International Journal of Advanced Research in Orthopaedics

Chembio Publishers
Right Choice for Researchers

Research Article *Volume 1; Issue 1*

Short Term and Long Term Effects of Taping, Exercises and Combined Taping and Exercises in Mechanical Neck Pain

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Received Date: August 13, 2018; **Published Date:** August 17, 2018

Abstract

Background and objective: One of the most common pains is the neck pain. The repetitive use of computers has forced many computer users to adopt a Forward Head Posture. When spinal tissues are under a huge load for a longer period of time, they change in structure and in time might undergo remodeling changes which may become permanent.
Materials and method: 60 subjects, 20 in taping group (A), 20 in combined exercises and taping group (B) and 20 in control group (C). Subjects with chronic mechanical neck pain (> 3 months duration), with positive kemps and brachial plexus compression test, moderate severity of pain based on Oswestry pain questionnaire scoring 20 to 40, aged between 30 to 50 years and Subjects whose dull aching pain increased by sustained postures, neck movement, palpation of cervical musculature were randomly selected in the study.
Results: Mean, Standard Deviation, paired and unpaired t test were used. There was significant decrease in pain (OPI) and NDI with increase in ROM in Group B as compared to Group A and Group C post 8th week of intervention. Increase in ROM was gradual and was maximum post 8 week of intervention in all the 3 Groups. There was statistical change in Oswestry Pain Index (OPI), Neck Disability Index (NDI) and Cervical Range of Motion (ROM) with $p \leq 0.05$.
Conclusion: The present study concludes that Kinesio Taping along with Exercise is helpful in decreasing pain and limiting neck disability. However Kinesio Taping alone could only reduce pain but was not that effective in limiting neck disability. Whereas the control group where only exercises were given showed a little reduction in pain and limit in neck disability. After the application of Kinesio Tapes along with specific exercises the outcome measures showed much better improvements. There was significant decrease in Pain, Neck disability and significant increase in cervical Range of motion.

Keywords: Kinesio taping; Oswestry paini; Mechanical neck pain

Abbreviations: OPI: Oswestry Pain Index; NDI: Neck Disability Index; ROM: Cervical Range of Motion; SPSS: Statistical Software of Social Sciences

Citation: Satyam Bhodaji, et al. Short Term and Long Term Effects of Taping, Exercises and Combined Taping and Exercises in Mechanical Neck Pain. Int J Adv Res Ortho 2018, 1(1): 180003.

Introduction

One of the most common pains is the neck pain. The repetitive use of computers has forced many computer users to adopt a Forward Head Posture [1,2]. Compared the head, neck, and shoulder postures of office workers with and without pain symptoms in these regions, during work hours, in their work environments, and found an increase in head tilt and neck flexion postures in the subjects having neck pain when compared to the asymptomatic subjects [1]. When spinal tissues are under a huge load for a longer period of time, they change in structure and in time might undergo remodeling changes which may become permanent [2]. According to Global Burden of Disease 2010 study, neck pain is the 4th leading cause of years lost to disability, ranking behind back pain, depression and arthralgias [3]. Approximately half of all individuals will experience a clinically important neck pain episode over the course of their lifetime. Mechanical neck pain affects 30 to 50% of the general population and 11 to 14% of working population will annually experience activity limitation [4]. Prevalence peaks at middle age and women are more affected than men. Risk factors include repetitive work, prolonged periods of cervical flexion. Mechanical neck pain results in low level of disability [5]. Some of the reasons why obese individuals may be predisposed to neck pain include elevated systemic inflammation, deleterious structural changes, increased mechanical stress and ground reaction force, diminished muscle strength, more psychological issues, and greater disability related to kinesiophobia compared with non-overweight people [6]. Although certain occupations such as office and computer workers, manual laborers, and health care workers, have been found in some studies to have a higher incidence of neck pain, the major workplace factors associated with the condition are low job satisfaction and perceived poor workplace environment [7].

