

◁자유연제 I 08:10 ~ 09:00▷

## Electromyographic Analysis of Biceps during Provocative Tests

Young-Soo Lee, M.D.\* · Dong-Bae Shin M.D.

*Department of Orthopedic Surgery,*

*Pochon CHA College of Medicine, Sungnam, Korea*

### Abstracts

The electromyographic activity of four muscles of biceps, rotator cuffs (supraspinatus, infraspinatus and subscapularis) was measured from the non-dominant shoulders of 12 volunteers during six methods of provocative test for the biceps pathology. Any method of provocative test can not isolate the biceps activity prominently compared to the other rotator cuff muscles. But the Speed test can more isolate the activity of biceps than the other tests. Based upon this study, we think that the O'Brien's test is not a provocative maneuver by which the pain reproduced is not associated with the tension generated within the biceps tendon.

=====  
Key Words : Biceps, Electromyography, Provocative tests

### Introduction

Long the neglected structure of the shoulder, the biceps tendon has over the past few years begun to receive greater attention. Nowadays it is well accepted that the biceps tendon pathology coexist with impingement syndrome, rotator cuff pathology and glenohumeral instability.

There were several provocative tests described in an attempt to elicit symptoms of biceps pathology such as Speed's test, Yergason's sign, Ludington's test, and extension-abduction test. However, no definite dynamic test has been shown to identify biceps pathology with a high degree of sensitivity or specificity. Moreover, superior glenoid labral lesions which was named as "SLAP" lesion clearly remain a diagnostic dilemma. In 1998, O'Brien and colleagues designed a new diagnostic test for diagnosing labral tears and acromioclavicular joint abnormalities and reported that fifty three of 56 patients whose preoperative examinations indicated a labral tear had confirmed labral tear at surgery.

The successful provocative test should maximally activate the muscle being tested, minimally activate the synergists and reliably produce symptoms in the affected individuals. The purpose of this article is to analyze the electromyographic activity of the biceps muscle and rotator cuff muscles in normal subjects, during provocative tests in order to determine which method of test best isolates activity in biceps.

### Materials and Methods

The non-dominant shoulder of twelve volunteers who have had no history of shoulder pathology were studied. All subjects were male.

Electromyographic signals were recorded from the long head of biceps, supraspinatus, infraspinatus, and subscapularis. Surface electrodes were used for the biceps and 50mm dual and single wire electrodes were placed intramuscularly in the supraspinatus, infraspinatus and subscapularis using the technique of Basmajian and DeLuca. Correct electrode placement was verified by the technique of maximal manual testing.

Dynamic tests were Speed, Yergason, Ludington, Heuter(part I, II), O'Brien(part I, II)

and abduction-extension test. Each tests were performed in a force of 30% of maximal voluntary contraction.

The EMG signal was sampled in a rate of 200Hz using high pass filter of 20 Hz. Electromyographic data were collected during 5 trials of 3 seconds per trial. And the lowest and highest values were discarded. The values obtained from the three trials were integrated and converted to RMS(root mean square) voltages for the quantitative measure. The preliminary data is being reported as percent activity per muscles as a function of the total activity in all 4 muscle

### **Results**

The levels of activity of the biceps were more higher than the other rotator cuff muscles in the Speed's test. In the speed's test, the levels of activity were 28% in the biceps, 25% in the supraspinatus, 26% in the infraspinatus and 21% in the subscapularis. In the other tests, the levels of activity of the biceps were always lower than the other rotator cuff muscles. The levels of activity of the biceps as a percent of maximal manual test(MMT) were 42% in the Speed's, 33% in the Yergason, 31% in the Ludington, 36% in the Heuter(Part I), 37% in the Heuter(Part II), 27% in the O'Brien(Part I), 42% in the O'Brien(Part II) and 38% in the Abduction-extension test.

### **Conclusion**

Any method of provocative test can not isolates the biceps activity prominently compared to the other rotator cuff muscles. But the Speed test can more isolates the activity of biceps than the other tests. Based upon this study, we think that the O'Brien's test is not a provocative maneuver by which the pain reproduced is not associated with the tension generated within the biceps tendon.