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Case study

Immediate effect of one-fifth, one-third, and half of body weight lumbar traction on disc morphology in patients with disc herniation - a case series

Kshipra Shastri*[1], Sakshi Chilwant[2], Shyam D Ganvir[3]

[1] Department of Community Physiotherapy, Bharati Vidyapeeth School of Physiotherapy, Pune, Maharashtra, India
[2] Department of electrotherapy and Elctrodiagnosis, LSFPEF'S College of physiotherapy, Pune, Maharashtra, India
[3] Department of Community Physiotherapy, DVVPFs College of Physiotherapy, Ahmednagar, Maharashtra, India

Corresponding author: Kshipra Shastri, ✉ kshipras3@gmail.com, **Orcid Id**: https://orcid.org/0009-0007-0751-1419

Department of Community Physiotherapy, Bharati Vidyapeeth (Deemed to be University) School of Physiotherapy, Pune

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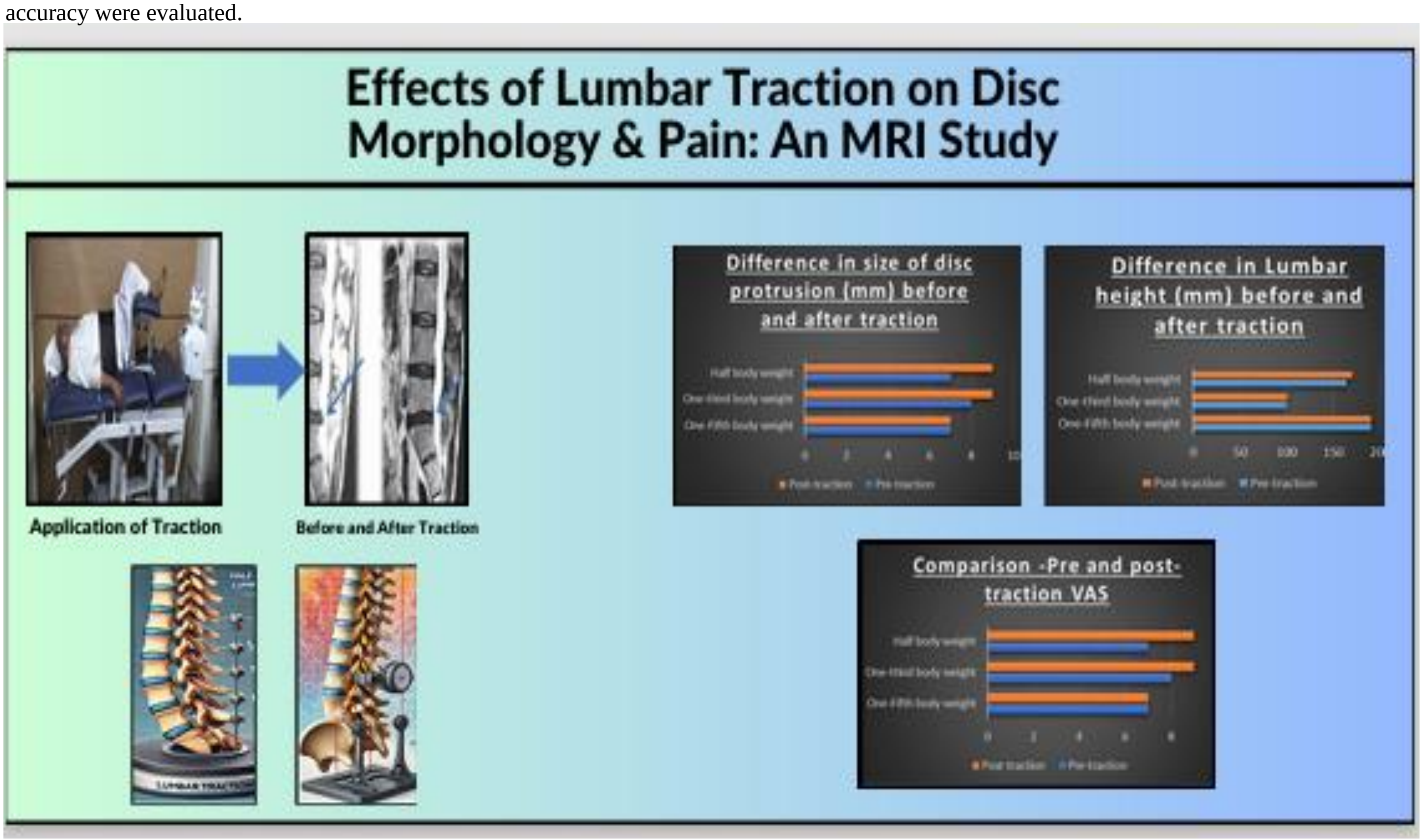
ABSTRACT

