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Cardiovascular Response to Laterally Directed Pressure Applied to the Cervical Spine

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**Purpose:** To compare the blood pressure (BP) and heart rate (HR) response of healthy volunteers to UPA of the CS versus placebo (UPA-P).

**Methods:** Thirty-four (13 females) healthy participants (mean ± SD age, 23.4 ± 2.1 years) with no history of syncope, no cardiovascular disease, and no cervical-shoulder pain were randomly assigned to 1 of 2 groups. Group 1 received a UPA-P when light touch was applied to right C6. Group 2 received UPA to the right C6.

BP and HR were measured with an OMRON automatic monitor in the following order (time points):

1. 5 minutes
2. 7 minutes after resting supine,
3. during the first set,
4. during the fifth set of UPA-P or UPA,
5. 2 minutes and
6. 4 minutes after the fifth set was applied (recovery period 1 & 2 respectively).

Blinded to the randomization process and the data collected, the primary author performed UPA-P or UPA on all volunteers. Analysis of variance and paired-difference statistics were applied to determine the cardiovascular response between both groups and within each group, respectively for all time points.

**Results:** There was a statistical difference in the following comparisons:

(a) UPA baseline SBP (time point 1) minus SBP during procedure (time point 3) (−3.7 ± 3.7 mmHg, $P < .05$);

(b) UPA-P baseline HR (time point 1) minus HR during the procedure (time point 3) (−3.9 ± 4.0 bpm, $P < .05$).

Post-hoc within group paired difference showed that only UPA baseline SBP (collapsed time points 1 & 2) minus SBP during procedure (collapsed time points 3 & 4) (−2.6 ± 4.5 mmHg, $P < .05$) was significant but the corresponding UPA-P HR comparison was not significant. All $P$-value analyses were Bonferroni corrected.

**Conclusion(s):** The change in SBP when performing anterior glide (UPA) of the cervical spine was different from those that received placebo. Within the UPA group, the average drop in SBP was −2.6 mmHg.

**Implications:** Performing UPA may lower the SBP, suggesting it could have sympatho-inhibitory effect similar to that of unilateral AP. Caution is advised when extrapolating these findings as the dosage of the UPA is the same as AP but was just 28% that of a CPA.

**Keywords:** Cervical spine; Unilateral anterior glide; Cardiovascular response

**Funding acknowledgements:** The study is partially supported by a 2013 research grant from the American Academy of Orthopaedic and Manual Physical Therapists.

**Ethics approval:** The Ethics committee of Sacred Heart University and Azusa Pacific University approved this study. All participants signed consent forms.

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**Research Report Platform Presentation**
**Number:** RR-PL-4014
**Monday 4 May 2015 12:02**
**Hall 406**

**SYSTOLIC BLOOD PRESSURE RESPONSE TO LATERALLY DIRECTED PRESSURE APPLIED TO THE CERVICAL SPINE – A RANDOMIZED, REPEATED-MEASURES, DOUBLE BLIND, PLACEBO-CONTROLLED STUDY**


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**Background:** The neurophysiologic system that modulates pain overlaps with blood pressure (BP) as observed in BP-related hypoalgesia. Cervical spine (CS) posterior pressure (AP) was shown to decrease systolic BP (SBP) while lateral glides (LAT) in the upper limb neurodynamic test (ULNT) position, LAT+ULNT, increased SBP. CS LAT appears effective for cervical radiculopathy. However, the cardiovascular response to LAT alone is unknown and many patients early on may only tolerate LAT but not LAT + ULNT.

**Purpose:** To compare the systolic blood pressure (SBP) response of healthy volunteers to lateral glide (LAT) of the cervical spine (CS) versus placebo (LAT-P).

**Methods:** Thirty-three (14 females) healthy participants (mean ± SD age, 23.5 ± 4.0 years) with no history of syncope, no cardiovascular disease, and no cervical-shoulder pain were randomly assigned to 1 of 2 groups.

Group 1 received LAT-P when light touch was applied to right C6.

