The effectiveness of isometric exercises as compared to general exercises in the management of chronic non-specific neck pain

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Abstract: To evaluate the effectiveness of isometric exercises as compared to general exercises in chronic non-specific neck pain. For this randomised controlled trial total 68 patients (34 each group) with chronic non-specific neck pain were recruited from Alain Poly Clinic and Institute of Physical Medicine & Rehabilitation Dow University of Health Sciences Karachi between May, 2012 and August, 2012. Simple randomisation method was used to assign participants into isometric exercise group and general exercise groups. The isometric exercise group performed exercises for neck muscle groups with a rubber band and general exercises group performed active range of movement exercises for all neck movements. Patients in both groups received 3 supervised treatment sessions per week for 12 weeks. Visual Analogue Scale (VAS), North wick Park Neck Pain Questionnaire and goniometer were used to assess pain, disability and neck range of movements at baseline and after 12 weeks. Both interventions showed statistically significant improvements in pain, function and range of movement $p = 0.001$for isometric exercise group, $p = 0.04$ for general exercises group and $p= 0.001$ for range of movement. However, mean improvements in post intervention VAS score and North wick Park Neck Pain Questionnaire score was better in isometric exercises group as compared to general exercise group. In conclusion, both interventions are effective in the treatment of chronic non-specific neck pain however; isometric exercises are clinically more effective than general exercises.

Keywords: Chronic non specific neck pain, isometric exercise, general exercises, physiotherapy, range of movement, cervical spine

INTRODUCTION

Musculoskeletal neck and shoulder pain is common; and 6-48% of adults have symptoms around neck and shoulder (Andersson *et al*, 1993). The authors could not locate any studies to identify the prevalence of neck pain in Pakistan. However, in the Western population around 70% estimated lifetime prevalence of neck pain has been reported (Côté *et al,* 1994). The annual prevalence in the Norwegian population is 34.4% with 13.8% prevalence of chronic neck pain (Bovim *et al,* 1994). The prevalence of neck pain is slightly more in women as compared to men with annual prevalence of 43% (Guez *et al*, 2002). Musculoskeletal disorders have been reported on is that they are one of the most frequent causes of long-term sickness leave and amongst those disorders neck and upper limb account for 75% of occupational musculoskeletal disorders consulted by UK rheumatologists (Cherry *et al*, 2001). Similarly the cost of neck pain treatment in the Netherlands in 1996 was estimated to be around 620 million pounds (Borghouts *et al,* 1999). Neck pain causes low level of disability; however, Côté *et al.* (1994) found that in five percent the disability was significant. Neck pain is the major source of use of health care resources. A survey conducted in 10 community physiotherapy departments in East Yorkshire area showed that 13.4% had neck complaints. In the UK physiotherapists provide between 4 and 10 treatment sessions for spinal problems (Foster *et al*, 1999). In the modern world sedentary lifestyle is increasing and in the work place with reliance on computers it is predicted that the prevalence of neck pain will continue to rise (Falla *et al*, 2004). Effective management of chronic neck pain is very important to prevent disability, episodes of acute on chronic neck pain and absences from work.

Chronic neck pain is characterised by a widespread sensation with hyperalgesia in the skin, ligaments and muscles. This sensation is prominent on palpation and during active and passive movements of neck (Ylinen, 2007). A number of patients with chronic neck pain have weakness in neck muscles (Ylinen *et al*, 2004) therefore these type of studies are clinically relevant. Several studies have been carried out to evaluate the role of strengthening exercise in the management of chronic neck pain. Some studies (Waling *et al*, 2002; Hagberg *et al.* 2000) suggest that strengthening exercises are not effective in the management of chronic pain over longer period whereas other (Ylinen *et al,* 2005; Ylinen *et al*. 2003; Ylinen *et al.* 2006; Ylinen *et al*. 2007) suggests that it might have a place. The above studies have used various modes of neck and shoulder exercises, outcome measures and times scales. General neck exercises are commonly prescribed in clinical practice for chronic neck pain although the evidence behind it is not clear. Studies have included various other exercises with general exercises, secondly most studies only included female patients. Therefore the aim of this study was to evaluate

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the effectiveness of isometric neck versus general neck exercises in the treatment of chronic neck pain in both male and female patients.