Similar to back pain, cervical and scapular stretching and strengthening exercises have been found to provide intermediate term relief for mechanical neck pain [8-10]. In one large randomized study of 206 patients with acute cervical radiculopathy, both physical therapy accompanied by home exercises and the use of a hard cervical collar produced greater reductions in neck pain and disability over a 6 week period than a "wait and see" approach [11]. However, systematic reviews have concluded that cervical collars are no more effective than sham interventions for neck pain [12]. In one randomized trial that compared spinal manipulations, home exercise and advice and pharmacotherapy with NSAIDs or acetaminophen in acute and sub acute neck pain, the manipulations and exercise groups fared better than medical treatment through 12-month follow-up [13]. Muscle relaxants tend to be more effective for acute pain than chronic pain.

Kinesio tape is a thin pliable adhesive material that can be stretched up to 120 to 140% of its origin making it more elastic than conventional tape. It provides a constant shearing force to skin over which it is applied [14]. It is air permeable, water resistant and can be worn for many days. Kinesio tape is therapeutic in nature. It improves muscle function by reinforcing weakened muscles; improve circulation and lymph underneath the skin by motion of muscle, decrease pain through neurological suppression, repositioning the laxed joints, by releasing abnormal tension on muscle and fascia. Although physiotherapists use Kinesio taping in clinical practice, but scientific evidence were not found. Studies have shown the effectiveness of Kinesio taping in treatment of shoulder pain, range of motion and trunk pain and the studies have found improvements in pain and range of motion in individuals with whiplash injury [15,16,4]. There are studies that have shown effectiveness of Kinesio taping and manual therapy on forward head posture [14].

The conventional exercises have been shown effective in mechanical neck pain [17]. The effects of Kinesio taping with conventional exercises are in reducing pain, improving cervical range of motion, functional abilities were not found. Conventional physiotherapy treatment takes a long time to recover which is more than 6 weeks of rehabilitation which is troublesome for regular follow-ups. It will be a beneficial to know the combined effect of Kinesio taping with exercises in short term duration as well as long term duration on Forward head posture neck pain. Short term effects of Kinesio taping and manipulation have been found effective in improving pain, cervical range of motion and functional status in mechanical neck pain. It was limited to know the effect with exercises. Therefore no studies have found short term effects as well as long term effects of Kinesio taping, exercise therapy and combination of both Kinesio taping and exercise on forward head posture as exercise therapy being used regularly was for longer duration follow-up. Therefore the present study aims to study the short term as well as long term effects of Kinesio taping with exercises for a period of 8 weeks in subjects with mechanical neck pain on management of pain, passive and active range of motion, functional ability (Figure 1&2).

Figure 1: Photograph showing the application on Kinesio Tapes.

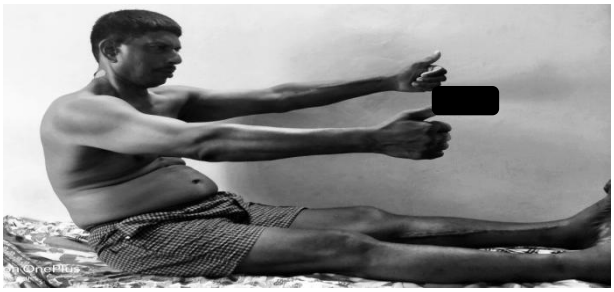

Figure 2: Photograph showing male subject exercising while tucking his chin.

Methodology

Ethical clearance was obtained from ethical committee of K.T.G. College of physiotherapy, Bangalore. 70 subjects with neck pain were selected for the present study. Patients were explained about the procedure in their vernacular languages.

Inclusion criteria included

i. Subjects with chronic mechanical neck pain (>3 months duration)

ii. Subjects with positive kemps and brachial plexus compression test which is a reliable and valid diagnosing test for Mechanical neck pain.

iii. Subjects with moderate severity of pain based on Oswestry pain questionnaire scoring 20 to 40.

iv. Both male and female subjects aged between 30 to 50 years.

v. Subjects whose dull aching pain increased by sustained postures, neck movement, palpation of cervical musculature.

vi. Subjects willing to participate in the study.

Exclusion criteria:

i. Subjects with spinal deformities

ii. Subjects with short neck.

iii. Subjects with specific neck pain such as disc lesion, inflammatory disease, neoplasm etc.

iv. Subject with history of osteoporosis, fracture.

v. Subjects with history of whiplash, cervical surgery, cervicogenic headache.

vi. Subjects allergic to kinesiotape.

vii. Subjects who are not on any kind of analgesics.

