The Effect of Lumbar Stabilization Exercises on H-reflex in Discogenic Sciatica

تأثير تمرينات التثبيت القطني على منعكسة هوفمان في التهاب عصب النسا الغضروفي

Dedication

To my husband
and all my family members for their support

ACKNOWLEDGEMENT

First of all and above of all, I would like to thank God, for giving me the ability to accomplish this work.

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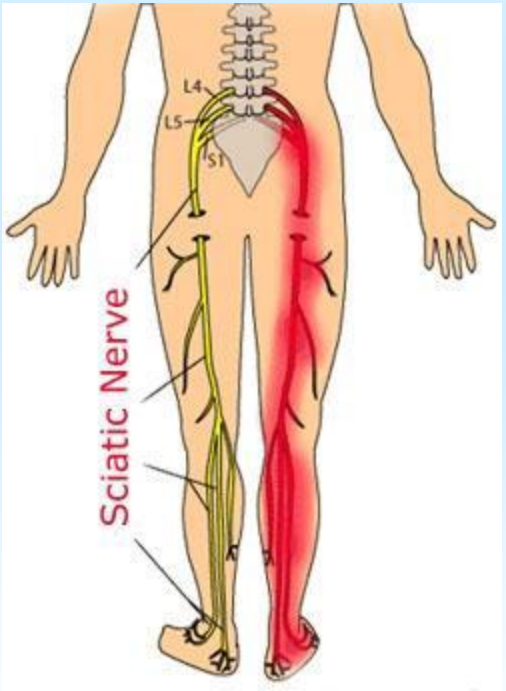
Introduction

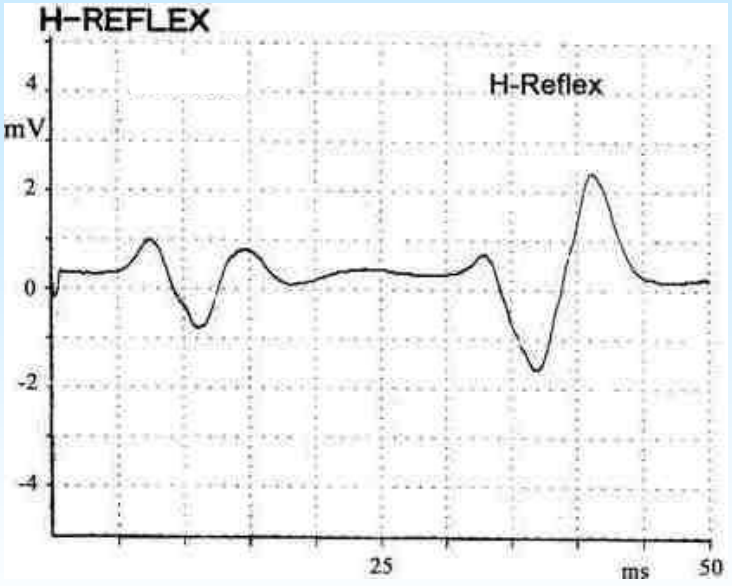
Low back pain (LBP) is one of the most common forms of chronic pain (**Mantyselka, 2001**) and is a significant cause of disability and cost in society **(Andersson et al., 1993**). Chronic LBP substantially influences the capacity to work and has been associated with the inability to obtain or maintain employment (**Stang et al., 1998**) and lost productivity (**Stewart et al., 2003**). It affects more than 50% of the general population. It is estimated that over 70% of adults have at least one episode of LBP during their lifetimes. (**Lawrence et al., 2006**) Prevalence is higher in young, economically active adults ;(**De Vitta, 1996)** indeed, LBP is the second most common reason for absenteeism from work, and one of the most common reasons for medical consultation **(Ebenbichler, 2001).**

Lumbar disc herniation is a common condition that frequently affects the spine in young and middle-aged patients.Regardless of etiology, herniations represent protrusions of disc material beyond the confines of the annular lining and into the spinal canal (**Anderson et al., 2008)**

Sciatica (or **sciatic neuritis**) is a set of symptoms including pain that may be caused by general compression and/or irritation of one of five spinal nerve roots that give rise to each sciatic nerve, or by compression or irritation of the left or right or both sciatic nerves. One of the possible causes of sciatica is a spinal disc herniation pressing on one of the sciatic nerve roots (**Sciatica at Dorland's Medical Dictionary)**



H-reflex is an electrically induced reflex analogous to the mechanically induced spinal stretch reflex (**Riann et al., 2004)**. It is an estimate of alpha motor neuron excitability when presynaptic inhibition and intrinsic excitability of the alpha motor neurons remain constant. This measurement can be used to assess the response of the nervous system to various neurologic conditions (**Fisher et al., 1992**), musculoskeletal injuries (**Hopkins et al., 2000**), application of therapeutic modalities (**Bell and Lehmann, 1987**) , pain, exercise training (**Maffiuletti et al., 2000**), and performance of motor tasks (**Capaday, 1997**).



