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San Marcos, Summer 2020

Research Day, San Marcos Campus

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Summer 8-19-2020

## The Effectiveness of Heart Rate Variability Biofeedback in Conjunction with Traditional Treatment for Thoracic Outlet Syndrome in a 25-year-old female: A Case Report

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### Recommended Citation

Rezaei, S. (2020, August 19). The Effectiveness of Heart Rate Variability Biofeedback in Conjunction with Traditional Treatment for Thoracic Outlet Syndrome in a 25-year-old female: A Case Report. Poster presented at the Campus Research Day Symposium, University of St Augustine for Health Sciences. <https://soar.usa.edu/casmsummer2020/8>

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# The Effectiveness of Heart Rate Variability Biofeedback in Conjunction with Traditional Treatment for Thoracic Outlet Syndrome in a 25-year-old female: A Case Report

Sepehr Rezaei, SPT

## INTRODUCTION/BACKGROUND

- Thoracic outlet syndrome (TOS) is a complex condition that causes pain, tingling sensation, hypesthesia, muscle atrophy, weakness, and edematous changes in the upper quadrant (UQ) and down upper extremity (UE).<sup>3,7,8,16,1</sup>
- Compression of neurovascular bundles in the interscalene triangle, costoclavicular space, and under pectoralis minor caused by trauma, congenital malformations such as a cervical rib, and abnormal/poor postures from muscle imbalances can lead to TOS.<sup>3,7,8,16,17</sup>
- Depression, anxiety, and asthma impact posture and respiratory muscles<sup>1,4,5,6,11,12</sup>
- Interventions for TOS can consist of correcting posture by addressing muscle imbalance, decreasing tone and muscle tightness and rib mobilization and in rare cases rib resection.<sup>3,7,8,13,16,17</sup>
- There is Limited research on the effectiveness of Heart Rate Variability Biofeedback (HRVBF) for treatment of TOS

## PURPOSE

The purpose of this case report is to find the effectiveness of HRVBF in conjunction with traditional treatment for a 25-year-old female with TOS who was referred for Physical Therapy (PT) services prior to rib resection.

## CASE DESCRIPTION

### PATIENT BACKGROUND & PRESENTATION

- Ectomorphic Female
- Right (R)-handed
- Constant numbness, pain, pins and needles sensations from R UQ to UE
- History of chronic depression/anxiety disorder and panic attacks

### BODY STRUCTURE

- Small SLAP tear of R superior labrum
- Decreased A/PROM
- Decrease Muscle Strength
- Decrease sensation in R UQ and R UE
- scapular winging of medial border
- Trigger points over upper trap, pec major, and infraspinatus

### ACTIVITY LIMITATIONS

- Inability to functionally use R UE
- Dressing, wash hair, and showering
- Open jars

### PARTICIPATION RESTRICIONS

- Back Packing
- Playing volleyball
- Yoga
- Working for long periods

## METHODS

### Week 1-2

- Soft Tissue Massage
- Myofascial Release
- Trigger Point Release
- 1<sup>st</sup> rib and thoracic spine mobilization
- Corrective Stretching (UT, LS, Scalene, Pec Min, Pec Major)
- Nerve glides (median, Radial, & Ulnar)
- Chin Tucks (DNF training)
- Scapular Positioning
- Posture Correction

### Week 3-5

- HRVBF: diaphragmatic breathing, positive affirmation and visualization, positive reinforcement to movement, coupled with HR monitor
- Motor control training on shoulder and postural mm
- Education on work ergonomics

### Week 5-6

- HRVBF
- Strength training for rotator cuff and postural mm
- Review HEP
- Review postural education and ergonomics
- Review breathing pattern strategies

## RESULTS

Outcome Measure	Initial Exam	Latest Progress Note
NPRS	Shoulder and neck pain: 8/10 at worst and 4/10 at best	0/10 for the past 3 weeks
UEFI	47/80	71/80
Quality of Life SF-12 QoL <sup>13</sup>	Physical Score (PCS): 31.03 Mental Score (MCS): 40.86	PCS: 40.43 MCS: 52.73
FABQ <sup>10</sup>	Physical Activity (PA): 28 Work (W): 37	FABQ(PA): 12 FABQ (W): 7
Sensory	Impaired sensation over R Anterior UQ, Entire R scapula, and R UE	WNL
Range of Motion (ROM)	Cervical: • Ext WNL* • SB. L limited 40% * R shoulder: • Flx 120* Mm guarding • Abd 90* Mm guarding • ER 55* Mm guarding	Cervical: WNL R shoulder: • Flx 160/162 • Abd 180/180 • ER 105/110
Strength MMT of R UE: L was WNL	Middle Deltoid 3/5 Serratus Anterior 2/5 Supraspinatus 2/5 Infraspinatus/Teres Minor 2+/5 Middle Trapezius 3-/5 Lower Trapezius 3-/5 Latissimus Dorsi 3+/5 Rhomboids 3-/5 Grip strength L18kg / R8kg	5/5 4/5 4/5 4-/5 4/5 4-/5 4/5 4-/5 L32kg / R27 kg

## DISCUSSION/CONCLUSION

- Poor posture, tone/hypertrophy of scalene, and tight pectoral muscles can cause TOS.<sup>3,7,8,16,17</sup>
- People with major depressive disorder experience changes in posture which include increased head flexion and increased thoracic kyphosis.<sup>4,11</sup>
- Increased respiratory muscle tension, hypertrophy, and trigger points are found in high anxiety patients.<sup>1,5,6,12</sup>
- People with respiratory distress like asthma over utilize their scalene muscles to aid with breathing.<sup>12</sup>
- Substantial evidence has shown that HRVBF can be used for treatment of a variety of biophysiological and pycological disorders like asthma, emphysema, depression, and anxiety.<sup>2,4,6,9</sup>
- Years of depression, anxiety, and asthma have impacted this pt's posture and muscle tone and have manifested TOS which has impaired her ROM, sensory system, strength/motor control, and increased fear and avoidance of motions.
- Resolving the musculoskeletal impairments only went so far, what was found to be most beneficial for this pt was the implementation of HRVBF in relaxing the pt through her day and not utilizing accessory muscles to breath.<sup>1,2,5,6,9</sup>
- Pt was set for a 1<sup>st</sup> rib resection and was thought to have possible nerve damage but was able to recover with conservative treatment in conjunction with HRVBF.
- More studies need to be conducted to see if there is a relationship with asthma and depression/anxiety disorders with TOS and the impact of HRVBF in a POC for TOS.

## CLINICAL APPLICATION

- Strong evidence that Depression impacts posture and Anxiety and asthma impact breathing
- Implementing HRVBF will help with relaxation and will aid in decreasing the use of accessory muscles during respiration
- HRVBF in conjunction with Physical Therapy intervention may be beneficial in a POC for treatment of TOS

## ACKNOWLEDGMENT

I would like thank the participant, my clinical instructors Mark C. Jones, DPT, PT and James Whitaker, DPT, PT and the University of St. Augustine.

## ABBREVIATIONS

## HEP

## REFERENCES

