Effect of Different Positioning of COntralateral Arm on Upper Limb Neurodynamic Test (1).

***Anu Sharma, **Manish Arora, ***Ajay Arora.**

Sardar Bhagwan Singh Post Graduate Institute of Biomedical Sciences and Research, Balawala Dehradun.

Abstract

Purpose

To see the effect of different positioning of contralateral arm on neurodynamic test for the upper limb.

Design

Experimental study on healthy subjects.

Methodology

Upper Limb Neural Test 1 was performed by placing the contralateral arm in Neutral, Horizontal Abduction, Horizontal Adduction and Flexion positions. Range of elbow extension measurement on the ipsilateral side was taken with help of half circle goniometer recorded by fellow therapist by placing fulcrum on lateral epicondyle of humerus and movable and immovable arm along the shaft of radius and humerus respectively.

Statistical Tests

Related t-test and one-way ANOVA was used to compare the results.

Results

Paired t-test revealed significant difference in the median nerve sensitivity when Neutral and Horizontal Abduction positions of contralateral arm were compared. Results also demonstrated significant difference on comparison of Neutral versus Flexion positions whereas Neutral versus Horizontal Adduction positions demonstrated non-significant results.

Conclusion

Upper Limb Neural Test(1) was affected by different positioning of contralateral arm.

Reprint requests: Anu Sharma
Sardar Bhagwan Singh
Post Graduate Institute of Biomedical Sciences and Research,
Balawala Dehradun.

Keywords

Neurodynamics, Upper Limb Neural test, Elbow extension.

Introduction

In the present situation the reported incidence of nerve injuries is high. More than 2.25 million injuries, which occur per year 93% of it claim neuritis. Those with traumatic brain injury 10-34%, have peripheral nervous system injuries. Upper limb nerves are affected more than the lower limb nerves.[13] The functional deficits observed following upper extremity nerve injuries generate deep marks on the psychosocial life of the patients.[6]

Neurodynamics, defined as the mechanical and physiological functions of the neural system has been effectively examined by selective neural tension tests. Neural tension provocation tests (NTPT) are used to evaluate the mobility and sensitivity of the nervous system. NTPT are straight leg raise (SLR), Passive knee Bend (PKB), slump test and the upper limb Neurodynamic test. These tests offer the clinician a means of detecting and determining the nature and extent of neural pathomechanics.[2] The loss of extensibility at one side may produce increasing tensile loads when the peripheral nerve or nerve root is stretched leading to mechanical dysfunction. This is the principle behind the neural tension or neurodynamic tests.[3]

Elvey (1979) first introduced the test known as the brachial plexus tension test (BPTT) to an international manual therapy conference in Melbourne. The term upper limb tension test (ULTT) was introduced by Keneally et al (1988) and also called it as the straight leg raise of the arm.[7] Butler (1991) has described ULNT(1) as a median nerve bias test. The ULNT(1) affect predominately the median nerve via the C5/6 nerve roots and to a lesser extent the C7 nerve root.[10]

Strain in the median nerve is affected during upper extremity positioning. These findings lend support to the use of upper-extremity positioning sequences in the clinic to induce nerve strain during evaluation of nerve dysfunction.[1]

Rubenach and Elvey (1985) claimed that the position and movement of the contralateral arm and the SLR could alter the symptoms provoked in an arm indicated that tension in pain sensitive structures was transmitted across the cervical spinal canal.[9] Rubenach (1985) also found that if an upper limb neural test was performed on one arm and the symptom response position maintained then the addition of the same test to the other arm would result in a change of symptoms with the majority reporting a decrease in symptoms. [4,9]

This study by Rubenach(1985) prompted me to see the effect of different positioning of the contralateral arm on upper limb neural test on the tested side.

The aim of the study is to find out the optimal position of contralateral arm during upper limb neural test so as to keep the limb in minimally stressed position when irritability of nerves is high.

