BACKGROUND

The stability of the ankle relies heavily on the proper function of mechanical and sensory structures, like: muscles, ligaments, tendons, muscle spindles, and Golgi tendon organs. The ankle joint may become clinically unstable with compromise to any of the previously mentioned structures acting as stabilizers to the ankle joint.

For individuals sustaining a single ankle injury, 20-80% will have recurrent injuries or experience instability of the ankle, known as chronic or functional ankle instability (CAI or FAI) (Donahue, Simon et al. 2011; Docherty, Hicks-Little et al. 2009).

There is currently no “gold standard” for the diagnosis of CAI; however, there are valid and reliable self-report outcome measures such as the Cumberland Ankle Instability Tool (CAIT) and the Ankle Instability Instrument (AI) that are indicated for this diagnosis (Donahue, Simon et al. 2011; Docherty, Hicks-Little et al. 2009).

Electromyography (EMG) has been used to map the electrical activation properties of muscles for stabilization of the ankle joint. EMG output helps to present a graphical image of electrical activity of the muscle(s) during functional testing in individuals with CAI when compared to a control group.

METHODS

Case-control study design

Case: Presence of ankle instability as identified by the CAIT and All Control: Normal/healthy group without history of ankle injury

20 Subjects recruited for the study

8 subjects in unstable ankle group: (5 men, 3 women; mean age 27.6 ± 3.8 years)

8 subjects in healthy ankle group: (2 men, 6 women; mean age 27.1 ± 3.8 years)

EMG surface electrodes placed on bilateral lower leg muscles: Anterior Tibialis, Peroneus Longus, Gastrocnemius - medial head; Soleus

RESULTS

The independent variables were the groups (Control & CAI). The dependent variables were the outcomes from the CAIT and All, the muscle EMG activities, and measured performance on the functional tests.

PURPOSE

To determine if there are any differences in lower leg muscle activation, as observed by mean or peak %MVIC with EMG analysis, during functional testing in individuals identified with chronic ankle instability (CAI) as compared to healthy controls.

Research Hypothesis: There is a difference in observed EMG muscle activity during functional testing in individuals with CAI when compared to a Control group of individuals with normal, uninjured ankles.

DISCUSSION/CONCLUSIONS

In the current study, significant differences were found between the control group and the CAI group for the CAIT and AII scores. Every participant in the CAI group scored below the 27/30 that suggests chronic ankle instability on the CAIT, whereas every participant in the control group scored 30/30 suggesting no perceived functional instability. The All suggests four or more yes answers as the threshold for CAI, all of the participants with CAI met this criterion as well.

Negative correlations were found between the CAIT scores and the Forward Lunge functional test, with contact time and force impulse. As the score on the CAIT decreased, indicating ankle instability, the time of contact of the lunging foot increased, suggesting that more time was required to stabilize the body at the end of the lunge and then return to the starting position.

The medialis Gastrocnemius showed both significant differences as well as trends toward decreased activation in individuals with CAI. Sula and Suaco (2011) also observed differences in activation timing of the lateral Gastrocnemius and Peroneus Longus with a lateral stepping activity when comparing subjects in the control group to those with CAI. Fox and Docherty (2008) found significant eccentric plantar-flexor torque deficits in participants with CAI. Our findings with relation to the SEBT of decreased peak muscle activation paralleled the findings of decreased peak torque production.

The clinical outcome measures, CAIT and All, identified subjective measures of ankle instability, even when performance on functional tests did not show signs of instability in subjects with CAI. The deficits in the Gastrocnemius in the CAI group suggest that plantar flexors are also affected by ankle strain injury. Clinically, the CAIT and All can be used to assess for CAI and could possibly be used to track changes in present function during rehabilitation. Also, the plantar flexors should be included in rehabilitation protocols and eccentric muscle activation should be facilitated. If these pilot findings are confirmed with follow-up studies, easily administered outcome measurement tools such as the CAIT and All would simplify assessment of CAI and rehabilitation protocols can be focused to be more effective at limiting the impairments associated with CAI.

The results of this study suggest that there are some EMG muscular activation differences between subjects with CAI and normal controls in lower extremity muscle activity. In addition, the CAIT and All were able to significantly distinguish between subjects with CAI and uninjured subjects in the control group.

REFERENCES available on handout.