Clinically, physiotherapy for back pain and radiculopathy is provided in the form of cold, heat, electromagnetic waves, ultrasound, mobilization, manipulation massage, corset use, traction, electrical stimulation, acupuncture, Maitland technique, Cyriax technique, McKenzie method and home instruction.

Although there are a wide variety of therapeutic exercises that have been proposed as treatments for LBP, the last 20 years have seen the development of a substantial focus on the use of exercises that are intended to address intersegmental stability in the lumbar spine. These exercises programs are varyingly referred to as lumbar stabilization, segmental stabilization, or core stabilization, among other terms, and are aimed at improving the neuromuscular control, strength, and endurance of a number of muscles in the trunk and pelvic floor that are believed to play important roles in the dynamic stability of the spine **(Christopher et al., 2007).**

Purpose of the study

The purpose of the study was to determine the effect of lumbar stabilization exercises on H-reflex, pain and functional disability in discogenic sciatica.

Significance of the study

LBP is one of the most human being complex problem .It is considered one of the most frequently treated and most costly disease in modern industrial societies disc disorders, back pain, and/or radiculopathy are often grouped together in terms of economic considerations, and a discrete estimation of the effect of symptomatic lumbar disc herniation on the economic system, in terms of days lost to work and reduced productivity, is hard to obtain. Nonetheless, back-related conditions are a common cause of disability (**Andrew, 2010)**. and many therapeutic interventions are available for managing LBP but no single modality seems to be superior to others **(Maigne, 2006)**.lumbar stabilization exercise is one of the options for LBP and for discogenic sciatica, these exercises are aiming to improve the neuromuscular control, strength, and endurance of a number of muscles in the trunk and pelvic floor that are believed to play important roles in the dynamic stability of the spine (**Christopher et al., 2007**).


Subject
Material
Methods

This study was conducted in the outpatient clinic in the faculty of physiotherapy, Cairo University. Assessment of H-Reflex was done by Professor Dr .**Hanan Hosny** in the Neurophysiology clinic of the General institute of health insurance.

I-Patients:

A box contained 30 folded papers were available for the patients. Papers were written by A or B. by equal numbers each patient was instructed to choose one paper and replace it again in the box. Each patient was assigned to the letter of the group he chose into either group A or B .Thirty patients participated in this study. They were referred from an orthopedist and all had MRI .and patients were randomly assigned into two groups:

(**Group A):** Consisted of 15 patients who received lumbar stabilization exercises and infra Red (IR) and Ultra sonic (US).

(**Group B):** Consisted of 15 patients who received IR and US Only.

Inclusion criteria:

All patients were selected for this study matched the following criteria:

1-Patient diagnosed clinically as disc herniation (L5-S1) with sciatica (confirmed with MRI).
2-Patient has referred pain in sciatic distribution, buttocks, back of thighs, leg and ankle.
3-Positive straight leg raising test (SLR).
4-age ranging from 20 to 50 years.

Exclusion criteria:

Patients were excluded from the study if they met the following criteria:

1- Previous back surgery.
2- Scoliosis, stenosis, metabolic system disorder, cancer, cardiac problem, peripheral neuropathy and history of upper motor neuron lesion.
3-Piriformis syndrome.
4-Any patient absent more than two sessions were excluded from the study.

1-Visual analog scale (VAS)

LBP level was measured by using the VAS which uses a line of 10 cm, divided from 0 to 10, 0 refers to no pain and 10 refers to the worst pain . The patients were asked to mark along the line at the point which refers to their level of pain. **VAS** is a valid and reliable method for pain assessment **(Scrimshaw, 2001).**

I ----------I

NO Pain

WORST Pain

2-Oswestrey Disability Questionnaire (ODQ)

Functional disability level of each patient was measured by **Oswestrey Disability questionnaire**; it is valid and reliable tool for measuring functinal disability in low back pain patients. It consists of 10 multiple choice questions of back pain included disability in daily functions and leisure time activities for each question, the patient selected one sentence out of sex that best describes his or her disability. The maximum score is 50(maximum disability) and the results was taken as a percentage from the total score. Higher score indicates greater disability.

- Score from 0 to 20% indicate minimal disability,
- 20 to 40% represent moderate disability,
- 40 to 60% represent severe disability,
- 60 to 80% represent crippled disability,

and scores from 80 to 100% represents patients that are confined to bed **(Fairbank and Pynsent, 2000)**

3-Electromyography unit

It is used for the assessment of H-Reflex (amplitude and latency).

It is a valuable tool to evaluate neurologic function **(Riann et al., 2004).**

H-reflex will be measured before and after the treatment program**.**

II-Instrumentations used in treatment:

The stabilizer pressure biofeedback:

It consists of an inflatable trisectional rectangular cushion (23x14cm) connected to a pressure gauze. The sections of the cushion communicate with one another and are made from non-elastic material. External force applied to the cushion is reflected as change in air pressure. The device is placed between the lumbar spine and a hard surface to detect motion in the lumbar spine as progressively more difficult exercises of the lower limbs are performed **(Carins et al., 2000).**

Procedures:

I-Pain assessment.