Lumbar traction is a widely utilized treatment option for lumbar disc herniation; however, the optimal traction dosage remains uncertain. This study intending to compare the immediate effects of varying traction weights on disc morphology and pain levels using real time MRI in individuals with Lumbar disc herniation, addressing a critical gap in clinical practice. in human plasma. Method novelty, sensitivity, rapidity, precision, and accuracy were evaluated.



Three patients, (60-year-old female, a 60-year-old male, and a 64-year-old male), with diagnosed with posterior or posterolateral lumbar intervertebral disc herniation at the L4-L5 or L5-S1 levels were enrolled. Real time MRI used to assess were lumbar height and disc herniation, while pain intensity was evaluated using Visual analogue Scale (VAS). Traction was applied at three different weights: one fifth, one third and one half of each patient's body weight. Measurements were taken before and after traction session. Traction with half of the body weight resulted in a considerable improvement in lumbar height compared to lesser weights ($P < 0.001$) with notable reduction in disc herniation ($P < 0.003$). All groups experienced reduced pain levels, with no significant differences in VAS scores among the different weights ($P = 0.07$). Half-body weight traction showed immediate improvements in lumbar disc morphology, such as increased disc height and smaller herniation size. Although all traction weights relieve pain, half-body weight traction provided additional structural improvement. These findings highlight the importance of individualized traction dosage based on patient-specific factors and treatment objectives.

Keywords: Traction, MRI, Herniated disc, Disc morphology.

INTRODUCTION

Lower back pain (LBP) is a common musculoskeletal condition [1]. Approximately 60–80% of the adult population is affected by LBP at some point in their lives, and the lumbar disc is most likely to cause low back pain. Structural changes in annulus fibrosis, nucleus pulpous, and vertebral end plates have been proposed as causes of low back pain in patients with disc herniation [2]. Conservative treatments such as medications, bracing, chiropractic, acupuncture, and lumbar traction are used to manage disc-related lower back pain [3]. In clinical practice, lumbar traction is the conventional treatment for patients experiencing low back pain [4, 5]. Given its prevalence as a treatment, the effectiveness of lumbar traction has been the subject of various systemic reviews.

A Systematic review presents conflicting findings regarding the effectiveness of mechanical traction, with some studies reporting moderate positive outcomes while others suggest minimal to no benefits[6]. Cochrane Systematic Review (2013) determined that traction, regardless of use alone or with other treatments, has limited or no impact on pain intensity, function, and resumption to work status in patients suffering from low back pain, with or without sciatica[7]. One more systematic review in 2018 reported that a wide variety of intervention methods could alter the clinical outcome of lumbar traction[8]. However, despite this, lumbar traction is still a commonly used treatment for patients with chronic lower back pain in numerous countries, with many healthcare professionals or physical therapists preferring to incorporate it into treatment plans, often as an adjunct to other treatment approaches [9].

