



Comparative Effect of Myofascial Decompression using Electrotherapeutic Vacuum Therapy and Mechanical Vacuum Therapy in Non- Specific Low Back Pain among Housekeeping Staffs - A Pilot Study

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Abstract

Musculoskeletal pain is a major cause of morbidity with extensive economic and societal consequences. Cleaners work is characterized by long standing hours, constant leaning forward of the body and also repetitive movements of the upper limb. It is necessary to address the myofascial restrictions which lead to discomfort and pain, and hinder the performance of an individual. This greater understanding can potentially guide to increased effectiveness of treatment as well as encouraging a multidisciplinary approach. This study therefore, focuses on evaluating the effect of Electrotherapeutic Vacuum Therapy modality and integrated modern technologies of Mechanical Vacuum Therapy tools to release myofascia which causes non specific low back pain among housekeeping staff. 30 female housekeeping participants fulfilling the inclusion and exclusion criteria were assigned into two groups (15 each); Group A (Electrotherapeutic Vacuum Therapy) and Group B (Mechanical Vacuum Therapy) by Consecutive sampling method. Treatment comprised for 3days/week (alternate days) for two weeks, i.e. 6 sessions per subject. Both groups underwent 5-minute session of spinal based exercises (back extension, posterior pelvic tilt, bridging exercises, and partial sit-ups) 10 reps with a 5 seconds hold time. Pain was recorded using Visual Analogue Scale during the first and last day of study. On comparing the differences between the groups, pre and post score for VAS (at rest and activity) was not statistical significant (p-value= 0.317). This experimental pilot study concludes that the techniques are not significantly showing any differences on VAS and. On the other hand, when compared independently, both the techniques are equally effective in managing pain.

Keywords: Electrotherapeutic Vacuum Therapy, Housekeeping staff, Mechanical Vacuum Therapy, Modified Schobers Test, Myofascial Decompression, Visual Analogue Scale.

Manuscript:

Introduction

Musculoskeletal pain is a major cause of morbidity with extensive economic and societal consequences. Occupations with high physical work strain, prolonged static muscle contractions, non-natural postures, and recurring movements are considered as an increased risk of musculoskeletal pain, which have a negative impact on work ability and effectiveness. (Haukka, et al., 2006) Housekeeping Staff work in almost all the sectors, of which Cleaners play a major role. Most of the cleaners are women. Tasks that these cleaners perform is important rather than the sector alone, most such as dusting and vacuuming, mopping and polishing floors and work stations along with routine housekeeping. Recurrent studies have proven that the cleaners are at a greater threat to develop any musculoskeletal disorders. (Disorders, 2008) Negative ergonomic aspects are associated with the expansion or aggravation of musculoskeletal disorders in these workers. (Silva-Júnior, Correa, & Morrone, 2012) It is one of the



foremost causes of disability and absenteeism from occupation. (Olawale & Agudzeamegah, 2012)

Fascia as a system not only provides stability, support, and cushioning but also locomotion and dynamic flexibility forming muscle. (Barnes M, 1997) Nevertheless this fascia is always discussed for being the potential to generate a pain causing factor of the back, its exact mechanism in causing lower back pain is hardly ever understood. (Langevin, et al., 2011) It is imperative that rehabilitation techniques be able to address fascial restrictions, tissue length impairments, and increase strength to avoid any possible imbalances that might lead to improper biomechanics and decreased performance. (Bea, Singh, & McOmber, 2017) By clinical application, myofascial releases are summed techniques that relieve soft tissues structures from abnormal holds of tight fascia. (Salvi & Akta, 2012)

Studies suggest that there are two techniques of Vacuum Therapy. The first is Electrotherapeutic Vacuum Therapy (EVT) or Negative pressure wound therapy (NPWT), the delivery of sub-atmospheric wound healing pressure, so as to use a vacuum pressure of 76mmHg. (Armstrong, Marston, Reyzelman, & et.al, 2012) Electrical vacuum therapy is a technique in which negative pressure is formed inside the cup by means of electrical suction pump or apparatus. The advantages of this type are that the therapists can modify the negative pressure without restraint, can produce a negative pressure pulse, and connect several cups. (Al-Bedah, Aboushanab, Alqaedet, & al., 2016)

