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COMPARISON OF EFFECTIVENESS OF ISOMETRIC EXERCISES WITH AND WITHOUT STRETCHING EXERCISES IN NON SPECIFIC CERVICAL PAIN

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ABSTRACT

Background: Cervical pain is a common condition and almost two thirds of population suffers with this condition. Cervical region is the commonest region for non-traumatic neck pain. Neck pain generates many muscular disturbances in the neck region and may result in tightness of muscles of cervical region. Stretching is considered as an effective mean of treating cervical pain. Isometric exercise is used to enhance the performance of muscles because it provides strength required to perform dynamic exercise. Both of the regimens either separately or combined are used in clinical settings to treat nonspecific cervical pain. This study aims to compare the results of cervical isometrics with and without stretching exercises in reducing non-specific cervical pain

Method: A randomized controlled trial research was performed at physiotherapy department of Mayo Hospital Lahore, Pakistan. A convenience sample of 40 participants was divided into two groups. The cervical isometric exercise was applied to group A and stretching plus isometric exercise to group B for 3 weeks. Nonspecific neck pain was analyzed by using visual analogue scale and goniometry for pre and post treatment assessment.

Results: Isometric exercises play an effective role in relieving pain (p value is 0.03) and minimizing inability of the body to perform functional activities (p value is 0.004) in contrast to the patients of group A. Isometric exercises were applied to the patients of group A (Level of pain: pain value is 0.172) and (physical inability to perform functional activities has P value 0.201).

Conclusion: The result showed that the patients with the complain of non-specific neck discomfort who were treated by cervical isometric alone, showed less improvement in pain relief in contrast to the patients who were treated by the cervical isometric long with stretching.

Keyword: Visual Analogue scale (VAS), Range of Motion (ROM), Stretching, Isometric Exercise, Golgi Tendon Organ, Manual Muscle Testing

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INTRODUCTION

Cervical pain is defined as the discomfort in any place within the area attached to the upper nuchal line from upper and lower margin. It is attached to the first spinous process of thorax and then from the sides. It is also attached to the lateral borders of the neck through Antero-posterior plane [1]. The function of longus colli and longus capitis which are the deep flexor muscles of cervical region, is to provide proper alignment to the posture and also provide stability [2]. They work together to balance the weight of head during its movement in different directions and stabilize the head during static muscle Endurance exercises are performed with least intensity but don't stabilize the head during exercises with maximum intensity in which powerful muscle contraction is needed [3].

Neck is the commonest location of non-traumatic musculoskeletal pain [4]. The issue of the neck discomfort is experienced by two thirds of general populations at some times during their lives. The chances of neck discomfort are more in the middle age and females are more prone to it. Health care centers have huge economic burden because of persistent symptoms of neck discomfort in up to 37% of individuals. The occurrence of neck discomfort changes a lot between studies with average point occurrence of 7.6% and average life time occurrence being 48.5%. [5,6,7]. Posture is considered to have influence on neck pain as it is vital component of normal balance [8]. Forward head posture comes under the heading of bad posture and it is one of the commonest postural abnormalities in people with neck problems. Individuals with neck shoulder problems have more severe forward head posture than those without this kind of diseases [9]. As a result of bad posture muscle length, tension/flexibility association disturbs thereby altering normal biomechanics hence resulting in muscular spasm yielding limited and painful range of motion in all directions [10,11,12]. This spasm is often triggered or worsened by neck movements or continual neck postures [13]. Muscular abnormalities in posterior neck related to pain are mainly of two types. One related to muscular tightness and the other to muscular strain. Symptoms and treatment strategies vary according to the fundamental faults [14,15,16]. Decrease in the pain following static stretching can be demonstrated on the basis of inhibitory effects of GTO (which imparts a reducing effect on the motor neuronal discharges, hence resulting in relaxation of the musculotendinous unit by reorganizing its latent length) and Pacinian corpuscle alteration. These reflexes ultimately permit reduction in tension in musculotendinous unit and reduced pain sensitivity [17].