MATERIALS AND METHODS

This randomised controlled trail was conducted at Alain Poly clinic & Institute of Physical Medicine & Rehabilitation Dow University of Health Sciences Karachi between May, 2012 and August, 2012. Males and females Patients referred from a consultant with diagnosis of chronic non-specific neck pain were recruited for the study. An inclusion criterion was age 20-50 years, MRI screenings of the cervical spine for exclusion of major pathology, neck pain history 3 months to 3 years. Exclusion criteria was neck pain for less than 3 months, history of neck surgery, inflammatory arthritis, tumors, cervical or thoracic spine fractures, neck pain radiating to arm due to radiculopathy, dizziness and other severe cardiac or associated medical conditions. Total 68 subjects met the inclusion criteria, 34 subjects in each group. The sample size was calculated with independent population group formula repeated measure analysis of variance (RM-ANOVA) with 99% confidence interval, power of test 99%.

Informed written consent was taken from the participants and then they were allocated into two groups by simple randomisation technique using computer software. Isometric exercise group performed isometric exercises with rubber (Theraband) targeting neck flexors, extensors, both sides flexors and rotators muscles. Each exercise was performed 20 repetitions 3 times a week for 12 weeks. General exercise group performed general range of movement exercises for flexors, extensors, both sides flexors and rotators neck muscles. Each exercise was performed 20 repetitions 3 times a week for 12 weeks. Same exercises were prescribed for both groups as a home exercise program to be carried out 2 times per day at least 5 days a week. Patients were instructed to perform exercises in sitting position but they were allowed to perform exercise in supine and prone lying if they had problems with sitting position. Qualified Physical therapists who had at least 2 years clinical experience in musculoskeletal conditions supervised the exercises in both groups. Visual Analogue Scale (VAS) and Northwick Park Neck Pain Questionnaire were used to collect pre and post intervention data The VAS is the most frequently used pain measure because it is simple to use and has good psychometric properties (Ylinen *et al*, 2004). The Northwick Park Neck Pain Questionnaire is a 10 item self-administered questionnaire mainly measure functional activities (Leak *et al*, 1994). Neck active range of movement was measured with the use of universal goniometer at base line and at the end of 12 weeks.

Table 1: Evaluation of VAS and neck disability in isometric neck exercise group and general neck exercise group

Intervention group	Parameters	Mean ±SD		P-value
		Baseline	12 Weeks	
Isometric neck Exercise Group	Visual Analogue Scale (VAS)	8.6±2.41	5.9.66± 2.23	0.001
	Northwick Park Neck Pain Questionnaire	20.81±2.49	11.38±2.41	
General neck Exercise Group	Visual Analogue Scale (VAS)	7.9 ±1.61	6.23±1.31	0.04
	Northwick Park Neck Pain Questionnaire	21.52±2.21	17.54±1.43	

Table 2: Pre and post comparison of cervical spine movements in isometric neck exercise group and general neck exercise group

Treatment Group	Cervical spine movement	Mean SD (Degree)		p-value
		Pre Treatment	Post Treatment	
Isometric Neck Exercise Group	Flexion	30.42±4.2	38.21±3.3	<0.001*
	Extension	32.34±3.9	40.12±3.1	<0.001*
	Left side Flexion	31.33±4.5	37.53±4.0	<0.001*
	Right side Flexion	29.46±4.0	38.90±3.9	<0.001*
	Left side Rotation	62.54±3.8	70.58±3.6	<0.001*
	Right side Rotation	60. 86±3.7	69. 75±3.8	<0.001*
General Neck Exercise Group	Flexion	29.22±3.2	35.42±3.8	<0.001*
	Extension	23.85±3.6	41.10±3.9	<0.001*
	Left side Flexion	28.31±3.9	39.35±3.4	<0.001*
	Right side Flexion	27.43±3.3	35.39±3.2	<0.001*
	Left side Rotation	64.34±3.6	71.14±3.4	<0.001*
	Right side Rotation	61. 92±3.5	67. 25±3.9	<0.001*

P-values were obtained employing Wilcoxon signed rank test. *P-value ≤ 0.05 is considered as significant

For data analysis SPSS version 16 was used. The effects of treatments within the groups were revealed by using T-test. To compare pre and post treatment scores of both groups Wilcoxon signed rank test was used with level of significance P-value less than 0.05 considered significant.

RESULTS

This study included 68 patients, 34 patients in Isometric exercise group A and 34 patients in General exercise group B. Age of the participants ranges between 22 and 48 years with mean age 34.43± 2.7 years. Overall (41) 60 % females and (n=27) 40% males participated in the study with equal allocation of females and males in each intervention group. Four participants dropped out of the study between 5-8 weeks but they participated in final assessment and their results are included.

