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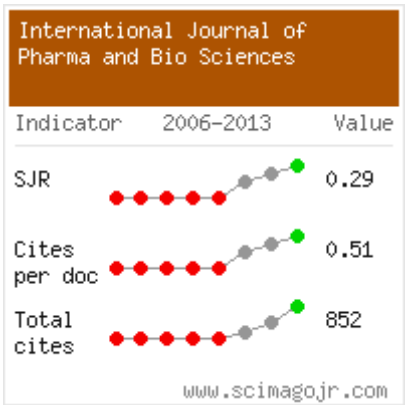

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PROLONGED EFFECT OF PRONE LUMBAR TRACTION AND PRONE LUMBAR TRACTION WITH SHORT WAVE DIATHERMY ON INDIVIDUAL HEIGHT A COMPARATIVE STUDY

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ABSTRACT

Traction has therapeutic effects over bones, ligaments, nerves, joints, intervertebral discs and muscles. Shortwave diathermy is proven to produce muscle relaxation, decrease muscle spasm and joint stiffness by increasing the collagen tissue extensibility and decrease tissue viscosity and tension. 50 normal college males were selected by the simple random sampling method. Initially the subjects receive prone lumbar traction. After 1 week the same subjects received shortwave diathermy and prone lumbar traction. The post test height was measured immediately and subsequently every 10 minutes for 60 minutes. Stadiometer was used to measure the height in millimeters. The prolonged effect of traction was found to be for 20 minutes and after that it gradually decreased. The prolonged effect of shortwave diathermy and traction remained for 30 minutes and then started reducing gradually. This study showed the effect of prone lumbar traction can be prolonged by applying shortwave diathermy before traction.

KEY WORDS: **Lumbar Traction, Stadiometer, SWD, Lumbar Disc**

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INTRODUCTION

Spinal traction is a procedure used to separate the intervertebral structures apart by applying a separating force. The objective of traction is to produce a separation over the intervertebral structures to counteract the shrinkage caused by compressive loading and restore its mechanical functioning. Many studies have been performed to analyze the effect of traction in which unloading of the intervertebral disc has been induced by means of traction[1-6]. These include gravitational, inversion, manual, mechanical and self traction[3].Traction has therapeutic effects over bones, ligaments, nerves, joints, intervertebral discs and muscles. The effects include increased mobility, ligament extensibility, muscular relaxation and increased disc height[3]. Among these known effects, there are some unknown effects like the duration of the traction effects. The lack of knowledge about duration of the traction effects lead to ineffective rehabilitation. Some studies have suggested that load magnitude position of the model during traction alters the traction effects [4,6,7,11]. But no study so far reviewed questions the duration of the traction effect. Heating can be used to alter the viscoelastic properties of connective tissues. Studies have shown that a significant drop in tensile stress occurs with a rise in the temperature of soft tissues to between 40°C and 45°C, compared with that recorded at room temperature[3,8]. Heat modalities are commonly classified as superficial or deep heating agents. Examples of deep heating agents are ultrasound or shortwave diathermy (SWD) [3]. SWD can heat up a larger treatment area and volume of tissue than is possible with ultrasound, while ultrasound can produce some mechanical effects in addition to the heating effect. Hot pack is the most traditional method of providing superficial heating. It has been suggested that a deep heating agent could produce a greater increase in tissue extensibility than superficial heating. Robertson et a. found that, in normal healthy subjects, SWD produced a significantly greater gain in tissue extensibility than did hot pack[9].Shortwave diathermy is also proven to produce muscle relaxation, decrease muscle spasm and joint stiffness by increasing the collagen tissue extensibility and decrease tissue viscosity and tension[4]. Hence the study has been done to analyze the duration of the traction effects on stature of the individual without and with shortwave diathermy. Lumbar traction has been used for many years to treat back pain. The conventional supine traction have been used for centuries for treating low back pain but recent systematic reviews , cast doubt on traction's effectiveness[74]. Lumbar traction is a popular procedure for increasing the intervertebral disc space by applying separating forces[6]. The traction force depends on the weight of the individual The lumbar traction procedure is used for various therapeutic purposes. But the duration of the effectiveness remains unknown. The traction force is another important parameter of the traction. The traction force is attenuated by tone of the muscle, ligaments and some other soft tissue structures. How to prevent the attenuation of the traction force is the biggest question among the traction users. The aim of the study is to analyze the prolonged effects of prone lumbar traction with and without shortwave diathermy on stature of the normal individual. We hypothesized that there will be a significant prolonged effect of prone lumbar traction with SWD on stature of the individuals.

