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Original Article

Comparative Effects of Comprehensive Corrective Exercises Versus Muscle Energy Techniques in Patients with Upper Cross Syndrome: A Randomized Controlled Trial

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ABSTRACT

Upper crossed Syndrme is one of the most prominent anomalous alignments currently. Janda defines 4 Upper Crossed Syndrome as the involvement of several skeletal system muscles that results in shortness and tightness of the anterior and upper trunk or weakening of the posterior section of the skeletal muscles. Objective: To compare the effects of Comprehensive corrective exercises versus muscle energy techniques in patients with upper cross syndrome. Methods: Randomized controlled trial with non-probability convenient sampling was conducted. Fifty-two patients were randomly allocated into 2 groups. The exercise duration period was of eight weeks and three sessions were conducted in one week. Group A was given muscle energy techniques and Group B was given comprehensive corrective exercises. The study was single (assessor)blinded. NDI and VAS were used as an outcome measure to quantify pain and disability in patients with upper cross syndrome. Measurements were taken at baseline (pretest), 8th week (posttest) and 12th week (follow up). Results: There were 52 diagnosed patients having upper cross syndrome with the mean age of 26.03 in group A (METS) in which 46.2% male and 53.8% females. The mean age of 28.76 in group B (CCEP) in which 65.4% males and 34.6% females. It was resulted that there was significant improvement at each level assessment. Statistically, comparison showed no significant difference were found between comprehensive corrective exercises and muscle energy techniques. However, both VAS and NDI showed better improvement in the CCEP group as compared to the MET group. Conclusion: Both techniques relived the pain and lowered the disability in upper cross syndrome patients; Whereas, Comprehensive corretive exercises are convinient and easy approach. Furthermore, these set of exercises maintained the effectiveness till 4 weeks post intervention.

INTRODUCTION

Currently one of most focus abnormal alignment is Upper crossed Syndrme [1]. Upper Crossed Syndrome is defined by Janda as the involvement of different muscles of skeletal system which leads to shortness and tightness of anterior and upper trunk or weakness of posterior part of skeletal muscles. Alteration of muscles activity such as facilitation of different muscles as levator scapula, sternocleidomastoid, pectoralis muscles and inhibition of cervical flexors, serratus anterior etc [2]. The muscular imbalance occurs because of weak/tight and tonic muscles [3]. The muscle imbalance causes rounded shoulder, forward head posture, scapular deviation and increased thoracic kyphosis. This postural deviation also causes joint degeneration. Joint degeneration also causes pain in some patients but the main cause of pain is due to altered muscle activation [4]. Musculoskeletal disorders basically occurs due to repeated work while handling constant loading in intact posture and this repeated motion causes pain in neck and shoulders which is the primary symptom of upper cross syndrome [5]. The main

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cause of the Upper cross syndrome is abnormal posture like the people who work repeatedly in that abnormal posture and this abnormal posture lead to musculoskeletal disorder like UCS [6]. Forward head posture and rounded shoulders are red flags of UCS and these symptoms occurs due to incorrect posture [7]. Muscle energy technique also involves the participation of the person so it is active technique. It is compromised on two features as Reciprocal inhibition and Autogenic inhibition. Limited researches have been done in past which compared these techniques [3]. Many researches showed that MET helps in stretching of several muscles like upper trapezius and strengthening of levator scapulae and lower trapezius [8]. Muscle energy technique and ischemic compression are effective in reducing pain associated with upper cross syndrome [9-10]. The Comprehensive Corrective Exercise Program is advanced approach and consist of corrective exercises. CCEP is designed on the basis of advantages and disadvantages of previous exercises. CCEP not only reduces the pain of specific body parts but also focus on correction of muscle imbalance and altered activation of muscle, healthy posture of the whole body [11-12]. MET is basically a technique in which person use voluntary contraction in precise controlled manner against operation countered force. MET used to decrease pain, muscle spasm, tone, improve blood circulation and strengthen the weakened structures [13-14]. It is important to involve patient's own participation, as muscle energy technique is an active technique. In static stretching all the work done is by therapist. Muscle energy technique compromised of two stages reciprocal inhibition and autogenic inhibition. Autogenic inhibition is defined as relaxation of the muscle is followed by the contraction and tension of that muscle as compared to reciprocal inhibition is known for relaxation of a muscle followed by stretch or tension [15]. CCEP is latest approach and effective because these corrective exercises are essential worldwide for the correction of malalignments but despite knowing its popularity and effectiveness, very few researches have been done on this approach [11]. In addition researcher focused to assess one of affected areas such as spine, shoulder, head, neck individually and describe other malalignments, altered muscle dysfunction and other movement patterns deformities [16-18]. Furthermore the plan of care is designed in such a way that strengthening of weak muscles and stretching of short muscles are prescribed at the region of affected areas [18]. In regards CCEP are best to correct alignment, movement dysfunction and posture correction [19].