To enhance the performance of muscle isometric exercise are frequently used. Many postural muscles work in isometric fashion and it provides a strengthen base for dynamic exercise [18]. This study is conducted with the aim to know whether isometric exercise with stretching or without stretching is more effective in reducing non-specific cervical pain.

MATERIAL AND METHODS

A randomized clinical control trial was conducted by taking a convenience sample of 40 patients from physiotherapy department of Mayo Hospital Lahore. Inclusion and exclusion criteria were set. Participants both male and female of age between 20 to 60 years with chronic stage neck pain (>7 weeks), NDI score above 15/50, having cervical spondylosis, chronic stage of tissue healing and tension headache fell under inclusion criteria however those with NDI score less than 14/50, acute pain and inflammation, torticollis, unstable/acute osteoarthritis, any recent fracture, vertigo, vertebrobasilar insufficiency, chronic heart disease, myocardial infarction or pregnancy were excluded from this research. Participants were divided into two groups. Group A (control group) receiving only Isometric exercise for neck region. Isometric exercise was performed with an elastic resistance band (Theraband). The exercises were performed in sitting position by holding the theraband directly forwards for neck flexion, backwards for neck extension, obliquely towards right and left and by crossing over the band for neck side flexion and rotation. All these were done for about 5-10 repetitions with a hold time of 6 seconds and 4 sessions per week. Sessions for first 4 weeks were given at hospital then 2-weeks home plan was given and after 6 weeks re-evaluation was done whereas group B, the experimental group received stretching exercise in addition to Isometric exercise. Procedure for Isometric exercise was same as for control group and 6 treatment sessions of static stretching of upper trapezius, levator scapulae, scalene and sternocleidomastoid (3 times a week) were given to patients. Dosage for stretching was 3-5 repetitions held for 10-30 sec. ROM of cervical spine was manually assessed with passive, active, and combined angular movements, prior giving treatment. Patients from both the groups were treated in the Department of Physiotherapy, Mayo Hospital Lahore. The questionnaire for nonspecific cervical pain was used to assess degree of function (addition of four questions i.e. socioeconomic status, marital status, type of treatment taken before and type of exercise performed were added to the original questionnaire to aid the study). NDI (Neck Disability Index) manual muscle testing for being inexpensive and commonly used method of strength assessment having fair stabilization, good reliability (depending on methods, subjects, and testers) and goniometry were used for the physical assessment of neck. The patients were assessed for change in pain intensity on the basis of visual analogue scale (0 representing no pain and 10 the most severe pain imaginable by the patient) for both groups. Exercise was performed for four week and two weeks follow up was regulated to check the recurrence of symptoms.

DATA ANALYSIS PRODECURE:

Data was analyzed using SPSS 20. Quantitative data was presented in form of mean \pm S.D whereas for qualitative data percentage and frequency tables were shown. P value less than 0.05 was taken as significant. At' test was used to determine the difference between two groups in all clinical parameters both before and after treatment.

RESULTS

Data from all 40 participants was recorded and used for analysis. There was no missing data. Majority of the participants (62.5%) were females. The mean age of subjects was 41 ± 8.963 . Majority of the participants were married (92.5 %). Participants having neck pain of gradual onset were 62.5% while the proportion for sudden onset was 37.5%. Majority of subjects had pain on dominant hand side and morning stiffness i.e 62.5% and 87.5% respectively. In 32.5% participants, the duration of pain was less than 1-2 weeks however 67.5% population had neck pain of the duration longer than 3-4 week.