60 patients were enrolled in the study after completion of the inclusion-exclusion criteria and signing the inform consent.

Outcome measures used in the study were Pain status by Numerical pain rating scale, Range of motion by Goniometer and Functional abilities by Neck Index Scale. Kinesio taping group (Group A) will be given Kinesio taping and combined exercises and Kinesio taping group will be given Kinesio taping and exercises (Group B). Before applying the Kinesio tape a sensitivity test was done. And if the subject does not have any reaction we will proceed with the method. The tape will be applied to the posterior neck muscles and trapezius. Strengthening exercises in supine position with manual resistance were performed for the group B and C. In prone position

subject extend their neck avoiding lifting shoulder. In sitting neck rotation without any lumbar rotation [18] (12 repetitions) were performed. Chin tucks done without contraction of sternocleidomastoid and without any breath holding (10 repetitions) [19].

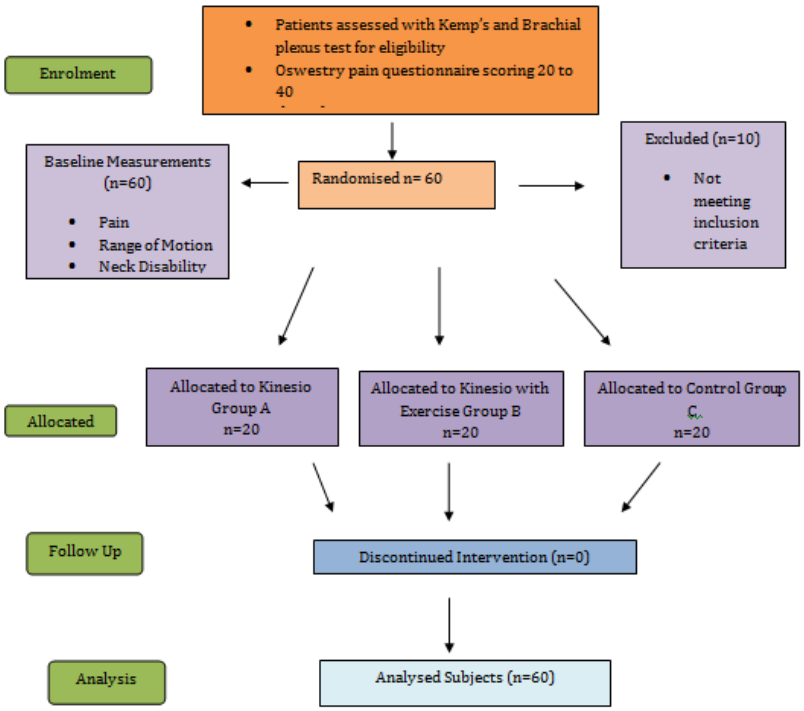

Figure 3: Above flow study chart showing combined exercise, exercise and strengthening exercises Group A, Group B & Group C.

Results

Statistical Analysis for the present study was done manually as well as using the statistical software of social sciences (SPSS) 20 version so as to verify the results obtained. Nominal data of the subjects like demographic data i.e. Age, Gender were analysed using the paired 't' test. Comparison of the pre intervention and post intervention outcome measures within the groups (intra group comparison) and between the groups (inter group comparison) was done by using paired t-test. Probability values less than or equal to 0.05 ($p \leq 0.05$) were considered statistically significant and probability values less than 0.001 were considered highly significant.

The study had subjects in the age group of 30-50(±6.653) years (Figure 4) (Table 1 & 3). Male: female gender distribution in both the groups is shown in Figure 5 and Table 2. Descriptive Statistics of pre test and post tests of OPI (Oswestry Pain Index) in all the groups A, B and C by chi square test are shown in Table 4. Comparison of pre test and post test of OPI (Oswestry Pain Index) in group A, B and C by using ANOVA shown in Table 5. Descriptive Statistics by chi square test and Comparison using ANOVA of pre test and post tests of NDI (Neck Disability Index) in all the groups A, B and C is shown in Table 6 & 7. Descriptive Statistics by chi square test and Comparison using ANOVA of pre test and post tests of of Cervical flexion, Cervical Extension and Cervical Rotation in all the groups A, B and C is shown in Table 8-13.