MATERIALS AND METHODS

The study design used was Pre-test post-test experimental study. A total of 50 normal healthy individuals was recruited using Simple random sampling. The same subjects were used for both the groups. Setting for this study was Department of Physical Medicine and Rehabilitation of a Tertiary Care Hospital, Tamil Nadu, India Subjects were included if they fulfilled the following: normal healthy male subjects between 17-30 years. Subjects were excluded if they had a history of previous

spinal surgery, Pott's spine, tumors in vertebrae or spinal cord, back pain, obesity as determined by their BMI, osteoporosis, degenerative disease of vertebral column and stomach ulcers. All the subjects included were explained in detail about the study and a voluntary written informed consent was obtained from them. The subjects initially received only continuous prone lumbar traction by Split Saunders's Equipment for twenty minutes. All the procedures were conducted at 5 P.M. The traction force exerted was 1/3 of individual's body weight. After completion of the intervention subjects are made to sit on chair with arm and back support prior to post test measurements and they were restricted from any forms of physical activity. After one week, the same individuals receive shortwave diathermy for the first ten minutes by EnrafNonius Equipment. The dosage selected was based on individual's tolerance. Following SWD, continuous prone lumbar traction for twenty minutes was administered. Outcome measure used was stadiometer (which was custom made for this study) to measure the height in millimeter.

MEASUREMENT PROCEDURE

The subjects were made to stand comfortably on stadiometer without shoes and researcher on the side of stadiometer. The normal spinal curvatures were maintained. Pointer of the stadiometer was then dragged down to the head of the subject till it touched the subject's vertex. That height was then noted and patient was allowed to step down from the stadiometer. Pre test measurement was taken before giving the intervention. Post test measurement was done once the intervention finished at 1st, 10th, 20th, 30th, 40th, 50th and 60th minute[19].

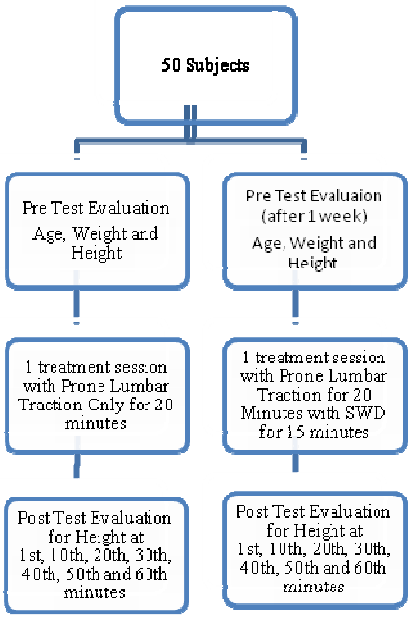


Figure 1
Patient on Prone Lumbar Traction

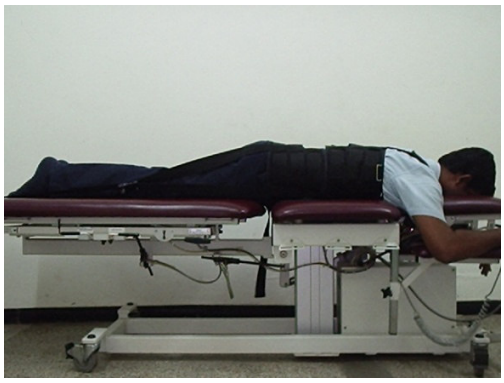
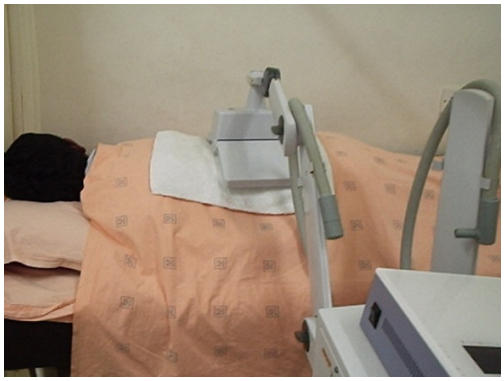