Clinicians contend that the current studies of traction on traction lack robust methodological standards, do not accurately reflect real-world clinical scenarios, and encompass diverse participant groups, leading to varied outcomes[10]. Despite its widespread use in clinical settings, the therapeutic benefits of lumbar traction on low back pain related to disc herniation remain controversial due to variable treatment parameters including duration, weight of traction force, direction of force, and number of sessions [11-15]. To overcome these methodological limitations, further studies need to find out the optimal treatment parameters to achieve a maximum clinical outcome from the traction and to provide evidence-based intervention to patients with disc-related lower back pain.

In light of these findings, our study aims to bridge the gap by examining the changes in the disc morphology in response to different traction forces, thereby contributing to the determination of optimal treatment parameters.

MATERIALS AND METHODS

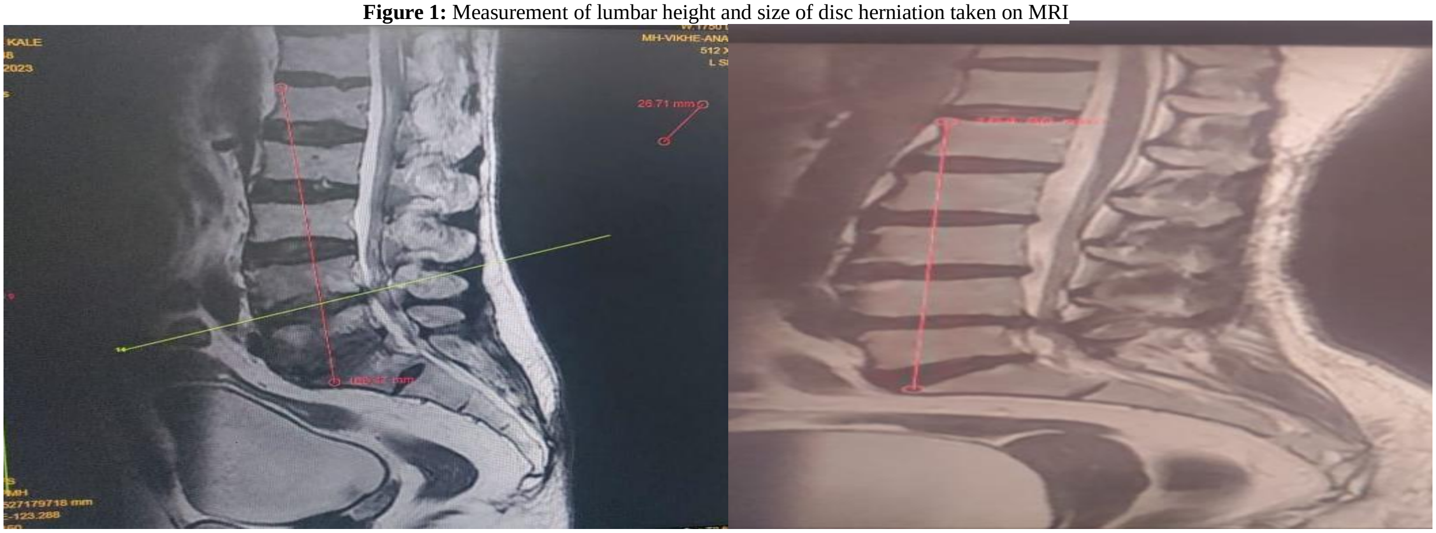
The study recruited three patients (mean age ± SD - 61.33 ± 2.3) after obtaining written informed consent. All three patients provided consent to allow for case studies and to publish their clinical information. Patients were included in the study if the disc herniation diagnosis was confirmed radio logically and clinically. Clinical findings included low back pain persisting under three months, positive straight leg raise, and neurological signs like diminished tendon reflexes or hypoesthesia, or muscular weakness in specific dermatomes and my tomes. Radiological findings included posterior or posterolateral lumbar intervertebral disc herniation in lumbar spine MRI at L4-L5 or L5-S1 levels. Patients were excluded if they had any contraindications to MR imaging or lumbar traction or had a history of spinal surgery, or cord compression.