METHODS

It was a Randomized Controlled trial. Data were collected from Physiotherapy department, Federal Medical and Rehabilitation Centre Lahore. Study was completed within 9 months after the approval of synopsis. The calculated sample size using pain as outcome measure was 26 in each group and after adding 20% dropout the sample size was 26+5=31 in each group. Non-probability convenient sampling technique was used to collect data. Inclusion criteria was: (1) Both gender, (2) Neck pain history of 4-12 weeks, (3) Aged between 20 to 35 years and (4) Patients diagnosed with upper cross syndrome. Exclusion Criteria was: (1) Any other impairment or disability (history of joint disease, pelvis/spine fracture or surgery), (2) History of cervical spine surgery with vascular syndrome, (3) Those with infection or history of trauma of spine, (4) Other neurological disorders. The rules and regulations set by the ethical committee of university of Lahore were followed while conducting the research and the rights of the research participants were respected. Written informed consent (attached) was taken from all the participants. Research Ethical Committee approval was taken (REC: IRB-UOL-FAHS/890-III/2021). Authors had prospectively registered the trial in Iranian Registry of Clinical Trials on 2021-10-08 (IRCT20210730052025N1). After approval, diagnosed patients of UCS were screened and 52 patients were randomly allocated in 2 groups (26 patients in each group). The demographic data was obtained by interview. The study was single blinded. The assessor was unaware of which treatment given to both groups. The exercise duration period was of eight weeks and three sessions were conducted in one week. Each session was of 45 minutes. Group A: This group received Muscle energy technique (METs) with routine physical therapy (hot pack for 15 minutes, mobilization, AROM). Reciprocal inhibition of METs was used for upper trapezius, levator scapulae and pectoralis major muscles. It involved patient's own muscle relaxation which is minimum to maximum therapist's force, 5-7 repetitions per session, 3 days a week for eight weeks. Muscle length is changed from shortened position to lengthened ones. Autogenic inhibition (Concentric inhibition): Target muscles which involve levator scapulae, pectoralis major, upper trapezius causing relaxation. Muscle is lengthened to shortened position. Patient's force is greater than therapist's. 5-7 repetitions per session, 3 days a week for eight weeks. Group-B: They received Comprehensive Corrective Exercises with routine physical therapy. CCEP consisted of three stages such as initial, improvement and maintenance Exercise technique involved in Upper cross syndrome ranges from frequency, intensity and duration as the muscles are strengthened enough. The initial phase consists of internal focus of attention. Participants are advised to contract hypoactive and relax hyperactive muscles for the correction of

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scapular muscles. Initial phase involves restoration of muscle balance. Initial phase includes series of exercises such as in figure lying in supine position with support of foam roll in various abducted arm positions as external rotation, diagonal positions and military press. Improvement phase involves upper extremity motion in various training positions. Exercise progression with the help of dumbbell, thera band or exercise gym ball. Exercises in sitting and prone position on gym ball and standing on balance board. This phase helps to improve uncorrected static posture. The exercises in Maintenance phase are same as in improvement phase but without any increase in frequency and intensity and participants have to maintain exercise adaptations for two weeks. Pain was measured by Visual Analogue Scale (VAS) whereas, functional disability was measured by Neck Disability Index (NDI). The outcome measures were assessed by assessor at baseline, 8th week and 12th week. Data were analyzed using SPSS version 24.0. The quantitative variables like age were presented in the form of mean ± SD and qualitative variables like pain and disability were presented in the form of frequency and percentage. Normality of the data was assessed with Kolmogorov Smirnov test. Difference between groups was assessed with the help of independent sample t- test/ Mann Whitney U test. However, within group differences were measured by repeated measures Anova for NDI and Friedman test for VAS. P-value ≤ 0.05 was considered significant.

RESULTS

There were 52 diagnosed patients having upper cross syndrome with the mean age of 26.03 in group A (METS) in which 46.2% male and 53.8% females. The mean age of 28.76 in group B (CCEP) in which 65.4% males and 34.6% females. The tests of normality showed that the data was normally distributed for NDI (p>0.05), therefore parametric test; Repeated Measure ANOVA was used to assess functional disability. Whereas, for VAS, data was not normally distributed therefore nonparametric test of Repeated Measures ANOVA was used for VAS (Table 1).

Variables	Type of intervention	Kolmogorov-Smirnova	
		Statistics	p-value
NDI_ Baseline	METS	0.098	0.200*
	CCEP	0.175	0.050
NDI_4 weeks	METS	0.119	0.200
	CCEP	0.180	0.063
NDI_12 weeks	METS	0.178	0.054
	CCEP	0.204	0.077
VAS baseline	METS	0.204	0.007
	CCEP	0.213	0.004
VAS (8th weeks)	METS	0.222	0.002
	CCEP	0.234	0.001
VAS (12th weeks)	METS	0.227	0.001
	CCEP	0.214	0.003

Table 1: Normality Testing

Repeated measures ANOVA used for the comparison within the group from baseline to 12 weeks. ANOVA shows that there was statistically significant improvement in paint intensity at each level of assessment i.e., Assessment at baseline, 8 weeks and after the treatment (Table 2).