The Mechanical Vacuum Therapy mechanism composes of generating vacuum on the skin, with the successive negative pressures which results in rupture of capillaries. In this technique practitioners position the cups based on the objective findings of fascial adhesions, muscle tightness, along trigger points, or to address myofascial restrictions. (Bea, Singh, & McOmber, 2017), That uses a vacuum pressure of 45-60mmHg, the average Mechanical Vacuum Therapy pump trigger can pull back 40mm, creating 35-85kPa of negative pressure. The largest negative pressure that can be maintained for 30 minutes is ≥ 25 kPa (Duh & Chiu, 2007)

It is essential, as physiotherapists, to seek and appreciate wide-ranging, moreover interrelated models of what exactly happens to the bodily tissues after any trauma or injury, and how is our approach to facilitate healing in our patients. The objective of this study therefore, focuses on evaluating the effect of Electrotherapeutic Vacuum Therapy modality and integrated modern technologies of Mechanical Vacuum Therapy tools to release myofascia over low back pain.

Materials and Methods:

This experimental pilot study was conducted at Dr.D.Y.Patil College of Physiotherapy, Pune-411018. 30 Female Housekeeping Staff with Non Specific Low Back Pain as per category 5,6,7 of Classification System of Coste and Colleagues, age group 25-50years were included by Consecutive sampling technique. Participants were blinded for their allotment and each group comprised of 15 subjects. They were divided into 2 groups: Group A- 15 (Electrotherapeutic Vacuum Therapy) & Group B- 15 (Mechanical Vacuum Therapy). Participants were excluded on the following basis- History of trauma, any spinal surgeries, degenerative Conditions, Haematological diseases such as haemophilia, leukaemia, pernicious anaemia and thrombocytopenia, Skin Allergies and Hypersensitive skin, open wounds or Ulcerated areas & Oedematous areas and Sutures.

Pain was recorded using Visual Analogue Scale. The procedure, benefits and potential risks of study were explained to the subjects before the intervention. Written Informed consent was taken from the participants meeting the inclusion and exclusion criteria and willingness to participate. Also all the participants received 4 spinal based exercises after the intervention. Both the groups received treatment for thrice a week (alternate days) for two weeks, i.e. 6 sessions per subject.

For Group A: Electrotherapeutic Vacuum Therapy

- Throughout the treatment session, 4 Silicone Vacuum Cups of dimensions 105 x 310 x 300 (in mm) from Vac 108 by Technomed Electronics were used over the lower back region.
- Pulse Mode was selected such that the device could generate a pulsatile vacuum when the machine is turned on. Pulse Interval: as 3:2 (on: off period in second).
- Vacuum Pressure: 100 – 200 mbar or as per the tolerance.
- Intensity was set as per the patient's tolerance.
- Duration of the treatment was 10mins/session.



- This device was never tested in a randomized controlled trial before.



For Group B: Mechanical Vacuum Therapy

- Throughout the study, 5cm diameter plastic cup from a Kangzhu therapy set was used according to the surface area to implement the intervention.
- A plastic handheld pneumatic pump generated the negative pressure within the cups.
- Prior to cup application, Free-up moisturizer was applied onto the target area of each participant's skin to improve cup suction and allow for gliding during the dynamic MFD intervention.
- The tool gun was then connected to the plastic piston to be placed on the skin surface.
- After which the suction was generated using one shoot (2nd if required as 1 pump= 141 mBar and 2 pumps= 254 mBar)
- The suction force of the gliding cups was initially low to allow the participant to become accustomed to the feeling.
- After of which, the negative pressure will be increased to enough force to ensure proper suction without causing unnecessary discomfort.
- Dynamic technique was applied, where in the 3 glides were given onto the paraspinal muscles of one side at a time, and then to the other side respectively; or only at the affected side.
- Application of vacuum unit was repeated for 2-3 times for desired effect, but not more than 4 times per session. This process was for 5 minutes.
- Throughout the treatment, the negative pressure force of the cups will be adjusted as needed for comfort.
- Treatment technique was terminated after cleaning the treated area by cotton. (Xie, 2017)



For Both the Groups: Exercise Therapy

Each subject underwent 5-minute session of spinal based exercises. The exercises include back extension, posterior pelvic tilt, bridging exercises, and partial sit-ups. Each exercise was repeated 10 times with a 5 seconds hold time. (Olawale & Agudzeamegah, 2012) They were carried out as follows: Bridging exercise; Posterior pelvic tilt; Partial sit-ups; Back extension.