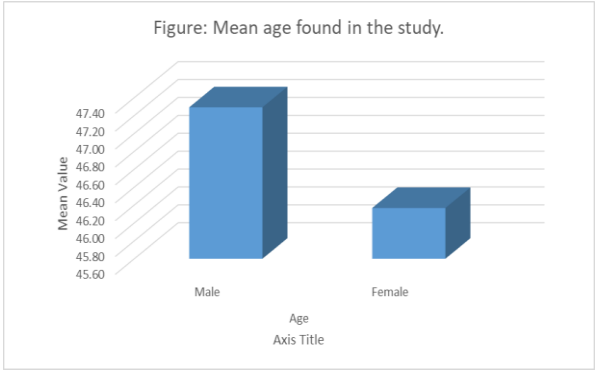

Figure 4: Comparison of Mean Age found in Group A, Group B and Group C.

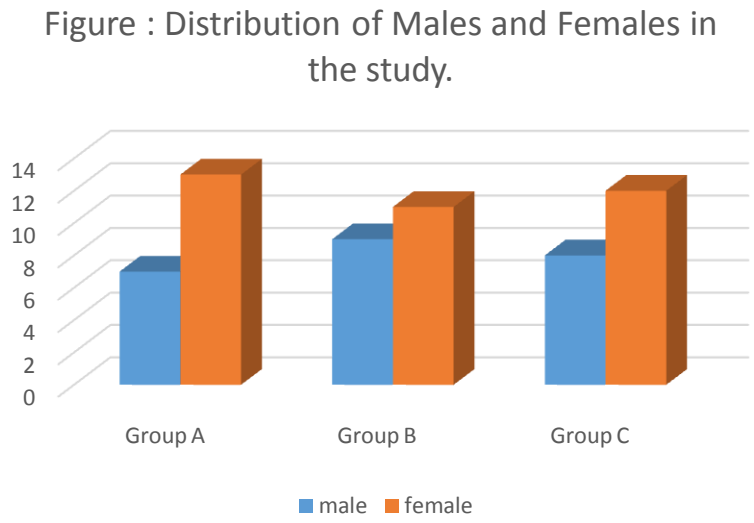

Figure 5: Distribution of Gender in Group A, Group B and Group C.

Age								
	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
1	20	40.45	6.653	1.488	37.34	43.56	29	55
2	20	49.15	6.081	1.360	46.30	52.00	37	60
3	20	50.25	6.439	1.440	47.24	53.26	38	60
Total	60	46.62	7.685	0.992	44.63	48.60	29	60

Table 1: Comparison for mean Gender between Group A, Group B and Group C by t test.

			Gender		Total
			Male	Female	
Group	A	Count	7	13	20
		% within Group	35.0%	65.0%	100.0%
	B	Count	9	11	20
		% within Group	45.0%	55.0%	100.0%
	C	Count	8	12	20
		% within Group	40.0%	60.0%	100.0%
Total		Count	24	36	60
		% within Group	40.0%	60.0%	100.0%

Table 2: Distribution of Gender in Group A, Group B and Group C by t test.

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	1,152.933	2	576.467	14.095	0.000
Within Groups	2,331.250	57	40.899		
Total	3,484.183	59			

Table 3: Comparison between Group A, Group B and Group C for Age by using ANNOVA.

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
OPI_pre 1 week	A	20	33.3000	5.82282	1.30202	30.5748	36.0252	20.00	40.00
	B	20	33.3000	4.82428	1.07874	31.0422	35.5578	25.00	40.00
	C	20	30.8500	6.20929	1.38844	27.9440	33.7560	20.00	40.00
	Total	60	32.4833	5.67328	0.73242	31.0178	33.9489	20.00	40.00
OPI_post4 week	A	20	31.5000	5.42412	1.21287	28.9614	34.0386	20.00	38.00
	B	20	29.9500	5.08325	1.13665	27.5710	32.3290	20.00	38.00
	C	20	29.9500	6.40292	1.43174	26.9533	32.9467	18.00	40.00
	Total	60	30.4667	5.61616	0.72504	29.0159	31.9175	18.00	40.00
OPI_post8 week	A	20	28.6000	5.38419	1.20394	26.0801	31.1199	18.00	37.00
	B	20	26.6000	4.93537	1.10358	24.2902	28.9098	19.00	36.00
	C	20	29.0500	6.48460	1.45000	26.0151	32.0849	18.00	40.00
	Total	60	28.0833	5.64573	0.72886	26.6249	29.5418	18.00	40.00