Materials and Methods

The study is experimental in nature. 100 young, healthy, normal subjects with age (mean 21.62 + 1.79) and height (mean 159.83 + 1.11) without any history of cervical pain or radiation down the arm since three months were included in the study. The subjects excluded were those with recent history of trauma, inflammation, odema, lack of range of motion of joints of upper limb, irritable skin conditions eg. Dermatitis, eczema etc., paraesthesia or anaesthesia in upper limb. Subjects who could not precisely respond to maneuvers whether cognitively, psychological or for any reasons were also excluded from the study.

The operational tools used were goniometer with double arm half wide protractor and digital stopwatch (Kadio. KD-1069).

The methods used in this study is taken form journal of physiotherapy (Butler)

(1999) Inter-therapist and Intra-therapist reliability testing for ULTT.

The upper extremity to be tested was positioned with the shoulder girdle depressed comfortably by the fist. Shoulder was abducted to approximately 100-110^0. Shoulder was rotated laterally to approximately 90^0 forearm parallel to the table. Forearm was fully supinated and the wrist and fingers were extended fully. Then the subject's elbow was extended until the initial onset of stretch is felt by the subject. A fellow experienced physical therapy assistant measured the elbow extension range of motion with the help of goniometer.

Firstly the above procedure is performed with the contralateral arm in the neutral position. After a rest of 10 min the same above procedure is repeated with contralateral arm in the horizontal abduction position. Again with an internal of 10 min. upper limb neural test(I) is performed with contralateral arm in flexion and again with same time gap with contralateral arm in horizontal adductions position upper limb neural test(1) is performed.[2]

Statistical analysis

Related t-test was used to compare the effect of neutral with horizontal abduction then with flexion and horizontal adduction position of contralateral arm on upper limb neural test. Later one-way ANOVA was performed to find out the variation between different conditions in all subjects.

Results

Paired t-test revealed that there was significant difference in the median nerve sensitivity test when the contralateral limb was placed in horizontal abduction and flexion position as compared to neutral position. P-value was found to be significant. ($p<O.05$).

Table No.1

Distribution of mean values and standard deviation of upper limb neural test(1) in Neutral VS Horizontal Abduction position of the contralateral arm.

Condition	N	Mean ± S.D	t value
Neutral	100	62.62±16.83	4.35
Horizontal Abduction	100	57.79±17.06	
Significance			p<o.o5

Table No.2

Distribution of mean values and standard deviation of upper limb neural test(1) in Neutral VS flexion position of the contralateral arm.

Condition	N	Mean ± S.D	t value
Neutral	100	62.62±16.83	2.30
Flexion	100	60.02±16.24	
Significance			p<0.05

Table No.3

Distribution of mean values and standard deviation of upper limb neural test (I) in Neutral VS Horizontal adduction position of the contralateral arm.

Condition	N	Mean ± S.D	t value
Neutral	100	62.62±16.83	0.76
Horizontal Adduction	100	61.72±17.11	
Significance			p>0.05

