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EFFICACY OF KALTENBORN GRADE III MOBILIZATIONS, MUSCLE ENERGY TECHNIQUES AND THEIR COMBINATION TO IMPROVE RANGE AND FUNCTIONAL ABILITY IN ADULTS WITH MECHANICAL NECK PAIN

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ABSTRACT

Background: Physiotherapy is an essential treatment in the management of Mechanical Neck ache, still there was lack of literature seen supporting the effectiveness of Physiotherapy interventions with their doses targeting specific group of population. The focus of study was to see the effectiveness of Kaltenborn Grade III mobilization, Muscle Energy Techniques and their combination to improve range and functional ability in patients with Mechanical Neck ache.

Methods: 72 patients with Mechanical Neck ache were randomly categorized in 3 groups (Mobilization, METs and Combination group). NDI scale and goniometry was used as an assessment tool to measure the outcome before and after treatment (follow up 1 week).

Results: According to the results there was significant improvement seen in Combination group (Mobilization and METs) in terms of pain, which decreased from 7.70 ± 0.69 to 1.25 ± 1.93 ($p=0.00$), gain in ROM e.g. Cervical Flexion (27.29 ± 2.38 to 37.54 ± 3.14). Whereas, marked significance ($p=0.00$) was seen in the NDI score and percentage of Combination group. ANOVA tells us that difference was significant in all three groups in categories of pain (VAS), gain in Cervical ranges and NDI score and percentage as $p=0.00$. Combination group had significant difference within the groups then METs and Mobilization group in all categories of VAS, Cervical ranges, NDI score and percentage.

Conclusion: Combination of (Grade III Kaltenborn and METs) was seen more effective in terms of improving Mechanical Neck Pain, in smaller treatment session (7 days only).

Keywords: Neck pain; Cervicalgia; Cervical Pain; Chronic; Manual Therapy; Functional Ability

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INTRODUCTION

Mechanical neck pain is a non-acute, non-traumatic movement disorder. Mechanical Neck Pain is one of the causal factors leading to time missed from work second to Low back pain. It is insidious in character having multifactorial factors i.e. bad habits, poor ergonomics, poor posture and muscle imbalance around the neck area. All above factors lead to abnormality in normal neck joint play and their surrounding muscles actions [1,2]. According to Visser et al there is no single mechanism responsible for tissue damage in Mechanical Neck ache. In reference to Cinderella hypothesis sustained low intensity task leads to selective and sustained Type 1 motor unit activation, Ca²⁺ start accumulating in these activated motor unit. This accumulation is due to limited blood supply resulting from larger number of motor unit activation at a time. Intra-muscular shear force is also one of these mechanisms responsible for Mechanical Neck Pain [3].

Cagnie B et al and his co-researches in a cross sectional study found two-fold increase risk in females than in males. They also found that adults who have age below 30 years have 2.61 times less chances of suffering with mechanical neck ache than elderly. They also found significant association of Physical and Psychosocial factors along with personal factors i.e. prolong sitting with forward bent posture of neck, mental exhaustion due to whole day work and lack of manpower with Mechanical Neck ache [4].

Clair DA et al on the bases of his Prospective Cohort study divided mechanical neck pain in to two types i.e. "Movement disorders" and "Loading disorders". This classification according to impairment can be used as a powerful indicator in determining prognosis of mechanical neck pain [5].

Borghouts JA et al In a Systematic review said that acuteness of pain and larger number of foregoing attacks are related with worse prognosis of mechanical neck ache [6].

Mechanical neck Pain is a problem typically explaining abnormality with muscles and neck joints; so when talking about treatment researches focus on Physiotherapy more rather than medical management of chronic neck pain. Dabbas V et al in a systematic review said cervical manipulation is more effective and safe than painkillers like NASIDs etc [7]. Painkillers although give short term relief of chronic neck pain but researches didn't support their efficacy on radicular neck pain.

Jordan A et al did a RCT with 3 months follow up on 119 patients found that endurance and long term effects i.e. increase in active range of motion were achieved in combination group. They recommended in their research that further studies were required to find out ideal treatment strategies [8].