Table 4: Descriptive Statistics of pre test and post tests of OPI (Oswestry Pain Index) in all the groups A, B and C by chi square test.

		Sum of Squares	df	Mean Square	F	Sig.
OPI_pre 1 week	Between Groups	80.033	2	40.017	1.254	0.293
	Within Groups	1,818.950	57	31.911		
	Total	1,898.983	59			
OPI_post 4 week	Between Groups	32.033	2	16.017	0.499	0.610
	Within Groups	1,828.900	57	32.086		
	Total	1,860.933	59			
OPI_post 8 week	Between Groups	68.033	2	34.017	1.070	0.350
	Within Groups	1,812.550	57	31.799		
	Total	1,880.583	59			

Table 5: Comparison of pre test and post test of OPI (Oswestry Pain Index) in group A, B and C by using ANOVA.

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
NDI_Pre 1 week	A	20	10.25	4.153	0.929	8.31	12.19	4	18
	B	20	8.80	4.420	0.988	6.73	10.87	2	17
	C	20	11.65	4.464	0.998	9.56	13.74	3	19
	Total	60	10.23	4.432	0.572	9.09	11.38	2	19
NDI_Post 4 week	A	20	9.15	3.815	0.853	7.36	10.94	4	17
	B	20	7.90	4.051	0.906	6.00	9.80	1	14
	C	20	11.15	4.428	0.990	9.08	13.22	3	19
	Total	60	9.40	4.255	0.549	8.30	10.50	1	19
NDI_Post 8 week	A	20	8.40	4.223	0.944	6.42	10.38	2	16
	B	20	6.60	3.872	0.866	4.79	8.41	0	12
	C	20	10.80	4.372	0.978	8.75	12.85	3	18
	Total	60	8.60	4.442	0.574	7.45	9.75	0	18

Table 6: Descriptive Statistics of pre test and post tests of NDI (Neck Disability Index) in all the groups A, B and C by chi square test.

		Sum of Squares	df	Mean Square	F	Sig.
NDI_Pre 1 week	Between Groups	81.233	2	40.617	2.149	0.126
	Within Groups	1,077.500	57	18.904		
	Total	1,158.733	59			
NDI_Post 4 week	Between Groups	107.500	2	53.750	3.188	0.049
	Within Groups	960.900	57	16.858		
	Total	1,068.400	59			
NDI_Post 8 week	Between Groups	177.600	2	88.800	5.129	0.009
	Within Groups	986.800	57	17.312		
	Total	1,164.400	59			

Table 7: Comparison of pre test and post test of NDI (Neck Disability Test) in group A, B and C by using ANOVA.

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Cervical Flexion _Pre 1 week	A	20	47.10	2.972	0.665	45.71	48.49	39	50
	B	20	47.40	2.458	0.550	46.25	48.55	42	50
	C	20	47.10	2.972	0.665	45.71	48.49	39	50
	Total	60	47.20	2.767	0.357	46.49	47.91	39	50
Cervical Flexion _Post 4 week	A	20	47.35	2.681	0.599	46.10	48.60	42	50
	B	20	48.40	1.603	0.358	47.65	49.15	45	50
	C	20	47.35	2.681	0.599	46.10	48.60	42	50
	Total	60	47.70	2.389	0.308	47.08	48.32	42	50
Cervical Flexion _Post 8 week	A	20	47.95	2.282	0.510	46.88	49.02	44	50
	B	20	49.85	0.366	0.082	49.68	50.02	49	50
	C	20	47.95	2.282	0.510	46.88	49.02	44	50
	Total	60	48.58	2.053	0.265	48.05	49.11	44	50

Table 8: Descriptive statistics of pre test and post test of Cerval Flexion in group A, B and C by using chi square test.

