ID: #389

A Time Course of Physical and Psychological Features Pre/Post Cervical Radiofrequency Neurotomy in Individuals with Whiplash: A Prospective Study

Ashley D. Smith, PT[1,2,3]; Gwendolen Jull, PT,PhD[1]; Geoff Schneider, PT, DSc,PhD[2,3]; Bevan Frizzell, MD[2,3]; R. Allen Hooper, MD[2] and Michele Sterling, PT,PhD[4]

[1][University of Queensland, Brisbane, Australia], [2][Advanced Spinal Care Centre, Calgary, AB, Canada], [3][University of Calgary, Calgary, AB, Canada], [4][Griffith University, Southport, Australia]

INTRODUCTION

• Individuals with chronic whiplash associated disorder (WAD) present with a complex clinical presentation, consisting of both physical and psychological features

• Physical features include features of central hyperexcitability, altered EMG of the upper quadrant muscles and reduced cervical range of motion (ROM)[1]

• Psychological distress, pain catastrophizing and post traumatic stress symptoms have also been identified in those with chronic WAD[2]

• We have previously demonstrated that physical (central hyperexcitability and ROM) and psychological features (pain catastrophizing and psychological distress) of chronic WAD improve following successful cervical radiofrequency neurotomy (RFN) i.e. Reduction of peripheral nociception[3,4]

• Not all patients undergoing RFN respond to the procedure[5]. Midline tenderness is the only reported variable in the literature to predict success of cervical RFN[6]

• Certain clinical features of WAD are associated with poor prognosis[1,2]

• It is not known whether these clinical features predict a successful response to cervical RFN.

AIM

• This study sought to provide a time course of physical and psychological manifestations of individuals with chronic WAD pre/post cervical RFN for both those who reported a successful response and also for those who reported a less successful response; and aimed to determine which clinical features may predict success to cervical RFN at the 3-month period post-procedure.

.

REFERENCES:

1. Sterling, M., et al., *Physical and psychological factors maintain long-term predictive capacity post-whiplash injury.* Pain, 2006. 122(1-2):102-108.
2. Williamson, E., et al., *A systematic literature review of psychological factors and the development of late whiplash syndrome.* Pain, 2008. **135**(1-2): 20-30.
3. Smith, A., et al., *Cervical radiofrequency neurotomy reduces central hyperexcitability and improves neck movement in individuals with chronic whiplash.* Pain Med, 2013. **15:**128-141.
4. Smith, A., et al., *Cervical radiofrequency neurotomy reduces psychological features in individuals with chronic whiplash symptoms.* Pain Phys , 2014. **17**: 265-274.
5. Lord, S., et al., *Percutaneous radiofrequency neurotomy for chronic cervical zygapophyseal-joint pain.* N Engl J Med, 1996. **23**:1721-1726.
6. Cohen, S., et al., *Factors predicting success and failure of cervical facet radiofrequency denervation: a multi-center analysis.* Reg Anest Pain Med, **2007**: 32(6):495-503.

METHODS

Design

- Prospective Cohort Observational Study

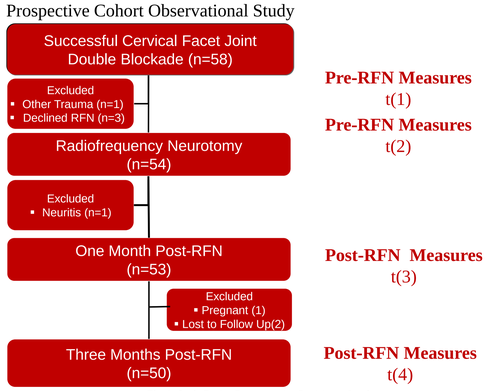

Fig. 1: Study Design Demonstrating Participant Involvement

- Inclusion Criteria:
  - Individuals underwent cervical RFN following successful response to comparative cervical facet joint double blockade (intra-articular injection (IAB) followed by confirmatory Medial Branch Block – MBB) with >50% relief of concordant neck pain for duration of local anaesthetic for <u>both</u> procedures
  - Chronic WAD II (Neck complaint and musculoskeletal signs including decreased ROM and point tenderness) – 6 months duration
  - 18-65 years of age
- Exclusion Criteria:
  - WAD III/IV (fracture); Non response to diagnostic facet joint injections; Previous history of neck pain or headache requiring treatment; Pregnant; Central or peripheral neurological disorder; Peripheral vascular disorder

Measures

- Demographic data inclusive of gender, age, duration of neck pain
- Neck Pain Intensity: Visual Analogue Score (0-100mm)
- Neck Disability Index (NDI) (0-100)

Quantitative Sensory Testing (QST)

- Pressure Pain Thresholds (PPT) via electronic pressure algometer in 3 sites bilaterally: C5/6 articular columns; Median Nerve in cubital fossa; Tibialis Anterior (Somedic AB; Farsta, Sweden – Fig. 2)
- Thermal Pain Thresholds via TSA II NeuroSensory Analyzer bilaterally over the C5/6 articular pillars (Medoc Advanced Medical Systems; Minneapolis, MIN, USA – Fig. 4)
- Nociceptive Reflex Response (NFR) via electrical stimulation to the sural nerve (Digitimer DSTA, Hertfordshire, UK – Fig. 6)
- Brachial Plexus Provocation Test

Psychological Questionnaires included:

- Pain Catastrophization Scale (PCS)
- Posttraumatic Stress Diagnostic Scale (PDS)

Outcome Measure (Success) = Global Rating of Change (GROC) ≥ 4

RESULTS

Group	SUCCESS (n=40)	Less SUCCESS (n=13)	*P* value
	Mean (+/- SD) or Median [IQR]		
Gender (F/M)	28/12	8/5	0.57
Age (yrs)	45.4 (11.1)	42.7 (10.1)	0.45
Duration of Symptoms (mths)	41 [30,65]	44 [42,178]	0.25

Table 1: Patient Demographic Characteristics by Group Status Prior to cRFN

- **Questionnaires**
- Analysis
  - Two-Way ANOVA (Group*Time; * Significance level: p<0.05)

	t(1)	t(2)	t(3)	t(4)
Pain (VAS) mm				
Success	58 (20)	54 (21)	19 (16)*	19 (19)*
Less Success	59 (19)	61 (15)	45 (21)	44 (18)
Disability (NDI) %				
Success	41 (14)*	40 (14)	25 (14)*	23 (15)*
Less Success	48 (18)	51 (18)*	41 (18)	41 (13)
GHQ-28				
Success	24 [17,30]	23 [17,30]	16* [11,25]	15* [10,26]
Less Success	25 [23,33]	34 [32,45]	28* [22,34]	24* [19,31]
PCS				
Success	14 [6,22]	13 [6,22]	8* [3,15]	4* [0,11]
Less Success	20* [15,28]	19* [17,31]	18 [14,33]	16 [14,33]
PTSS				
Success	8 [2,13]	7 [2,14]	5 [0,12]	4 [2,10]
Less Success	7 [1,14]	14 [3,14]	9 [6,18]	6 [2,29]

Table 2: Group Differences vs. Time
GHQ-28: 28 item General Health Questionnaire; PCS: Pain Catastrophization Scale; PTSS: Post Traumatic Stress Symptoms
Success: GROC≥ 4; Less Success: GROC<4

- <u>Group*Time Interactions:</u>
  Only individuals reporting a successful outcome to RFN demonstrated a reduction in pain, disability and pain catastrophization scores (p<0.05; Table 2). Following RFN, both Groups demonstrated reduced psychological distress (p=0.0001; Table 2). Neither Group reported improvements in post-traumatic stress symptom severity post-RFN (p=0.07: Table 2)

- **Physical Measures**

Fig. 2: Measurement of cervical spine PPT

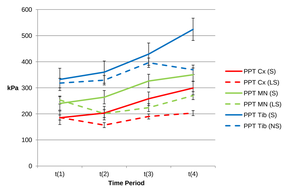

Fig. 3: Group PPTs (Means +/- SE) vs. time

- Both Groups demonstrated reduced pressure hyperalgesia (locally and remotely) following cRFN (p<0.0001; Fig. 3).
- No Group differences in elbow extension ROM during BPTT (p = 0.68). Both Groups improved elbow ROM post-cRFN (p <0.0001).

RESULTS (cont.)

- **Physical Measures (cont.)**
- Both Groups demonstrated reduced thermal hyperalgesia following cRFN (p < 0.0001; Fig. 5).

Fig. 4: Measurement of Cold Pain Threshold

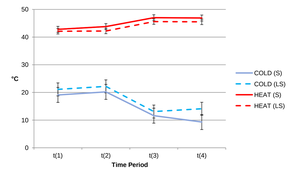

Fig. 5: Thermal Pain Thresholds (Mean +/- SE) over time

- Only individuals reporting a successful response to RFN demonstrated an increased NFR threshold post-RFN (p=0.01; Fig. 7)

Fig. 6: The NFR response.

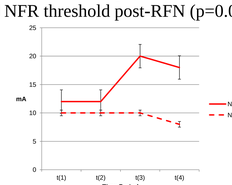

Fig. 7: NFR thresholds (Mean +/- SE) vs. time

Logistic Regression Models: Predictors of RFN Success (GROC ≥4)

Model # Predictor	Odds Ratio	Standard Error	Probability	Sensitivity	Specificity
#1 NDI	0.91 (0.83 – 0.00)	0.04	0.037	0.975	0.231
#2 PCS	0.94 (0.89 – 0.99)	0.03	0.018	0.95	0.231

Table 3: Odds Ratio of the clinical variable in multivariate logistic regression for predicting cRFN success
NDI: Neck Disability Index; PCS: Pain Catastrophization Scale

CONCLUSIONS

- 75% of individuals reported a successful response (GROC ≥ 4) to cervical RFN 3-months post-procedure
- At baseline, individuals who later reported RFN to be successful demonstrated less disability and pain catastrophization
- Individuals reporting RFN to be successful demonstrated improvements in pain, disability and pain catastrophization scores
- Neither Group demonstrated improvement in post-traumatic stress severity symptoms following RFN
- Both Groups demonstrated improvements in all physical measures (apart from NFR threshold) post-RFN
- Only individuals reporting RFN to be successful demonstrated improvements in the NFR threshold
- Low levels of NDI and PCS were independent predictors of RFN success, 3-months post-procedure
- Further research is required regarding the underlying mechanisms responsible for those who do and do not improve with RFN.

For additional information please contact:

Ashley D. Smith, PT
University of Queensland
ashley.smith2@uqconnect.edu.au
T: 1 403 210 9969