To prepare the buffer, 13.6 g KH_2PO_4 was added to a1 litre reagent container and dissolved using 1 litre Milli-Q water. By using diluted orthophosphoric acid, the buffer pH was accurately adjusted to 3.0 (±0.5) and filtered through a 0.45-micron filter after being sonicated for 10 minutes. For the preparation of the mobile phase, 0.1M phosphate buffer and HPLC-grade acetonitrile were mixed in a 30:70 v/v ratio and then sonicated for 5 minutes. A 70:30 v/v mixture of acetonitrile and water was used as the diluent to prepare working solutions, IS, and sample solutions [16].

Intervention

Each patient received a single session of traction using Decompression Therapy Unit Triton Chattanooga- BiONiCS Innovations. The traction force was static and applied for half an hour on a split table. Lumbar traction was given in Fowler's position. Each patient positioned on the traction table was outfitted with thoracic and pelvic harnesses to ensure stability. Their hips and knees were flexed at 90° angle using padded footstools placed beneath both legs, resulting in an 18° angle of pull for the traction sling (15). Case 1 received one-third of their body weight as traction force, Case 2 received one-half, and Case 3 received one-fifth traction force (Fig. no 2, 3 and 4).

Figure 1: Measurement of lumbar height and size of disc herniation taken on MRI



Case Description

	Case 1	Case 2	Case 3
Description	A 60-year-old female presents with chronic right-sided lower back pain persisting for five months, accompanied by tingling, radiating pain, and difficulty walking. Activities like Shifting From sitting to standing exacerbates her symptoms, rated at 8/10 on the VAS on activity with no history of trauma. She is a known case of diabetes mellitus for 4 years, managed with medication.	A 60-year-old male presented with chronic low back pain that gradually developed over six months, exacerbated by activity and centred on the L5-S1 region. The pain was accompanied by tingling sensations, radiating pain, and gait disturbances. Pain intensity, rated on the VAS, was 7 during activity and 4 at rest.	A 64-year-old male presented with lower back pain radiating to both lower limbs, more pronounced on the left side, exacerbated by prolonged sitting and lifting a heavy object six months ago. Pain, rated 8 on the VAS scale, worsened with activities like sitting, coughing, and squatting but eased with rest.
Objective Finding	Limited lumbar range of motion, with extension providing relief. Tightness, tender lumbar muscles and weakness in the L5 myotome are noted. Positive supine straight leg raise reproduces both leg and back pain. MRI findings reveal diffuse disc bulge at L4-L5 and L5-S1, with disc osteophyte complex at L4-L5.	The straight leg raising test exacerbated leg pain. The S1 reflex on the right side was absent, with other lower limb reflexes intact. Sensory changes were not detected. MRI revealed diffuse posterior disc protrusion at the L5-S1 level, compressing the theca sac, encroaching on bilateral neural foramina, and abutting bilateral nerve roots.	Limited lumbar spine mobility and tenderness were noted on examination, with intact sensations and normal lower limb reflexes. Left lower limb muscle strength was graded at 3/5, assessed by manual muscle testing, and the straight leg raise test was positive. MRI revealed diffuse disc bulges at L5-S1, compressing bilateral exiting nerve roots and narrowing neural foramina.

Figure 2: Application of traction with One-Fifth body weight – Participant number 1

Figure 3: Application of traction One-third body weight – Participant number 2

Figure 4: Application of traction half body weight – Participant number 3

Intervention

Each patient received a single session of traction using Decompression Therapy Unit Triton Chattanooga- BiONiCS Innovations. The traction force was static and applied for half an hour on a split table. Lumbar traction was given in Fowler's position. Each patient positioned on the traction table was outfitted with thoracic and pelvic harnesses to ensure stability. Their hips and knees were flexed at 90° angle using padded footstools placed beneath both legs, resulting in an 18° angle of pull for the traction sling (15). Case 1 received one-third of their body weight as traction force, Case 2 received one-half, and Case 3 received one-fifth traction force (Fig. no 2, 3 and 4).