		Sum of Squares	df	Mean Square	F	Sig.
Cervical Flexion_Pre 1 week	Between Groups	1.200	2	0.600	0.076	0.927
	Within Groups	450.400	57	7.902		
	Total	451.600	59			
Cervical Flexion_Post 4 week	Between Groups	14.700	2	7.350	1.301	0.280
	Within Groups	321.900	57	5.647		
	Total	336.600	59			
Cervical Flexion_Post 8 week	Between Groups	48.133	2	24.067	6.844	0.002
	Within Groups	200.450	57	3.517		
	Total	248.583	59			

Table 9: Comparison of pre test and post test of Cervical Flexion in group A, B and C by using ANOVA.

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Cervical Extension_Pre 1 week	A	20	57.50	2.585	0.578	56.29	58.71	50	60
	B	20	58.15	2.033	0.455	57.20	59.10	54	60
	C	20	57.50	2.585	0.578	56.29	58.71	50	60
	Total	60	57.72	2.394	0.309	57.10	58.34	50	60

Cervical Extension_Post 4 week	A	20	57.85	2.254	0.504	56.79	58.91	52	60
	B	20	58.95	1.276	0.285	58.35	59.55	56	60
	C	20	57.85	2.254	0.504	56.79	58.91	52	60
	Total	60	58.22	2.018	0.260	57.70	58.74	52	60
Cervical Extension_Post 8 week	A	20	58.75	1.860	0.416	57.88	59.62	55	60
	B	20	59.80	0.523	0.117	59.56	60.04	58	60
	C	20	58.75	1.860	0.416	57.88	59.62	55	60
	Total	60	59.10	1.602	0.207	58.69	59.51	55	60

Table 10: Descriptive statistics of pre test and post test of Cervical Extension in group A, B and C by using chi square test.

		Sum of Squares	df	Mean Square	F	Sig.
Cervical Extension_Pre 1 week	Between Groups	5.633	2	2.817	0.483	0.620
	Within Groups	332.550	57	5.834		
	Total	338.183	59			
Cervical Extension_Post 4 week	Between Groups	16.133	2	8.067	2.052	0.138
	Within Groups	224.050	57	3.931		
	Total	240.183	59			
Cervical Extension_Post 8 week	Between Groups	14.700	2	7.350	3.065	0.054
	Within Groups	136.700	57	2.398		
	Total	151.400	59			

Table 11: Comparison of pre test and post test of Cervical Extension in group A, B and C by using ANOVA.

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Cervical Rotation_Pre 1 week	A	20	79.00	1.257	0.281	78.41	79.59	76	80
	B	20	79.25	1.410	0.315	78.59	79.91	76	80
	C	20	79.00	1.257	0.281	78.41	79.59	76	80
	Total	60	79.08	1.293	0.167	78.75	79.42	76	80
Cervical Rotation_Post 4 week	A	20	79.35	0.875	0.196	78.94	79.76	78	80
	B	20	79.65	0.745	0.167	79.30	80.00	78	80
	C	20	79.35	0.875	0.196	78.94	79.76	78	80
	Total	60	79.45	0.832	0.107	79.24	79.66	78	80
Cervical Rotation_Post 8 week	A	20	79.85	0.489	0.109	79.62	80.08	78	80
	B	20	80.00	0.000	0.000	80.00	80.00	80	80
	C	20	79.85	0.489	0.109	79.62	80.08	78	80
	Total	60	79.90	0.399	0.052	79.80	80.00	78	80

Table 12: Descriptive statistics of pre test and post test of Cervical Rotation in group A, B and C by using ANOVA.

		Sum of Squares	df	Mean Square	F	Sig.
Cervical Rotation_Pre 1 week	Between Groups	0.833	2	0.417	0.243	0.785
	Within Groups	97.750	57	1.715		
	Total	98.583	59			
Cervical Rotation_Post 4 week	Between Groups	1.200	2	0.600	0.863	0.428
	Within Groups	39.650	57	0.696		
	Total	40.850	59			

Cervical Rotation_Post 8 week	Between Groups	0.300	2	0.150	0.940	0.397
	Within Groups	9.100	57	0.160		
	Total	9.400	59			

Table 13: Comparison of pre test and post test of Cervical Rotation in group A, B and C by using ANOVA.