Table No.4

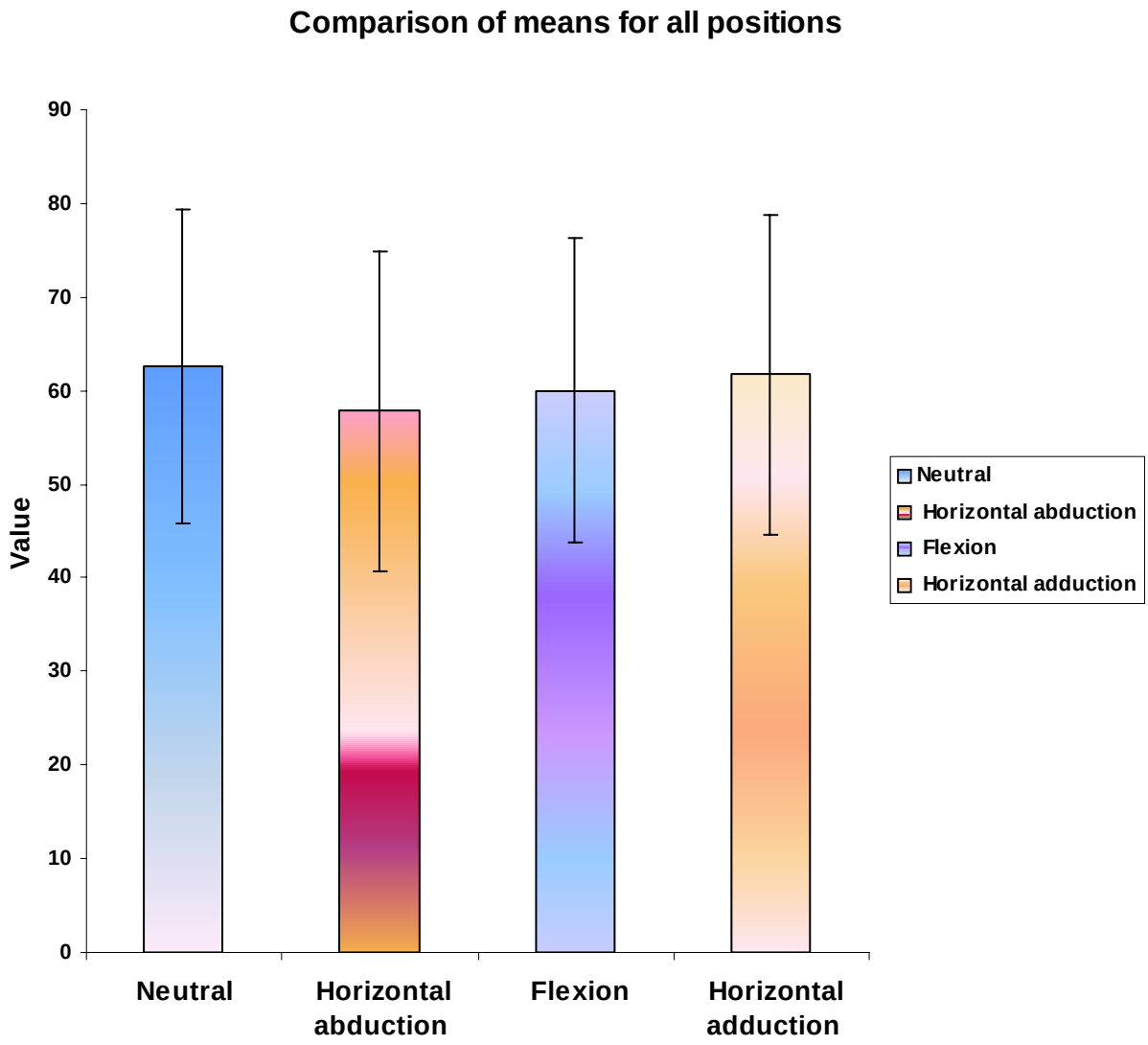
One way ANOVA between different conditions of contralateral arm

Condition	F-Value	P-Value
Neutral, Horizontal abduction, flexion and Horizontal adduction	1.58	P>0.05
Significance		p>0.05

S → Significant (P<0.76)

NS → Non- Significant (P>0.05)

On comparison of different conditions of contralateral arm among themselves, one way ANOVA was performed which revealed non significant results as P>0.05.



Graphical Representation of Comparison of means for all positions.

The results of this study showed that horizontal abduction and flexion position of contralateral arm may be the most sensitizing positions to elicit median nerve sensitivity of the tested side.

Discussion

From the results of this study we can say that horizontal abduction and flexion positions of contralateral arm may affect the median nerve sensitivity on the tested side. These results can be supported by the study of Rubenach (1985) who documented that if ULNT was performed on one arm and the symptom response position maintained then the addition of the same test to the other arm would result in a change of symptoms with the majority reporting a decrease in symptoms. Tension in the nervous system must therefore be transmitted transversely across the neuraxis.[4]

Rubenach (1985) also hypothesized that performing the ULNT on the non-affected arm produced lateral displacement of the spinal cord and brachial plexus. From her study we can say that the cause of horizontal abduction and flexion position affecting the median nerve

sensitivity may be due to the lateral displacement of the spinal cord and brachial plexus.[12] The results of this study was also supported by the finding of Elvey (1980), who claimed that movements of the contralateral arm and the straight leg raise could alter the symptoms provoked in an arm.[8]