Pre and post treatment ROM was compared by using paired t-test. In group A mean pre-stage score for active neck flexion was 40.78 ± 12.83 and after treatment it was 50.15 ± 10.56 . Mean active neck extension before treatment was 33.42 ± 9 and after treatment it was improved to 46.00 ± 7.83 . Mean active right side bending before treatment was 19.47 ± 6.75 and after treatment it was 24.94 ± 7.38 . Mean active left side bending before treatment was 19.84 ± 6.56 and after treatment it was 24.42 ± 5.71 . Mean active right rotation before treatment was 33.84 ± 10.29 and after treatment was 44.47 ± 8.3 . Mean active left rotation before treatment was 37.63 ± 10.84 and after treatment it was 48.15 ± 8.6 . In group B mean active neck flexion before treatment was 42.04 ± 11.706 and after treatment it was improved to 67.28 ± 4.01 . Mean active neck extension before treatment was 36.42 ± 11.16 and after treatment it was 61.80 ± 7.0 . Mean active right side bending before treatment was 22.47 ± 7.6 and after treatment it was improved to 36.04 ± 5.18 . Mean active left side before treatment was 24.42 ± 8.2 and after treatment was its value was 38 ± 5.9 . Mean active right rotation before treatment was 34.71 ± 9.78 and after treatment it was 62.52 ± 7.24 and the mean active left rotation before treatment was 39.19 ± 12.06 and after treatment it was 63.00 ± 7.4 . (Table 3) It has been shown that that the group B (receiving Isometric exercise along with stretching exercise) showed better improvement and a greater difference in pretreatment and post treatment values for ROM then group A..

Between groups analysis for pain was carried out by using independent t-test. When pre and post treatment pain was evaluated for both groups, a significant difference in pain reduction was noticed ($p=0.04$) in favour of group B. Table 1 and 2 show the details of pain scale reading noted before and after comparative treatment. At the end of 4 week's follow ups 100% pain reduction was seen in Experimental group whereas Control group showed on an improvement of 50%.

The mean score of Neck Disability Index was 48.26 ± 11.376 before the treatment in group A (Isometrics group). After the treatment the mean score is reduced to 16.68 ± 6.307 . The value of $p < 0.005$ which showed that Isometrics are significant in treating non-specific neck pain by reducing the neck disability.

In group B (Isometrics with Stretching), the mean score of neck disability was 49.95 ± 15.134 before the treatment. After the treatment sessions were given the mean score of neck disability index was reduced to 8.55 ± 2.088 . The p value is < 0.005 that showed that Isometric with Stretching is also significant. Since, the mean paired difference is greater in group B so Isometrics with Stretching is clinically more superior to Isometrics alone. (Table 4)

Table1: Pre VAS scale difference between the groups

Before treatment	Pain perception (VAS scale)						Total
	4.00	5.00	6.00	7.00	8.00	9.00	
Isometric exercise without stretching	0	0	7	2	8	2	19
Isometric exercise with stretching	1	1	2	5	9	3	21
Total	1	1	9	7	17	5	40

Table2: Post VAS scale difference between the groups

After treatment	Pain perception (VAS scale)					Total
	0.00	1.00	2.00	3.00	4.00	
Isometric exercise without stretching	0	1	8	8	2	19
Isometric exercise with stretching	3	18	0	0	0	21
Total	3	19	8	8	2	40

Table 3: Mean Range of motion of neck before and after treatment (isometrics without stretching= group A, isometrics with stretching= group B)

Movement	Treatment received	Frequency (number)	Mean	Std. Deviation	Std. Error Mean
Post treatment cervical flexion	Isometrics without stretching	19	40.7895	12.83043	2.94350
	Isometrics with stretching	21	42.0476	11.70673	2.55462
Post treatment Cervical flexion	Isometrics without stretching	19	50.1579	10.56337	2.42340
	Isometrics with stretching	21	67.2857	4.01426	.87598
Pretreatment Cervical extension	Isometrics without stretching	19	33.4211	9.13671	2.09611
	Isometrics with stretching	21	36.4286	11.16947	2.43738
Post treatment Cervical Extension	Isometrics without stretching	19	46.0000	7.83865	1.79831
	Isometrics with stretching	21	61.8095	7.06837	1.54245
Pretreatment Right side flexion	Isometrics without stretching	19	19.4737	6.75252	1.54913
	Isometrics with stretching	21	22.4762	7.64604	1.66850
Post treatment Right-side flexion	Isometrics	19	24.9474	7.38221	1.69360
	Isometrics with stretching	21	36.0476	5.18147	1.13069
Pretreatment Left side flexion	Isometrics without stretching	19	19.8421	6.56813	1.50683
	Isometrics with stretching	21	24.4286	8.20714	1.79094
Post treatment Left side flexion	Isometrics without stretching	19	24.4211	5.71854	1.31192
	Isometrics with stretching	21	38.3810	5.92854	1.29371
Pretreatment Right side rotation	Isometrics without stretching	19	33.8421	10.29705	2.36231
	Isometrics with stretching	21	34.7143	9.78337	2.13491
Post treatment Right side rotation	Isometrics without stretching	19	44.4737	8.31577	1.90777
	Isometrics with stretching	21	62.5238	7.24996	1.58207
Pretreatment Left side rotation	Isometrics without stretching	19	37.6316	10.84850	2.48882
	Isometrics with stretching	21	39.1905	12.06905	2.63368
Post treatment Left side rotation	Isometrics without stretching	19	48.1579	8.69395	1.99453
	Isometrics with stretching	21	63.0000	7.40270	1.61540

