluoroscopy with subjects standing at a marked position, eyes facing forward, elbow in full extension, and slight forearm pronation. The range of motion was subject dependant, but all trials began with the arm at the subject's side. Shoulder elevation trials were collected prior to and after the suprascapular nerve block. To control the velocity of motion, an audible count of four seconds (eight seconds total) was used during both shoulder elevation and depression. Each set of trials consisted of two shoulder elevation and one shoulder depression in the scapular plane.

The suprascapular nerve block was performed by an anaesthesiologist (PK). An inch above the junction of the middle and outer third of the scapular spine, the suprascapular nerve was targeted at the scapular notch. After aspiration did not result in blood, lidocaine 1.5% 1 ml was injected. A total of 100 mg of lidocaine was injected to the subject's nerve. Ten minutes following initial injection, subjects was asked to stand, and the post block trial was collected.

In order to compare pre and post block trials, humeral elevation angles for both conditions were matched by calculating the humeral angle with respect to gravity. Humeral head translation was measured using a 2-D registration technique developed by Crisco et al. [4] The measured superior humeral head translation was calculated in each humeral elevation angle with respect to the resting position, which was defined as the 0° position, arm at the side. This method of measuring humeral head translation was previously validated by the investigator with a

measured error of less than 0.5 mm. A one-way repeated measures analysis of variance (ANOVA) was used to examine mean differences between the two conditions (pre and post block).

Fig. 1. Subject set-up during testing protocol.

RESULTS

There was no statistical difference between the measured humeral head translation before and after the suprascapular nerve block ($p = 0.5$). The pre-nerve block trials shows that only at 30 degrees of arm elevation is the humeral head superiorly migrated (0.5±3.1mm) compared to the initial position. On the other hand, the post-nerve block trials showed superior migration of the humeral head at 30 (1.4 ± 3.0mm) and 90 (1.1±3.7mm) degrees of humeral elevation (Figure 2).

DISCUSSION

The result of the current study shows that there is no difference in measured humeral head translation prior to and after suprascapular nerve block. This result is in accordance with a similar study by Werner et al. [5]. The pattern of increased in humeral head superior translation seen with rotator cuff patients, was not observed in the present study. This might suggest that decrease in muscle activation of the supraspinatus and infraspinatus has no effect on centralizing the humeral head in the glenoid during arm elevation. However, care should be taken when interpreting the results of this study due to the limited number of subjects. This is an ongoing research study and the investigators are planning on testing more subjects.

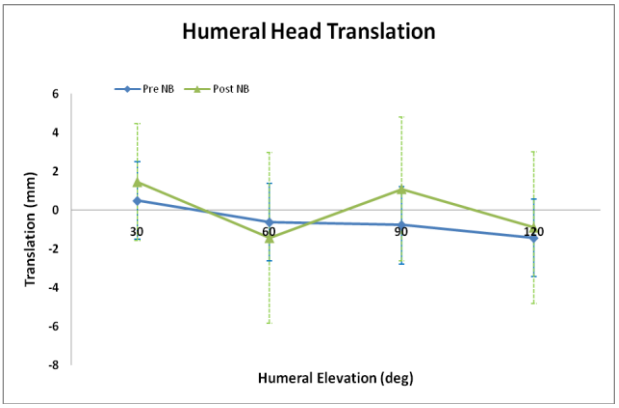

Fig. 2. Pre and post nerve block humeral head translation during shoulder elevation.

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