Figure 2
Patient on SWD



RESULTS

None of the 50 participants in the treatment groups dropped out throughout the study period. The compliance of the 2 treatment groups was satisfactory. We used Student's "t" test to analyze the data. Demographic data of all the participants are shown by the means of age, height and weight in table 1. No significant difference ($p > 0.05$) was found among all of the outcome measures at the baseline. Within the group data was analyzed using paired "t" test and between the group data was analyzed using unpaired "t" test. Table 2 and 3 represents the data following the intervention. After the 1st minute there was a maximum increase in height of the subjects which gradually reduced by 60th minute but did not reach the baseline. This increased height was maintained till 30th minute in SWD plus traction whereas only traction group shows the creep effect only for first 20 minutes. The pretest mean for group 1 was 169.16 ± 5.84. Following intervention, group 1 showed mean increased height of 168.676 Cms at 1st minute, whereas group 2 showed 170.284 Cms. At 30th minute, the values for group 1 were 169.536 Cms and group 2 were 170.090 Cms, and those for 60th minute were 169.348 Cms and 169.740 Cms for group 1 and group 2 respectively. There was a greater increase in height in the traction plus SWD group when compared to the only traction group. Although, this was not statistically significant, a clinically significant difference was noted. The p value at 60th minute for between the group analyses, using unpaired "t" test, was 0.733

Table 1
Demographic data of the subjects

Demographic Data	N	Mean
Age	50	21.18 ± 2.46
Height	50	169.16 ± 5.84
Weight	50	62.94 ± 10.57

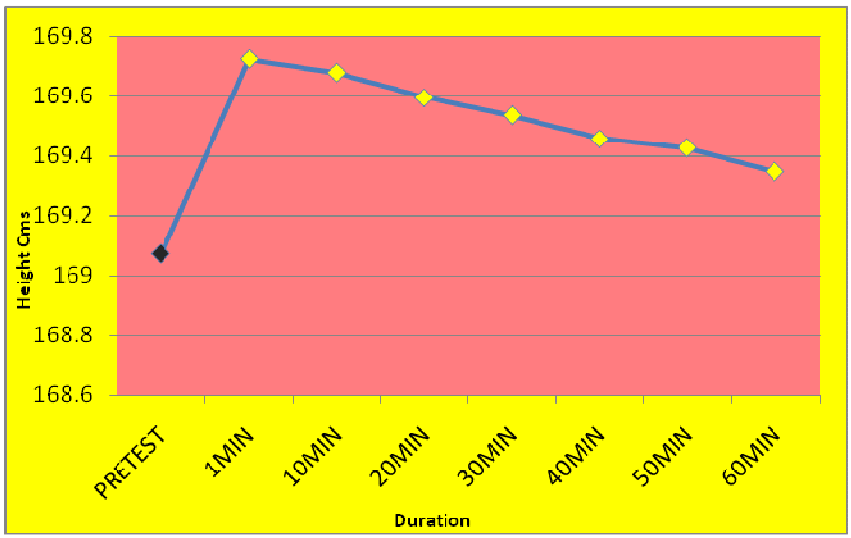
Table 2
Representing Data for Traction Group

Minutes	Mean	Standard Dev.	Significance
1st minute	169.6760	5.94115	.000
10th minute	169.6220	5.86670	.000
20th minute	169.5960	5.85188	.000
30th minute	169.5360	5.85267	.000
40th minute	169.4580	5.87287	.000
50th minute	169.4280	5.82433	.000
60th minute	169.3480	5.78846	.003

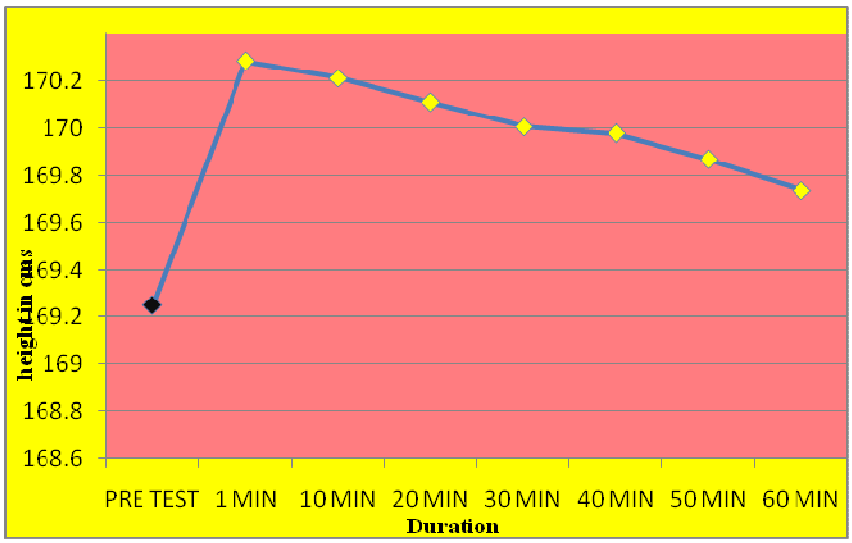
Table 3
Representing Data for Traction with SWD Group