Hurwitz EL et al in a systematic review found that exercises and manual therapy both were seen more effective in noninvasive treatment of mechanical neck pain than medications etc. They also recommended that further studies are required to found the long term improvement of symp-

toms in mechanical neck pain [9].

Vermon H et al and his co researches in a systematic review find out that spinal mobilization was found more effective in improvement of chronic mechanical neck pain in adults as compared to soft tissue mobilization. Further studies are required to judge long term increase in range of motion in mechanical neck pain patients [10].

Schenk R et al and his co researches did a Randomized Control Trial to find out effectiveness of METs to improve all ranges of neck in patients of mechanical neck pain. This supports METs as an effective treatment for improvement in range of motion of mechanical neck ache but sample size (n=18) was very small and Placebo effect was used in comparison group[11].

Through researches different conservative treatments in treating neck pain are given but still a lot more work needs to be done to see effectiveness of different multimodal treatment options. Gross A et al in a systematic review find out that multimodal treatment (mobilizations and exercises) give more satisfactory results in treating mechanical neck pain. In this review the researchers only focus on short term goal (Pain) in mechanical neck pain [12]. The objective of the study is to compare the efficacy of Kaltenborn Grade III mobilizations, METs and their combination to manage Mechanical Neck Pain and wants to see the best possible outcome of METs along with manual mobilization in terms of long term effective treatment choice.

MATERIALS AND METHODS

Quasi experimental study design was used. Data was collected from Fatima Memorial Hospital Department of Physiotherapy Shadman Lahore. Study is completed in 3 months after the approval of synopsis. Non probability Purposive sampling was used to get the sample. A total number of 72 patients, 24 in each group were taken in this study. This sample is calculated by using 69% effectiveness of MET's group and 89% effectiveness of manual mobilization and exercises [9] with 5% margin of error through the software named Sample size 2.0

The subjects were divided into 3 groups on Random basis each group containing 24 subjects

Patients of both genders (age limit 20-30 years) having non-radiating neck pain from the last 30 days, not taking any other medications (painkillers) and limitations in neck range of motion were included in the study

Patient having cervicogenic headaches, any other serious trauma on neck (i.e., Wiplash injury), any history of other systematic diseases (HTN, DM, RA, SLE or tumor), Severe cervical muscle spasm, poor ergonomics during work or doing continuous computer or desk work more than 5 hours were excluded from the study.

Data Collection Procedure:

After taking consent from patients, patients were randomly assigned groups. Mechanical neck pain was diagnosed by Physiotherapist on present signs and symptoms of the patient. NDI scale was used to assess the pre functional

status at Physiotherapy department before treatment. After assessment patients were randomly distributed in Group A, Group B and Group C. Patients in all three groups were given a baseline treatment of hot pack for 15 minutes.

In Group A, mobilizations techniques (Kaltenborn grade III) were applied at hypermobile neck joints in each treatment session. Patient is in prone position with both hands on forehead. In above position Posterior/Anterior glides are given with 10 repetitions with 5 seconds hold in each repetition on spinous process and apophysealhypomobile joints. In one week repetitions would be same.

In Group B, METs were included. Patient is in sitting position tight muscle is passively moved up to its restricted barrier; at that point agonists muscles are isometrically contracted for 5 seconds with rest of 15 sec. This isometric contraction is 20% -30% of original strength of muscle. This repeated 3-5 times in one treatment session.

Group C was same as given in Group B along with each treatment session also include Kaltenborn Grade III mobilizations done in Group A.

After 1 week follow up each group improvement will be noted on NDI scale.

Confounding variable were controlled by blinding and using standardized treatment dosages. All treatment will be applied by single handed for controlling bias.

Data collection tools (Performa/Questionnaire) standardized WOMAC scale is used to collect relevant information from subjects.