Both groups improved significantly in both outcome measures with P-value = 0.001 for Isometric exercises group and P-value = 0.04 for general exercise group. However, Isometric neck exercises are clinically more effective than general exercises. In Isometric neck exercise group mean VAS reduced to 5.9.66±2.23, which was 8.6±2.41 before intervention. The Northwick Park Neck Pain Questionnaire score reduced to 11.38±2.41 from 20.81±2.49. In neck General exercise group, mean VAS and Northwick Park Neck Pain Questionnaire score reduced to 6.23±1.31 and 17.54±1.43, which was 7.9± 1.61 and 21.52±2.21 respectively on base line (table 1).

Cervical spine range of movement improved significantly in all movements in both intervention groups p=<0.001 (table 2).

DISCUSSION

To the authors knowledge this is the first study evaluated the effects of isometric and general neck exercises in the management of chronic non-specific neck pain in Pakistan. Both interventions significantly decreased neck pain, improved neck function and improved neck range of movements after 12 weeks of intervention. In this study the subjects were followed for only 12 weeks, previously reported results suggest that 16 weeks of training program and 10-15 repetition of exercises is adequate to Attain neuromuscular and physiological changes related to decrease in muscle pain (Pedersen *et al,* 2013). In present study there were more females' patients than males and this supports previously reported findings that neck pain is more common in females as compared to males (Hoy *et al,* 2010). The positive findings of present study supports the findings of (Waling *et al*, 2002) study compared the effects of strengthening, endurance, coordination and control groups in chronic neck pain patients. Both of these studies were almost similar in terms of duration and frequency of exercises 10 weeks and 12 weeks in present study. However, Waling *et al*. (2002) found no difference in all groups over 8, 17 months and 3 years follow up whereas in present study we did not follow up participants beyond 3 months and it is not possible to establish whether gains in pain, range of movement and functional abilities will carry over for a longer period. Secondly Waling *et al*. (2002) study only included female patients still at work with low base line pain scores and disability whereas in present study base line pain score was high hence more room for improvements. Both groups showed reduction in pain but mean improvements in pain was better in Isometric neck exercise group. These findings are in line with Ylinen, *et al*. (2005) randomised controlled trial suggest that endurance and strength training significantly reduced neck pain (VAS) at the 12-month follow-up. The exercise groups also performed strengthening exercises for the trunk and leg muscles. These extra exercises could have influenced the results of this study and no further explanation was given why these exercises were included in training programs. In our study participants only performed isometric and general exercises for neck in the supervision of physical therapist therefore one could assume that the improvements could only be due to the specific intervention.

Ylinen *et al*. (2006) demonstrates that 2 weeks institutional rehabilitation consisting of isometric neck exercises performed with an elastic rubber band significantly reduced pain and disability scores. Unlike to our study in this study participants also performed dynamic exercises for shoulders and arms with dumbbells and it is not clear whether the effect is due to isometric neck or shoulder exercises. Shoulder strength and endurance training has proven to be effective in chronic neck pain (Hagberg *et al.,* 2000). Four subjects dropped out during 5 to 8 weeks of the study but they have participated in post intervention assessment. These four subjects still showed significant improvements in reduction of pain intensity, improved function and increased cervical spine range of movement. This is supported by Ylinen *et al*. (2006) study revealed that 2 weeks institutional rehabilitation consisting of isometric neck exercise is effective in reducing neck pain if carried out for one year. On the basis of this clinicians may consider to instruct patients to carry out home exercises for a longer period to achieve and maintain gains. The present study showed significant gains in range of movements in all neck movements in both isometric and general exercise groups. The participants performed general exercises dynamically through range of motion and therefore may have caused increased in range of motion. Isometric exercise was performed in static position but still significantly increased range of movement in all neck movements. One explanation for this could be that isometric exercise increases muscle strength and provides a stable base for movements. Ylinen *et al*. (2003) has reported that isometric neck

exercise improved neck flexors muscle strength by 110%, extensors strength 69% and rotators strength by 76%. In endurance exercise group neck flexors strength improved 28%, extensors strength 16% and rotator strength 29%. This study included only female patients and women attain only 20% to 70% of the neck strength as compared to men (Chiu *et al,* 2002). The present study included both male and female patients but neck muscles strength was not measured. In future studies it is recommended to consider measurement of muscle strength to establish a clearer relationship between range of movement and muscle strength in both and female patients.

CONCLUSION

Both isometric and general exercises are effective in reducing neck pain, improving function and increasing active range of neck movements. However, isometric exercises have proven to statistically and clinically more effective in all measures as compared to general exercises.

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