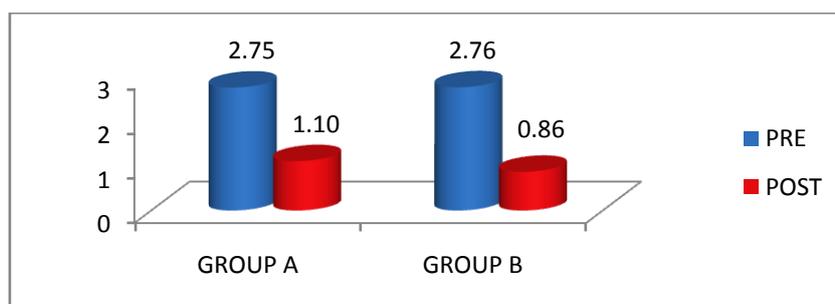


Statistical Analysis

The composed data was updated in Microsoft EXCEL-2007 sheet. Variables were checked for homogeneity of variances using Winpepi (Version 11.65) and were found to be normally distributed. Statistical analysis was done using Primer for Biostatistics (Version 7). Paired t-test was used to compare quantitative outcomes within the group. Independent t-test (unpaired t-test) was used to compare quantitative outcomes between the groups. Mean and Standard Deviation was carried out for both the groups.

Table No. 1: Comparison of VAS (AT REST) within groups

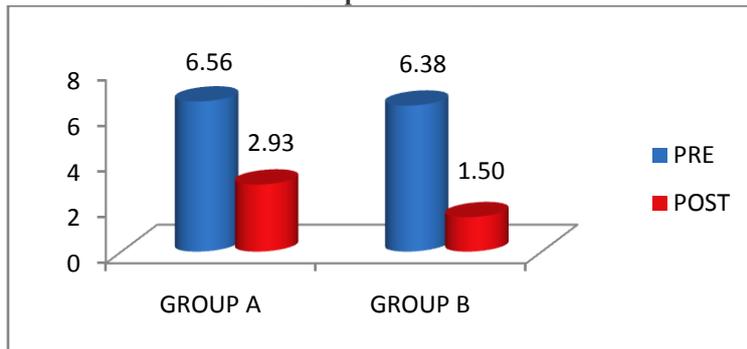
		N	MEAN	S.D	P-Value	t-Value	Inference
GROUP A	PRE	15	2.75	1.82	<0.001	4.93	Highly Significant
	POST	15	1.10	0.68			
	DIFFERENCE		1.64	1.29			
GROUP B	PRE	15	2.76	2.08	<0.001	4.27	Highly Significant
	POST	15	0.86	0.75			
	DIFFERENCE		1.89	1.71			



Graph no. 1: Graphical representation that signifies the difference in the pre and post score of means for VAS (at rest) within both the groups.

Table no. 2: Comparison of VAS (ON ACTIVITY) within groups

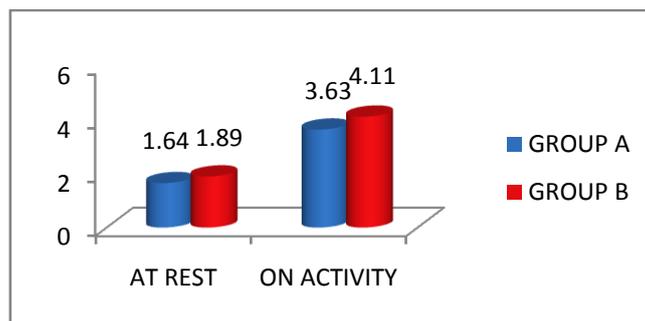
GROUP		N	MEAN	S.D	P-Value	t-Value	INFERENCE
A	PRE	15	6.56	1.32	<0.001	11.83	Highly Significant
	POST	15	2.93	1.18			
	DIFFERENCE		3.63	1.18			
B	PRE	15	6.38	2.00	<0.001	11.51	Highly Significant
	POST	15	2.27	1.50			
	DIFFERENCE		4.11	1.38			