Minute	Mean	Standard Dev.	Significance
1st minute	170.2840	5.69906	.000
10th minute	170.2140	5.70274	.000
20th minute	170.1120	5.70573	.000
30th minute	170.0900	5.65181	.000
40th minute	169.9780	5.66660	.000
50th minute	169.8680	5.65669	.000
60th minute	169.7400	5.65119	.000

Graph 1
Height reduction following traction



Graph 2
Height reduction following traction and SWD



DISCUSSION

Traction was applied only over the lumbar spine; therefore, whole body length measurements must be interpreted with caution[6]. Many studies till date have been conducted to analyze the effect of traction. The previous studies found that height is gained during traction and lost after traction. It was found that the gained stature existed beyond 45 minutes. Bridger et al. found 8.94 mm stature gain by traction[43]. The mechanism of stature gain is fluid influx to the disc from surrounding tissue[2]. Adam et al. stated that proteoglycans in the disc sucks in the fluid from the surrounding tissues[2]. Komari et al. concluded the improvement in clinical symptoms by means of improving blood flow in low back pain patients[13]. They theorized that the improved blood flow occurs prior to the actual reduction of the herniated nucleus pulposus, and they also established morphological changes which occurred in disc during the traction. Rodacki et al. found that initial gain in intervertebral disc height may be related to pressure variation than elastic deformation of the annulus fibrosus and ligaments[6]. During the application of short wave diathermy the intramuscular temperature will be raised up to 4.58 ^{0}C and that is maintained for 7 minutes.Shortwave diathermy given before the traction relaxes the muscle and continuous shortwave diathermy relieved pain and spasm[64]. Another study concluded that the reduction of spinal height could be due to contraction of small muscles in the spine[69]. While giving shortwave diathermy the muscle relaxed, and this may enhance the traction force. The combined effects of short wave diathermy and traction lead to more height gain.Most of the study involved in the focus of magnitude and duration of the traction. It has been proved that the gained height remained beyond 41 minutes[6]. When the internal pressure of the disc rises, it causes radial deformation on the wall of the annulus fibrosus, which bulge the disc and reduce its height. The fluid cannot be expelled instantly from the nucleus pulposus due to the initial deformation, which occurs in the elastic elements of disc. When the compressive loads (gravity) are imposed over a long period of time, only a small amount of fluid gradually and slowly gets expelled. It is also stated that insignificant elastic deformation occurs in the intervertebral disc after a prolonged period of body weight bearing[72].In our study, we found that both the groups show a gradual reduction of height initially, but traction group showed more reduction after 20 minutes of inactivity

following traction but does not reach baseline even after 60 minutes. But, shortwave diathermy and the traction group showed more reduction after 25-30 minutes. The reason could be the height gain immediately following shortwave diathermy and traction is found to be more than traction alone. Kanalyanphotoporn stated that the deformation variability in subject's response during loaded phase may be caused by individual variability in the efficiency of biomechanical homeostatic processes controlling fluid movement into and out of the intervertebral discs[50]. The combination of shortwave diathermy and traction has a little prolonged effect compared to traction alone. Hence, our study suggests the use of shortwave diathermy to increase the traction effects.

LIMITATIONS AND SUGGESTIONS

Sample size we used to be very small, study with a larger population is therefore recommended. This study was done with male subjects only. Future studies should be done on the female population. Further recommendations are to compare normal subjects with obese individuals or individuals with pathological conditions. We conducted the study at 5 P.M. diurnal variations can also be investigated.Pre-test height of the both the groups were not the same at the time of measurement after 1 week.

CONCLUSION

In this study we made an attempt to study the effect of traction on stature. Traction has been used to increase intervertebral disc height and the intervertebral space of the lumbar spine which increases the whole body length. In our study, we conclude that traction along with short wave diathermy shows a more clinically significant increase in height of normal male subjects when compared to only traction in the same individuals.

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CONFLICT OF INTEREST

Conflict of interest declared none.

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