Treatment Groups	Statistics	Within Group Comparison				p-value
		NDI Baseline	NDI 4th Week	NDI 8th Week	NDI 12th Week	
METS	Mean±SD	37.34±3.01	24.04±3.91	15.27±3.75	37.34±3.01	0.001
	Minimum	32.00	18.00	7.00	32.00	
	Maximum	45.00	32.00	21.00	45.00	
CCEP	Mean±SD	35.31±3.96	17.92±4.12	9.61±3.05	35.31±3.96	0.001
	Minimum	27.00	10.00	1.00	27.00	
	Maximum	42	26.00	15.00	42	

Table 2: Comparison within group using Repeated Measure ANOVA

The results regarding pain intensity using VAS at baseline showed the that mean and standard deviation of pain score were found to be 6.9 ± 7.5 and 1.16 ± 1.10, minimum 5.0 ± 5.0, maximum 10.0 ± 9.00 and in Group A (METS) and Group B (CCEP). The results regarding pain intensity using VAS at 4 weeks showed the that mean and standard deviation of pain score were found to be 3.7 ± 7.50 and 1.25 ± 1.03, minimum 2.0 ± 1.0, maximum 6.0 ±5.0 and in Group A (METS) and Group B (CCEP). The results regarding pain intensity using VAS at 12 weeks or after treatment showed the that mean and standard deviation of pain score were found to be 1.7 ± 1.0 and 1.2 ± .89, minimum .0 ± .0, maximum 4.0 ± 3.0 and in Group A (METS) and Group B (CCEP) (Table 3, 4).

Groups	Outcome Measures	Mean±SD	Minimum	Maximum
METS	VAS at baseline	6.92±1.16	5.00	10.00
	VAS at 4th week	3.73±1.25	2.00	6.00
	VAS at 12th week	1.77±1.24	0	4.00
CCEP	VAS at baseline	7.50±1.10	5.00	9.00
	VAS at 4th week	3.23±1.03	1.00	5.00
	VAS at 12th week	1.00±0.89	0	3.00

Table 3: Within Group Comparison for VAS through Friedman Test

Mann-Whitney U Test- Between Group Comparison for VAS			
Outcome Measures	Treatment Groups	Mean Rank	p-value
VAS (baseline)	METS	0.00	0.053
	CCEP	13.50	
VAS (8th weeks)	METS	0.00	0.237
	CCEP	13.50	
VAS (12th weeks)	METS	0.00	0.018
	CCEP	13.50	

Table 4: Inferential Statistics for both treatment groups using VAS

DISCUSSION

The study aimed to determine the effects of muscle energy techniques and comprehensive corrective exercises in patients with upper cross syndrome. The study also shows that CCEP is more effective as its effects are maintained after four weeks of detraining period. The study aimed to evaluate the effectiveness of muscle energy techniques

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and comprehensive corrective exercises on pain and functional disability in patients of upper cross syndrome using neck disability and Visual Analogue scale and comparing the effects of both exercises on baseline, 8 weeks and at 12 weeks the detraining period [20]. In this study research, Comprehensive Corrective exercises had positive effects in patients with upper cross syndrome in reducing pain and functional disability after implementation of these exercises. Exercise intervention will be beneficial in reducing pain and musculoskeletal injuries due to posture in patients of upper cross syndrome. Stretching and strengthening exercises are essential in upper cross syndrome [2]. We propose to evaluate the effectiveness of CCEP and METS in patients aged between 20-35 years with UCS in terms of posture correction, reducing pain and functional disability. According to different studies, researchers believed that it is important for UCS patients to correct their posture, alignment as they may contributed many musculoskeletal injuries and motor control issues [21]. The results of this study showed that the decline of pain and improves by comprehensive corrective exercises and muscle energy techniques in upper cross syndrome. Statistically, no significant differences were found between comprehensive corrective exercises and muscle energy techniques with a p-value ($p>0.05$). Another study also conducted in 2020 which showed the effectiveness of CCEP in patients of Upper cross syndrome. The results of the study showed that these exercises are effective in improvement of posture, alignment and activation of movement patterns. The results showed that corrective exercises effectively improves disability and reduce pain in Upper cross syndrome [12]. Another literature conducted in 2020, on the comparison of muscle energy technique and conventional therapy. The results of the study of showed that pain and disability in upper cross syndrome is improved by conventional therapy and muscle energy techniques. However MET is superior to conventional therapy to reduce pain and functional disability. Therefore MET is feasible and more effective as compared to conventional therapy in patients of upper cross syndrome [22]. The research is started in pandemic so people are avoiding to visit hospitals. Due to Covid-19, we have to wait for too long for the completion of data. Sample size in this research is small. More age groups are invited for the research study. There should be multicenter studies as the study is conducted in only three centers. Further studies can be conducted to see the effects of CCEP on other muscle groups. This study suggests future researchers to increase the sample size as this size of data is smaller to investigate the effects of techniques. Future investigators should add more age groups to get clearer picture.

CONCLUSION

The present study shows that comprehenive corretive exercises are convinient and easy approach to improve disability and pain in ptients with upper crossed syndrome. As the improvements in patients maintained 4 weeks after treatment. The results of this study showed that the decline of pain and disability improves by comprehensive corrective exercises in upper cross syndrome.

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