Graph no. 2: Graphical representation that signifies the difference in the pre and post score of means for VAS (on activity) within both the groups.

Table no.3: COMPARISON OF DIFFERENCE OF VAS (at rest & on activity) BETWEEN GROUPS:

	GROUP	MEAN	S.D	p-value	t-Value	INFERENCE
AT REST	A	1.64	1.29	0.660	0.44	Not Significant
	B	1.89	1.71			
ON ACTIVITY	A	3.63	1.18	0.317	1.01	Not Significant
	B	4.11	1.38			



Graph no.3: Graphical representation depicting the mean differences of pre and post score for VAS (at rest and activity) between the groups.

Discussion

To the best of our knowledge, this pilot study on, evaluating and comparing the effect Electrotherapeutic and Mechanical Vacuum Therapy on pain among the female housekeeping staff portrays that both the techniques were equally effective with its independent underlying mechanism. The possible mechanism can be considered, as vacuum draws the muscle further than its normal elastic limits and leads increase in microvasculature of that area ensuring local hyperaemia. Hereby, improves the blood supply in the capillary system of that particular site. The metabolites that are diversified from the bony tissue towards muscle are taken up by the phagocytes from these capillary beds. An overview of various published studies, provide no convincing facts but most of them indicate the scientific interest in modernized mechanical vacuum therapy. The conclusion was that this technique was beneficial in managing pain in several musculoskeletal conditions. Alas, those studies were found to be mostly on poor quality primary studies. (Lee, Kim, & Ernst, 2011)

Previous literature suggests that, mechanical vacuum therapy is advantageous through the sound effects of cortisol that decreases stress and dopamine. This mechanism is uncertain but as this technique affects these neurotransmitters it can only be supposed that pain is reduced in this way. There is also the release of endogenous opioids such as endorphins which offers euphoria giving a better feeling. (Rahim,



Elkabalawy, & Atta, 2017)

On the contrary, where all along the pain pathway intervention helps, whether it is higher up in the limbic cortex or lower down in the spinal cord, is still unidentified. An additional mechanism may perhaps be by 'Counter irritation' which is the progression of relieving pressure from deep structures in the body by infuriating the superficial skin and transmitting it to other structure.

Conclusion

Considering the statistical results of this experimental pilot study conducted, we can conclude that the techniques are not significantly showing any difference between the two techniques – electrotherapeutic and mechanical vacuum therapy; for Pain among the housekeeping staff. On the other hand, when compared independently, within the group both the techniques are equally effective in improving the quality of pain.

Clinical Implications

Nevertheless, subjective results of this pilot study noted, as a feedback after the interventions; there were instantaneous improvements in the severity of pain when treated with Mechanical Vacuum Therapy. This modernized skilful technique has its own perks such as it is cost-effective; independent of electricity; changeable vacuum pressure and cup size in between the treatment session, various forms within itself- static, dynamic, massaging, functional etc.

Whereas, the electrotherapeutic vacuum therapy does not require any special manual skills and has a few drawback such as it is expensive than the earlier, has only pulsed and continuous mode, with standard sized cups, hence cannot be modified as per the treatment area. In the end, it is the therapists' preference as both are effective is achieving positive results irrespective of the duration of intervention.

Limitations of the Study

- Only Female housekeeping staffs were included.

Future Scope of Study

Based on this pilot study, future researchers can:

- Consider a larger sample population for significant difference between the interventions.
- Study can be conducted considering the different modes and techniques of Vacuum therapy.
- Future studies can consider other outcome measures like ROM, Flexibility, Muscular strength and endurance, etc.

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