Group 2 received LAT to the right C6. SBP was measured with an OMRON automatic monitor in the following order (time points):

1. 5 minutes and
2. 7 minutes after resting supine,
3. during the first set,
4. during the fifth set of LAT-P or LAT, and
5. 2 minutes and
6. 4 minutes after the fifth set was applied (recovery period 1 & 2 respectively).
Blinded to the random allocation process and to data collected, the primary author performed LAT-P or LAT on all volunteers. Analysis of variance and paired-difference statistics were applied to determine the SBP between both groups and within each group, respectively for all time points. Paired difference was further performed on each group (LAT-P or LAT) between either: the sequential highest minus the lowest (of all time points) or the sequential lowest minus the highest time points to determine if the procedure appears sympatho-excitatory or -inhibitory.

Results: There was no statistical difference between both groups based on measurements of age, weight, height, SBP for the LAT and LAT-P groups at all time points, and SBP for each within group comparisons for all time points. Post-hoc within group paired difference for the lowest minus the highest (9.2 ± 4.7 mmHg, p < .05) or the highest minus the lowest SBP (−9.6 ± 3.5 mmHg, p < .05) showed that LAT produced a washout (−0.7 ± 10.5 mmHg, p > .05) dichotomous SBP response. LAT-P lowered the SBP (−6.5 ± 2.5 mmHg, p < .05). All p-value analyses were Bonferroni corrected.

Conclusion(s): The LAT placebo and LAT resulted in sympatho-inhibitory SBP response in some individuals, while only LAT produced a sympatho-excitatory SBP response in other individuals.

Implications: When performing LAT alone (without the addition of ULNT), one may expect a dichotomous SBP response, suggesting that some may have a sympattho-excitatory response while others may have a sympatho-inhibitory response. This is the first study that showed findings suggestive of possibly two mechanisms underlying the BP-related hypoalgesia that we see when performing LAT.

Keywords: Cervical spine; Lateral glide; Blood pressure

Funding acknowledgements: The study is funded by a research grant awarded by the American Academy of Orthopaedic and Manual Physical Therapists.

Ethics approval: The Ethics committees of Sacred Heart University and Azusa Pacific University approved this study. All participants signed their informed consent.

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Research Report Poster Presentation
Number: RR-PO-12-04-Mon
Monday 4 May 2015 13:00
Exhibit halls 401–403

EFFECTS OF BALANCE STRATEGY TRAINING IN MYASTHENIA GRAVIS: A CASE STUDY SERIES
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Background: Studies of exercise in patients with myasthenia gravis (MG) are sparse. Balance strategy training (BST) consists of exercises that address the functional needs of patients and target the sensorimotor system to improve function. BST exercises have been shown to be beneficial in increasing balance, strength and overall functional ability in various populations.

Purpose: While benefits of BST have been reported in healthy and neurological population, the efficacy of BST has not been investigated in patients with Myasthenia Gravis (MG). This prospective study aims to determine if BST improves functional ability and balance in people with MG.

Methods: Seven individuals with MG participated in a 16-session workstation intervention. Repeated measures (pre/post-intervention and 4-week follow-up) consisting of quantitative myasthenia gravis score (QMG), 6-minute walk test (6MWT), timed up and go (TUG) with dual task (TUG(manual) and TUG(cognitive)), and standing stability on foam with eyes closed (foamEC) were assessed.

Results: Most measurements showed sustained improvement at follow-up. QMG, TUG(cognitive), and foam EC achieved clinically significant improvements (>15%). No adverse effects were reported.

Conclusion(s): BST was effective in improving balance and QMG scores in subjects with MG. Future research needs to involve repeated assessments over a longer period of time on a greater number of subjects with a control group to investigate the sustained effects of the balance program. Future studies should also seek to establish an optimal intensity for training to optimize effects of exercise in patients with MG.

Implications: The BST exercise program appears to be a promising tool in improving balance and strength in patients with MG. The exercise program should constitute a multi-modal approach that targets different aspects of sensorimotor system and includes functional strengthening.

Keywords: Myasthenia gravis; Balance; Functional mobility

Funding acknowledgements: Myasthenia Gravis Association Queensland.