DATA ANALYSIS

The data is analyzed by using the SPSS 18.0 statistical software. Baseline characteristics including means and standard deviations (SD) will be described. The mean differences with SD for the outcome measures of Functional /ADLs improvement in terms of pain on NDI scale. ANOVA is applied to compare the outcome of 3 groups. Paired t-test is used for comparison of improvement within the groups. T test is used to assess the between-group differences for two outcome measures (Goniometry, NDI scale) at each follow-up period. Level of significance is 0.05. A one-tailed hypothesis's generated favoring the combination treatment with isolated technique. The minimum required sample size is 24 subjects per group.

RESULTS

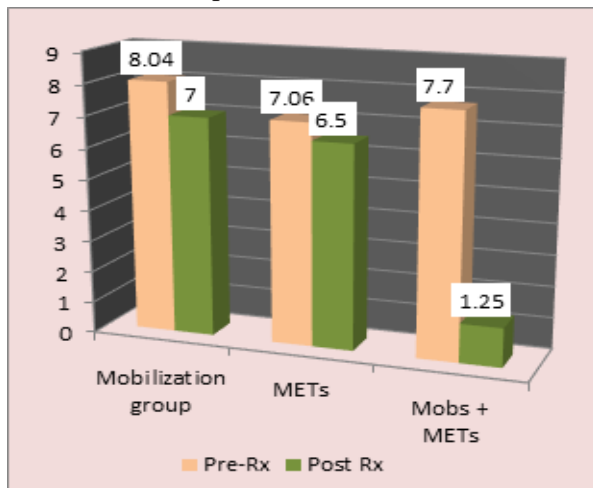
Table 1: Treatment outcomes in Mobilization, METs and Combined group in different categories

		Pre treatment score mean	Post treatment score mean	P value
Pain (V.A.S)	Group A (Mobilization)	8.04±0.80	7.00±1.25	p>0.05
	Group B (METs)	7.66±0.81	6.58±1.23	p>0.05
	Group C (Combination Group)	7.70±0.69	1.25±1.93	p=0.00

Gain ROM of Cervical Flexion	Group A (Mobilization)	27.33±2.92	28.91±3.46	p>0.05
	Group B (METs)	27.54±2.94	31.20±3.72	p>0.05
	Group C (Combination Group)	27.29±2.38	37.54±3.14	P<0.05
Gain ROM of Right SF	Group A (Mobilization)	28.41±3.29	30.79±3.30	p>0.05
	Group B (METs)	30.08±3.03	34.04±4.11	p>0.05
	Group C (Combination Group)	30.20±2.84	41.45±3.84	P<0.05
Gain ROM of Left SF	Group A (Mobilization)	30.12±4.08	32.62±4.68	p>0.05
	Group B (METs)	32.37±5.7	36.25±6.25	p>0.05
	Group C (Combination Group)	32.62±4.5	43.25±3.75	P<0.05
Gain in ROM of Right Rotation	Group A (Mobilization)	43.79±6.9	47.50±5.9	p>0.05
	Group B (METs)	42.50±4.9	45.37±5.1	p>0.05
	Group C (Combination Group)	43.25±5.7	57.33±3.0	P<0.05
Gain in ROM of Left Rotation	Group A (Mobilization)	47.91±5.4	51.58±5.3	p>0.05
	Group B (METs)	47.54±7.0	50.08±7.0	p>0.05
	Group C (Combination Group)	48.08±6.8	58.50±3.4	P<0.05
NDI Score	Group A (Mobilization)	34.54±3.5	30.50±4.9	p>0.05
	Group B (METs)	33.87±4.1	30.87±4.5	p>0.05
	Group C (Combination Group)	33.12±3.5	3.29±7.7	p=0.00
NDI %	Group A (Mobilization)	70.00±7.6	62.20±9.4	p>0.05
	Group B (METs)	68.87±7.6	62.72±8.5	p>0.05
	Group C (Combination Group)	67.50±6.3	6.67±15.5	p=0.00