Discussion

The present study was aimed to check the effects of Taping, Exercises and combined Taping and Exercises on Short term and Long term Mechanical Neck Pain. The study included a total of 60 subjects having Mechanical Neck pain out of which 20 subjects were given Kinesio Taping (Group A), other group had 20 subjects who were given Kinesio Taping with Exercise (Group B), and the last Group of 20 Subjects were only given Exercises (Group C). Most epidemiological studies report an annual prevalence raging between 15% and 50%, with one systematic review reporting a mean rate of 37.2% [4,5,12]. The prevalence of neck pain is as high as back pain [5,12]. Neck pain is associated with several comorbidities including Headache, back pain, arthralgia and depression [5,20]. Subjects in the present study were in the age group of 30-50 years. The prevalence of neck pain is higher in females than in males, and the literature is mixed as to whether it peaks or plateaus in the middle age [4,12, 21]. However, the prevalence of age is commonly found in the middle age wherein women are more affected than men. Various risk factors are associated in prevailing Mechanical Neck pain such as repetitive work, prolonged periods of cervical flexion. The repetitive use of computers has forced many computer users to adopt a Forward Head Posture [1,2]. Mechanical neck pain leads in low level of disability [5].

In the present study all 3 groups showed significant results in all the groups namely Group A, B and C. the study was done to determine the short-term effects of Kinesio taping, on neck pain and cervical range of motion in individuals with acute whiplash-associated disorders. Forty-one patients (21 females) were randomly assigned to 1 of 2 groups: the experimental group received Kinesio taping to the cervical spine (applied with tension) and the placebo group received a sham Kinesio taping application (applied without tension). The study found out that patients with acute whiplash associated disorders who received Kinesio taping with tension showed improvement in pain and range of motion which were clinically less meaningful [22]. The study was carried out to find out efficacy of neck stabilization exercises on neck pain. 60 subjects randomly divided into 3 groups. First group only physical agents and Second group isometric, stretching and physical agents were used. Third group physical agents and stabilization exercises were used. The study was done for 6 weeks. The study found out that the stabilization exercises were superior to isometric and stretching [1].

Group A was comparatively batter then the other two groups. This may be due to the tension created by increased stimulation during active movements provides stimulation to mechanoreceptors [23]. Perceived stimuli are Proprioceptive and targets different somato sensory receptors which reduce pain. Continuous feedback 24 hours a day for 3 to 5 days per week allows the tape to correct postural imbalances [24]. Decreased strength in neck muscles has been associated with chronic mechanical neck pain [19]. Exercises including stabilization exercises, strengthening and endurance exercises, Proprioceptive exercises decrease pain and improve range of motion [25]. Intense exercises may increase activity in motor pathways thereby exerting an inhibitory effect on pain centers in Central Nervous Systems. Muscle contraction will stimulate mechanoreceptors and increase sensory nerve activity which in turn may inhibit the pathways mediating pain. Thus there appears to be several mechanisms in neural system through which training may relieve pain [26].

Conclusion

The present study was conducted to compare the effectiveness of Short term and long term effects of taping, exercises and combined taping and exercises in mechanical neck pain subjects. Sixty participants were selected based on inclusion criteria after obtaining the Informed Consent. The participants were randomly assigned into three groups with twenty in each group. Pre-intervention OPI, NDI and ROM scores were measured. Sessions were carried out 3 times a week for 8 weeks. Post intervention scores were measured at the end of 4^{th} and 8^{th} week. The scores of pre and post interventions were then compared to get the results. Present study results concluded that combined Kinesio Taping along with Exercise is helpful in decreasing pain and limiting neck disability. There was a significant short term effect of Kinesio taping with exercises on improvement seen on Range of motion; Neck Disability Index in subjects with chronic mechanical neck pain. There was also a significant long term effect of Kinesio taping with exercises on improvement seen on Range of motion, and Neck Disability Index in subjects with chronic

mechanical neck pain. But the difference in short and long term effects of all three treatment groups is quite a small fragment.

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