Table 4: Neck disability index (isometrics without stretching= group A, isometrics with stretching= group B)

Category	Group of patient	Frequency (number)	Mean	Std. deviation	Std. Error mean
Pretreatment Neck disability index percentage	Isometrics without stretching	19	48.2632	11.37659	2.60997
	Isometrics with stretching	21	49.9524	15.13432	3.30258
Posttreatment Neck disability index percentage	Isometrics without stretching	19	16.6842	6.30743	1.44702
	Isometrics with stretching	21	8.5238	2.08852	.45575

DISCUSSION

Isometric and Muscle stretching exercises are well known maneuvers in treating neck pain and are frequently recommended and used in treatment of neck pain. The results of study confirm that effectiveness of Isometrics with Stretching was more than Isometrics alone. Combination of Isometric exercise and Stretching exercise was found to be remarkably effective for increasing cervical range of motion and decreasing pain. Karlsson et al did study about Evaluation of pain and function after two home exercise programs in a clinical trial on women with chronic neck pain with special emphasize on completers and responders in 2014 and he concluded that no differences in the two primary outcomes between the two interventions were found. Both interventions based on home exercises improved the two primary outcomes, but the adherences were relatively low [19].

Jakobson et al did Single blinded cluster randomized controlled trial on effect of workplace versus home-based physical exercise on pain in healthcare workers in 2014 and he found that supervised physical training at the workplace is superior to home-based exercise in reducing pain symptoms and increasing adherence. Previous investigations have shown promising results of physical exercise for relieving pain among different occupational groups [20]. Ayhan et al did randomize control trial in 2016 about the effectiveness of Neck Stretching Exercises following total thyroidectomy on reducing neck pain and disability and he concluded that neck stretching exercises done immediately after a total thyroidectomy reduce short-term neck pain and disability symptoms. There are a limited number of studies showing effects of neck stretching exercises in reducing neck discomfort symptoms, no study has specifically dealt with and examined the effect of neck stretching exercises on neck pain and disability [21].

Isometric and muscle stretching exercises are still debatable researches revealed that the combination of these two therapeutic techniques results in better improvement and relief of neck pain. Previously most of the work was conducted on strength training combined with stretching exercise verses stretching alone. Hakkinen A et al in 2008 did randomized one-year follow-up study about Strength training

and Stretching versus Stretching only in the treatment of patients with Chronic neck pain in which he compared the effects of strength exercise combined with stretching and stretching alone for neck pain relief and revealed that there was no significant difference in both the groups receiving respective [22]. The results of the present study were similar to previous researches and showed that a combination of Isometric Exercises and Stretching Exercises results in greater relief of pain and increase in range of motion as compared to Isometric Exercise alone which although relieved neck pain and increased range of motion of neck but to lesser extent. However, under the light of present study effectiveness of Isometric combined with stretching is evidently visible and hence may be recommended to treat neck pain.

CONCLUSION

It was concluded that effectiveness of Isometrics with Stretching was more than Isometrics alone. Combination of Isometric exercise and Stretching exercise was found to be remarkably effective for increasing cervical range of motion and decreasing pain.

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