RESULTS

The statistical analysis of lumbar height (mm) tables No 1- 3 demonstrated a statistically significant increase in lumbar height with the application of half of the body weight during traction therapy, as compared to one-fifth and one-third of body weight, with a statistically significant p-value of < 0.001. Similarly, traction using half of the body weight demonstrated a significant reduction in disc herniation compared to traction with one-fifth and one-third of body weight, as indicated by a p-value of < 0.003 as shown in tables 4, 5, and 6. However, no statistically significant change was observed in the pre- and post-traction visual analogue scale (VAS) scores when comparing the impact of traction with the three different body weights, with a p-value of 0.07 as shown in Table no 7. These findings signify the differential effects of varying traction weights on lumbar height and disc herniation with maximum change using half of the body weight. However, the intensity of pain perception across the different weight categories remains non-significant between the three cases.

Selectivity

A chromatogram obtained from blank plasma has been verified to demonstrate the absence of any significant interference from endogenous components (Figure 4).

Linearity

The calibration curves of EFN and TEL in human plasma exhibited better linearity within the concentration ranges of 5-200 ng/ml. The method displayed a strong linear relationship in this range. Figure 5 illustrates typical calibration curves of spiked plasma samples, along with the regression equation and corresponding correlation coefficient (r^2) values for EFNand TEL. The correlation coefficient for EFN was determined to be 0.9997, while for TEL it was found to be 0.9995 as shown in Table 2 and Table 3.

Lumbar height

Table 1: Difference in Lumbar height (mm) before and after traction

Lumbar Traction	Pre-traction	Post-traction	Difference
One-Fifth body weight	190.21	190.41	0.2
One-third body weight	100.06	100.17	0.11
Half body weight	164.5	170.1	5.6

Table 2: Between Group Comparison -Pre and post-traction lumbar height

Lumbar Traction	Mean ± SD		p Value	Result
One-Fifth body weight	190.31 ±0.141	One-fifth body weight vs One-third body weight vs Half body weight	<0.001	Significant
One-third body weight	100.12± 0.077			
Half body weight	167.30 ±3.96			

Table 3: Turkey -Kramer Multiple Comparison Test

Body weight0.2	Mean difference	p Value	Result
1/5 vs1/3	90.195	<0.001	Significant
1/5vs ½	23.010	<0.01	Significant
1/3 vs ½	67.18	<0.001	Significant

Disc Protrusion

Table 4: Difference in size of disc protrusion (mm) before and after traction

Lumbar Traction	Pre-traction	Post-traction	Difference
One-Fifth body weight	7	7	0
One-third body weight	8	6	2
Half body weight	9	5	4

Table 5: Between Group Comparison -Pre and post-traction disc protrusion

Body weight	Mean ± SD		p Value	Result
One-Fifth body weight	3.38 ± 0.11	One-fifth body weight vs One-third body weight vs Half body weight	<0.003	Significant
One-third body weight	4.68 ±0.16			
Half body weight	3.85±0.07			

Table 6: Between Group Comparison -Pre and post-traction disc protrusion

Body weight	Mean difference	p Value	Result
1/5 vs1/3	-1.30	<0.001	Significant
1/5 vs ½	-0.47	>0.05	Not Significant
1/3 vs ½	0.83	<0.001	Significant

VAS

Table 7: Between Group Comparison -Pre and post-traction VAS

Body weight	Mean ± SD	One-fifth body weight vs One-third body weight vs Half body weight	p Value	Result
One-Fifth body weight	7.5 ± 0.70		0.70	Not Significant
One-third body weight	8.5 ± 0.70			
Half body weight	7.0 ±2.82			

DISCUSSION

Our study was prospective, intending to compare the influence of lumbar traction of three different body weights on degenerative lumbar disc height and size of disc herniation by using magnetic resonance imaging in individuals with lumbar PIVD. Results showed that lumbar traction with half of the body weight is the highest effective weight for increasing lumbar disc height and decrease in disc herniation compared to 1/5th and 1/3rd body weight, as the changes in the intervertebral disc height were not significant with the 1/5th and 1/3rd body weight.

