ROLE OF THE BICEPS BRACHII DURING THROWING: AN EMG STUDY

Methods:
Fifteen male subjects (age=22.1 ± 2.8yrs; weight=79.59 ± 9.30 kg; height= 177.29 ± 9.2cm) who played at least five years (10.8 ± 2.6 years) of organized baseball participated in this study. All subjects provided informed consent approved by the university IRB. Prior to testing, each subject performed a 5-second elbow flexion isometric maximum voluntary contraction (MVC) on an isokinetic dynamometer (Biodex System III, Biodex Medical, Shirley, NY) while biceps brachii and brachioradialis electromyographic activity (EMG) were collected. All EMG data was collected using frequency modulated telemetry electromyography [Noraxon USA, Inc., Scottsdale, AZ]. The EMG data from the MVC were used to normalize muscle activity during the throwing activities. Following the MVC, each subject was given a warm-up to become familiar with the throwing technique and the testing protocol. The warm-up period consisted of 10 throws. Following the warm-up period, subjects threw a baseball at a circular target of one meter in diameter attached to a net placed 10 meters away from the subject. Each subject performed 10 throws while wearing an orthopedic elbow brace (BC) [See Figure 1], and 10 throws with no brace (NBC). The orthopedic brace was designed to comfortably restrict range of motion at the elbow. In this case, the purpose of this study is to determine the role of the biceps brachii during throwing.

Discussion:
The results demonstrated that the biceps brachii was active at both the elbow and shoulder during throwing. The moderate biceps brachii activity (>20% MVC) accompanied by the moderate brachioradialis activity that existed during throwing (LCP, PP, and DP) may suggest that while the primary function of the biceps brachii is elbow motion, muscle tension generated across the shoulder joint may be beneficial in providing shoulder stability by increasing the shoulder's resistance to torsional forces in the vulnerable abducted and externally rotated position and diminishing the stress placed on the inferior glenohumeral ligament.[4] Results from this study suggest that biceps tendonitis may adversely affect shoulder stability by eliminating the biceps tension generation that exists across the shoulder joint, thus not be a recommended treatment for throwing athletes.

References:

Results:
Data were analyzed with a three factor (muscle x condition x phase) ANOVA (p<.05). The data revealed no significant EMG differences the biceps brachii and brachioradialis between either the braced or non-braced condition or the phases of throwing. Mean biceps brachii and brachioradialis EMG (normalized to the % MVC) are listed in Figure 2.

FIGURE 2: Muscle activity during all phases of throwing for both braced conditions

<table>
<thead>
<tr>
<th>CONDITIONS/MUSCLE</th>
<th>PHASE OF THROWING</th>
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<tbody>
<tr>
<td></td>
<td>ECP (%)</td>
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<tr>
<td>NBC Biceps Brachii</td>
<td>22%</td>
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<tr>
<td>NBC Brachioradialis</td>
<td>21%</td>
</tr>
<tr>
<td>BC Biceps Brachii</td>
<td>15%</td>
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<tr>
<td>BC Brachioradialis</td>
<td>18%</td>
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