SUPRASCAPULAR NERVE BLOCK DISRUPTS THE NORMAL PATTERN OF SCAPULAR KINEMATICS

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INTRODUCTION

Elevation of the arm is not accomplished by the motion of a single articulation, but rather is a combination of both glenohumeral and scapulothoracic motion. Previous research has demonstrated an increase in scapular upward rotation with alterations in rotator cuff activity, either due to tears [1] or fatigue. [2] We propose the use a suprascapular nerve block as an appropriate model of dysfunction of the supraspinatus and infraspinatus. It is our hypothesis that this block will result in a compensatory increase in scapular rotations, similar to what is observed due to fatigue and rotator cuff tears.

METHODS

Ten subjects with no reported shoulder pathology successfully completed a nerve block protocol (age range 23-33). Kinematic and force data were collected prior to and immediately after a suprascapular nerve block. The 3Space Fastrak (Polhemus, Colchester, VT) was used to collect kinematic data. A thoracic receiver was placed over T3 with double sided tape, a humeral receiver was mounted on a molded cuff strapped to the distal humerus, and a scapular receiver was fixed to a scapular tracking device attached to the scapular spine and acromion. [3] Data were collected for scapular plane elevation and three scapular rotations were analyzed: posterior tilting, upward rotation, and external rotation. [3] Force production during shoulder external rotation with the arm at the side was measured with a 50 kg capacity load cell (Lebow, Troy, MI). The nerve block was performed by an Anesthesiologist (PK). After sterile prep of the skin, local anesthetic was infiltrated at a point 2 cm above the scapular spine and at the junction of the outer and middle one third of the spine. A 22 gage 5 cm insulated nerve stimulator needle was advanced to the scapular notch with 0.6 mA of current at 2 Hz. When motor stimulation was seen at current of less than 0.3 mA, 1.5 ml of 1.5% lidocaine was injected. Once repeat stimulation at 0.8 mV did not result in any muscle activity, the remaining 5.7 ml of 1.5 % lidocaine (total 100 mg) were injected and the needle was removed.

Figure 1 Photograph demonstrating the location of the scapular sensor and injection of lidocaine.

RESULTS AND DISCUSSION

There was no significant effect of the nerve block on posterior tilting and external rotation. However, for upward rotation, there was a significant effect of the block ($p = 0.009$). The amount of scapular upward rotation was found to be significantly increased due to the block at humeral elevations from 20 to 90 degrees ($p < 0.01$) (figure 2). The results of the present study are similar to changes due to cuff tears and fatigue, which also result in increases in upward rotation that peak in the mid ranges of motion. [1,2] Despite the fact that the muscles innervated by a suprascapular nerve (supraspinatus and infraspinatus) do not directly control the movement of the scapula, they appear to indirectly affect the scapulothoracic rhythm. The changes in scapulothoracic and humeral kinematics noted in the present study may lead to detrimental conditions such as a reduction in the subacromial space, mal-alignment of the humeral head and glenoid fossa, and a reduction in muscle mechanics (ideal muscle length and moment arms). Alternatively, the scapulothoracic kinematic changes might be considered beneficial as they may be compensatory motions helping to maintain joint stability.

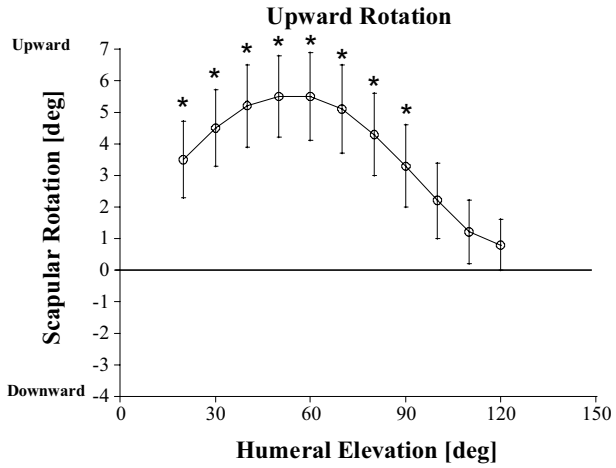

Figure 2 Changes in scapular rotations after the nerve block (Means $\pm$ SEM).

CONCLUSIONS

The results of this study indicate that abnormal kinematics patterns found in patients with rotator cuff tears may be compensatory in nature, rather than one of the underlying causes of the pathology.

REFERENCES

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