Yu-Hsuan Cheng et al. in 2020, conducted a systematic review to examine the effects of mechanical traction on patients with ruptured intervertebral discs. The results of traction groups showed significant short-term improvements in function and pain intensity compared to the control. However, the data related to investigating the effect of traction on disc size was limited, with only two studies addressing this. Though previous studies have shown that traction can reduce herniated disc size and increase disc height, the optimal weight for traction remains unclear [2].

Muhammad et al. in 2018, conducted a systematic review of 24 RCTs, having only 5 high-quality trials, found that traction alone or combined with other interventions had minimal effect on pain and functions in patients with LBP, with or without sciatica. In 27% of studies, traction was combined with rehabilitation, and traction forces varied greatly, with 35% of RCTs using varied percentages of body weight (20-100%). Variations in patient positioning, session length, frequency, and traction force questioned the ideal dosage of traction treatment [8]. The current study, however, standardized parameters such as type, time, position, and weight, showing that traction at half body weight had significant effects.

Daniel et.al, in 2016, conducted a study to examine the mmechanical outcome of traction on lumbar intervertebral discs using MRI and concluded that horizontal traction was effective in increasing the disc height of lower lumbar levels, particularly in the posterior area of the discs. Additional research addressing the effects of traction with varying modes, intensities, and durations on the change in disc height is necessary for accurate control of traction applied to particular disk levels. A substantial increase in the average disc height was observed solely in lower lumbar discs after 30 minutes of traction. The increase in the posterior disc height was more pronounced than the rise in the anterior disc height. Current study used horizontal traction, and traction had a significant impact on posterior lumbar disc height [16].

The study done by Kumari et.al was intended to compare the immediate effects of three distinct traction forces applied in Fowler's position on SLR range of motion and intensity of LBP in patients with lumbar PIVD. The duration of the improvement in SLR range of motion or LBP is uncertain, as the current study only looked at the immediate effects. Improvement in the above outcomes was seen with just half of body weight traction as seen in the current study [17].

Following the above literature, it was unclear what amount of body weight while giving mechanical lumbar traction is best or most therapeutic for PIVD patients in quantifiable factors like disc herniation and lumbar height. According to the present study, half of the body weight is the highest effective weight for increasing lumbar disc height and decreasing disc herniation compared to 1/5th and 1/3rd body weight. The possible reason behind this traction is thought to enhance the strain in the posterior longitudinal ligaments, which in turn creates a retractile force that forces the ruptured disc material back into IVDS, thereby decreasing the size of the herniated disc.

However, the present study did not show a significant difference in terms of VAS scores when the three groups were compared, which might be because the study did not compare the long-term effects of traction. Variations in initial characteristics such as participant's weight, height, age, degree of herniation, and initial weight of each participant included in the research might have influenced the outcomes. The present study provides various implications for clinical practice, the immediate pain reduction provided by traction with half of the body weight may hold clinical value considering the potential to increase lumbar height and reduce disc herniation on MRI. Due to the lack of a randomized controlled design, these results should be interpreted with caution. For future research, trials with large samples and control are needed to confirm the true benefits of traction.

CONCLUSION

It was observed that the application of half of the body weight during traction demonstrated significant results. Greater improvement in immediate MRI changes, leading to reduced disc herniation and increased lumbar height. All three groups experienced a decrease in their initial pain levels, with no noticeable distinction in the effectiveness of the three different body weights used during mechanical traction.

Informed consent

Informed consent of the patient was taken before participation in the study.

Acknowledgment

We thank the participants who contributed to the study.

Conflict of interest

The authors affirm that there are no conflicts of interest.

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REFERENCES

1. Vanti C, Turone L, Panizzolo A, et al, 2021. Vertical traction for lumbar radiculopathy. Arch Physiother. Pages 11-7. Doi: https://doi.org/10.1186%2Fs40945-021-00102-5.