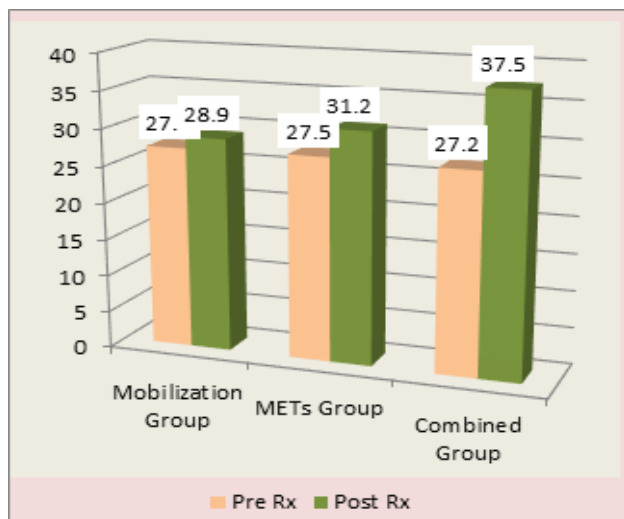
Description: Pain improvement was significant in Combination group p=0.00 ; pain level decreased from 7.70±0.69 to 1.25±1.93 in this group. However, significant improvement (p<0.05) was seen in terms of ROM gain in Cervical Flexion (27.29±2.38 to 37.54±3.14) , Right SF (from 30.20±2.84 to 41.45±3.84), Left SF (from 32.62±4.5 to 43.25±3.75), RR(from 43.25±5.7 to 57.33±3.0)and LR (from 48.08±6.8 to 58.50±3.4). Whereas, marked significance (p=0.00) was seen in the NDI score and percentage of Combination group (from 33.12±3.5 to 3.29±7.7 and 67.50±6.3 to 6.67±15.5 respectively).

Figure 1: Pain level on VAS in different groups (pre and post treatment)



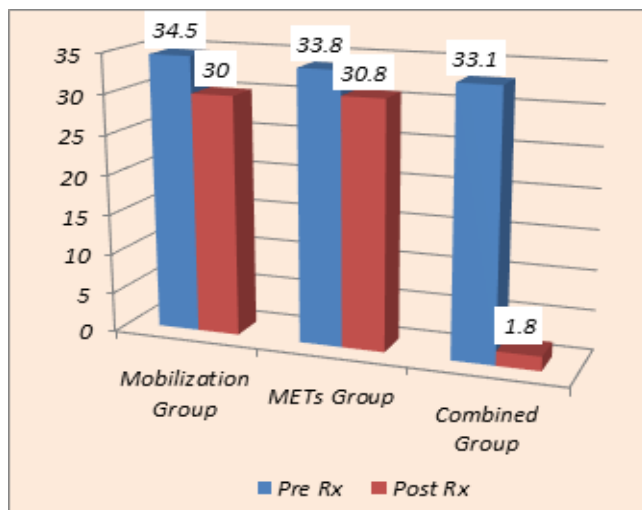
Description: Pain improvement was marked in combined treatment group from 7.7 to 1.25.

Figure 2: Gain in Cervical Flexion in different groups before and after treatment



Description: Marked gain in ROM was noticed in combined group from 27.2 degrees to 37.5 degrees.

Figure 3: NDI Scores of different groups before and after the treatment



Description: Significant improvement in NDI score was noted in combined group $p=0.00$

DISCUSSIONS

Mechanical neck pain is a major problem after back pain which need a treatment having long lasting effects, improving the quality of life and efficacy in work. Mechanical neck Pain is a problem typically explaining abnormality with muscles and neck joints; so when talking about treatment researches focus on Physiotherapy more rather than medical management of chronic neck pain. Dabbas V et al in a systematic review said cervical manipulation is more effective and safe than painkillers like NSAIDs etc [7]. Painkillers although give short term relief of chronic neck pain but researches didn't support their efficacy on radicular neck pain. As the cause of pain is multi factorial, Gross A et al in a systematic review find out that multimodal treatment (mobilizations and exercises) give more satisfactory results in treating mechanical neck pain [2].