Hammer (1997) further supported the study by claiming that because the nervous system is a continuous tract any limb movement must have mechanical consequences for nerve trunks and the neuraxis.[14]

Byl (2002) did the study to quantify the strain of the median nerve and the ulnar nerve throughout upper-extremity positioning to evaluate nerve dysfunction. He lend support to the use of upper extremity positioning sequences in the clinic to induce nerve strain during evaluation of nerve dysfunction.[1]

Dilley (2003) concluded that the median nerve is unloaded when the shoulder is adducted or elbow is flexed. This finding support the results of this study that horizontal adduction position is less sensitizing for eliciting median nerve tension test.[5]

This study showed that positioning the contralateral arm in horizontal abduction and flexion positions may affect median nerve sensitivity. Limitations of the study are that the quantitative range of motion of various joints involved was not recorded rather the range of end position was taken into consideration.The tests were performed on people with no neural irritability and altered neural responses due to compression or stretching may be having different results.Since the positions of other joints involved was not maintained by any fixating devices, human errors in reproduction of the sensitizations could have come into play.The initial onset of tissue resistance was recorded by subsequent feedback given by the subject, so chances of error may be there.

Conclusion

From the result of this study we can conclude that upper limb neural test was affected by positioning of the contralateral arm. Significant results were obtained in horizontal abduction and flexion positions of contralateral arm on the upper limb neural test (1).

Further research may contradict the findings.

Reference

1. Byl C. and Puttlitz C. Strain in the median and ulnar nerves during upper-extremity positioning.J. Hand Surg.,(2002); 27(6) : 1032-1040.
2. D.S. Butler. Intertherapist and intratherapist reliability testing for the upper limb tension test (Median nerve Bias) – Assessing the onset of passive resistance R1 and R2. Aus. J. Physio. (1999).
3. David J. Magee, Orthopaedic Physical Assessment, 4th edition,Elsevier (2006):22.
4. D.S. Butler. Mobilization of the nervous system, 1stedition, Churchill Livingstone,(1991):50.
5. Dilley A and Lynn B. Quantitative in vivo studies of median nerve sliding in response to wrist, elbow, shoulder and neck movements. Clin. Biomech.(2003); 18(10): 899-907.
6. Dogan Tuncali and Kamalettin Toksoy. Upper extremity nerve injuries: The significance of soft tissue associations. Neuroanat. , (2004); vol.3; 15-17.
7. Elvey RL (1979) Painful restriction of shoulder movement:a clinical observational study. In: Proceedings, Disorders of the knee, ankle and shoulder. Western Australian Institute of Technology, Perth.
8. Elvey RL (1980) Abnormal brachial plexus tension signs. In: Proceedings, Second Biennial conference, Manipulative Therapists association of Australia, Adelaide.
9. Elvey RL and Rubenach H (1985) The upper limb tension test: the effect of the position and movement of the contralateral arm. In: Proceedings, Manipulative Therapists Association of Australia, 4th biennial conference, Brisbane.
10. Grieve's Modern Manual Therapy. The vertebral column, 2nd edition,Longman,(1994).
11. Keneally M, Rubenach H and Elvey R (1988). The upper limb tension test. The SLR test of the arm.In:grant R (ed) Physical Therapy of the cervical and thoracic spine, clinics in Physical therapy 17. Churchill Livingstone, Edinburgh.
12. Maria Zuluaga Sports physiotherapy Regional Assessment and Management.,6th edition,Elsevier,(1995),chapter 26 : 475-482.
13. Okamoto H and Oka Y. Experimental study on tension and stretching to peripheral nerve. Nippon Seikeigeka Gakkai Zasshi(1990); 64(5): 472-478.
14. Warren Hammer. Use of the straight-leg test for upper extremity involvement. Dynamic Chiropractic (1997); vol 15: 24.