2. Cheng YH, Hsu CY, Lin YN, 2020. The effect of mechanical traction on low back pain in patients with herniated intervertebral disks: a systemic review and meta-analysis. Clin Rehabil; 34(1), Pages 13–22. Doi: 10.1177/0269215519872528.

3. Wenger HC, Cifu AS, 2017. Treatment of Low Back Pain. JAMA. 318(8), Pages 743–4. Doi: 10.1001/jama.2017.9386.

4. Borman P, Keskin D, Bodur H, 2003. The efficacy of lumbar traction in the management of patients with low back pain. Rheumatol Int. 23(2), Pages 82–6. Doi: 10.1007/s00296-002-0249-0.

5. Chung TS, Yang HE, Ahn SJ, et al, 2015. Herniated Lumbar Disks: Real-time MR Imaging Evaluation during Continuous Traction. Radiology. 275(3), Pages 755–62. Doi: 10.1148/radiol.14141400.

6. Van Tulder MW, Koes B, Malmivaara A, 2006. Outcome of non-invasive treatment modalities on back pain: an evidence-based review. Eur Spine J Off Publ Eur Spine Soc Eur Spinal Deform Soc Eur Sect Cerv Spine Res Soc. 1(Suppl 1), Pages S64-81. Doi: 10.1007/s00586-005-1048-6.

7. Wegner I, Widyahening IS, van Tulder MW, et al, 2013. Traction for low-back pain with or without sciatica. Cochrane Database Syst Rev. (8), Pages CD003010. Doi: 10.1002/14651858.CD003010.pub5.

8. Alrwaily M, Almutiri M, Schneider M. 2018. Assessment of variability in traction interventions for patients with low back pain: a systematic review. Chiropr Man Ther; 26, Page 35. Doi: 10.1186/s12998-018-0205-z.

9. Madson TJ, Hollman JH, 2015. Lumbar Traction for Managing Low Back Pain: A Survey of Physical Therapists in the United States. J Orthop Sports Phys Ther. 45(8), Pages 586–95. Doi: 10.2519/jospt.2015.6036.

10. Gay RE, Brault JS, 2008. Evidence-informed management of chronic low back pain with traction therapy. Spine J Off J North Am Spine Soc. 8(1), Pages 234–42. Doi: 10.2519/jospt.2015.6036.

11. Tadano S, Tanabe H, Arai S, et al, 2019. Lumbar mechanical traction: a biomechanical assessment of change at the lumbar spine. BMC Musculoskelet Disord. 9, 20(1), Pages 155. Doi: 10.1186/s12891-019-2545-9.

12. Cyriax J, 1950. The Treatment of Lumbar Disk Lesions. Br Med J. 2(4694), Pages 1434–8. Doi: 10.1136/bmj.2.4694.1434.

13. Judovich BD, 1955. Lumbar traction therapy; elimination of physical factors that prevent lumbar stretch. J Am Med Assoc. 159(6), Pages 549–50. Doi: 10.1001/ jama.1955. 02960230013005.

14. Crisp EJ, Cyriax JH, Christie BG, 1955. Discussion on the treatment of backache by traction. Proc R Soc Med. 48(10), Pages 805-14. Doi: 10.1177/003591575504801012.

15. Lee RY, Evans JH, 2001. Loads in the lumbar spine during traction therapy. Aust J Physiother. 47(2), Pages 102–8. Doi: 10.1016/s0004-9514(14)60301-9.

16. Chow DH, Yuen EM, Xiao L, et al, 2017. Mechanical effects of traction on lumbar intervertebral discs: a magnetic resonance imaging study. Musculoskeletal Science and Practice. 29, Pages 78-83. Doi: 10.1016/j.msksp.2017.03.007.

17. Kumari A, Quddus N, Meena PR, et al, 2021. Effects of one-fifth, one-third, and one-half of the bodyweight lumbar traction on the straight leg raise test and pain in prolapsed intervertebral disc patients: a randomized controlled trial. BioMed Research International. Doi: 10.1155/2021/2561502.