In present study, pain improvement was significant in Combination group (mobilization and METs) $p=0.00$; pain level decreased from 7.70 ± 0.69 to 1.25 ± 1.93 in this group. However, significant improvement ($p < 0.05$) was also seen in that group in terms of ROM gain in Cervical Flexion (27.29 ± 2.38 to 37.54 ± 3.14), Right SF (from 30.20 ± 2.84 to 41.45 ± 3.84), Left SF (from 32.62 ± 4.5 to 43.25 ± 3.75), RR (from 43.25 ± 5.7 to 57.33 ± 3.0) and LR (from 48.08 ± 6.8 to 58.50 ± 3.4). Although, marked significance ($p=0.00$) was seen in the NDI score and percentage (from 33.12 ± 3.5 to 3.29 ± 7.7 and 67.50 ± 6.3 to 6.67 ± 15.5 respectively) also, proving that combination of mobilization and METs is really effective in improvement of mechanical pain. In terms of ANOVA same group had significant ($p=0.00$) difference within the groups then METs and Mobilization group in all categories of pain (VAS), gain in Cervical (Flexion, Right SF, Left SF, RR, LR) and NDI score and percentage. However, METs and Mobilization difference was not significant within the group. My results were consistent with various previous researches i.e., Gross AR et al and his co-researchers found that exercise and mobilizations are effective in treating pain of patients with mechanical neck disorder. They didn't explain the type of both mobilizations and exercises along with their effect for improvement in range of motion of neck [7]. Present results were also consistent with Hamilton L et al study in which he found both Mobilization and METs effective in improvement of pain in sub occipital muscles ($p > 0.01$). However, they recommended further studies to see their effects in combination along with focusing other muscles of neck [9].

METs and mobilization show improvement in my study in certain categories but that was not significant as compared to the combine treatment i.e. mean gain in RR in mobilization group was from 43.79 ± 6.9 to 47.50 ± 5.9 and LR was 47.91 ± 5.4 to 51.58 ± 5.3 , showing gain close to 5.06 in both consistent with results of Martínez-Segura R et al and his co researchers in a Randomized control trial compare manipulation with mobilizations in mechanical neck pain. They took sample of 70 patients and divided them in two groups on receiving manipulations and other receiving mobilizations. According to the results both treatment

(manipulations $p=0.001$ and mobilizations $p=0.01$) were significant in improving pain and ROM immediately in patients having dysfunction at C3-C4 or C5 level. According to immediate effects in improvement in all ranges of neck except rotation were significant i.e. Flexion ($p=0.01$) extension ($p=0.05$) and Right and left side bending $p=0.01$. Further researches are required to find treatment option for improvement in rotation of neck [3]. METs show non-significant noticeable improvement in Cervical right and left side flexion (30.08 ± 3.03 to 34.04 ± 4.11 and 32.37 ± 5.7 to 36.25 ± 6.25 respectively), previous researches proved that METs are effective treatment option in improving pain when muscle spasm is the cause i.e., Walker MJ et al in a Randomized Control Trail found METs were significant effective in short and long terms improvement in mechanical neck pain, range and disability. Neck disability index along with Visual Analogue Scale was used to measure outcome [8]. Lenehan KL et al in RCT found METs to be significant in improving range of motion in thoracic rotation $p=0.0005$. There recommended further studies focusing on METs in other regions [10].

More research is required to see the prolonged effects of these treatment options are the really effective in improving the quality of life in long term as in my study follow up was missing, this study only focus the short term and immediate effects of the treatment.

CONCLUSION

Combination of (Grade III Kaltenborn and METs) was seen more effective in terms of improving Mechanical Neck Pain, in smaller treatment session (7 days only). METs and mobilization show improvement in my study in certain categories but that was not significant as compared to the combine treatment. So while treating mechanical neck pain patients, Combination of Mobilization and METs should be preferred as it has more significant effect.

Limitations

In this study work was done on the flexibility of muscles and limited joint play in the hypomobile joints of the neck. For long term effects strengthening of muscles has to be addressed so the muscles could compensate with the increased load on the neck.

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