The patients were asked to place a mark along the line to denote their level of pain (Campbell et al., 1990).

II-Assessment of functional disability.

The patients were asked to complete the questionnaire as it is designed to give us information as how your back or leg trouble has affected your ability to manage in everyday life.

Patients were informed to answer every section by making one box only in each section that most closely describes him today.

III-Assessment of H-reflex.

Patient was in prone position, with the upper extremities positioned symmetrically at side. The distal parts of the legs were placed on a comfortable small pillow with feet suspended over the edge of the table and remained immobilized. The area of popliteal fossa, soleus, and midway between popleteal fossa and soleus for both legs were gently cleaned with alcohol.

An electrical stimulation surface bar electrode was placed with coupling gel on the popliteal fossa of both legs with the cathode electrode proximal to anode and in line with the posterior tibial nerve. A recording surface electrode was positioned over the soleus muscle 3cm below the bifurcation of the gastrocnemius tendon: cathode was proximal to anode .

The ground electrode was positioned midway between the stimulation and recording electrodes. Electrodes were secured with adhesive tape to maximize skin electrodes contact. Pulse duration used is 1.0 ms and intensity that elicits H-maximum with minimum and stable M-response Two minutes practice trials to elicit H-reflex were obtained to familiarize the patient with the H-reflex stimulation and recording procedures. Then four readings of the maximum H-reflex and stable minimum M-response with constant intensity were recorded and averaged from each leg **(Al-Jabr, 2004)**

IV-Straight leg raising test

A straight leg raising (SLR) test was performed by asking the patient to raise his straight leg (30-70 degrees) with the patient in a supine position. If this provokes a typical, dermatomal pain in the leg the test considered positive **(Patrick, 2002**).

The treatment procedure

Each of the following exercises was repeated for 15 repetitions, 5 repetitions in 3 sets with one minute rest in between as suggested by **Richardson et al. (1999) and Hagins et al., (1999)**.

1-abdominal hollowing

Patient lied in crook lying position with feet flat on the treatment table. The investigator sat beside the patient with thumbs placed anteriorly and inferiorly to the anterior superior iliac spine, lateral to the rectus abdominis. The patient was instructed to inhale and after exhalation, he was instructed to pull his navel up and backwards towards his back while maintaining his normal breathing pattern with holding his contraction for 10 seconds each repetition .The investigator should feel a slow developing tension under his thumbs in the abdominal wall.

2-Quadruped abdominal hollowing

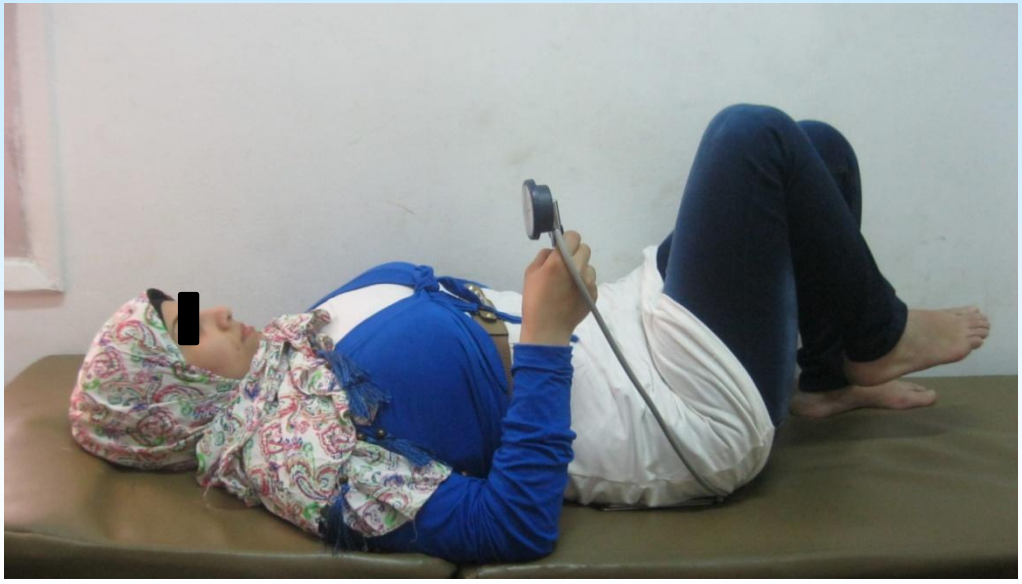
Patient lied in quadruped position on the treatment table with hips, knees, and shoulders flexed 90 degrees, the spine was in the neutral position. the patient was instructed to inhale allowing his abdomen to drop, as he exhale, he pulls his umbilicus up towards his spine without moving his spine with holding for 10 seconds while maintaining his normal breathing pattern.

3-Unilateral abduction

Patient lied in crook lying position. Patient was instructed to contract his lower abdomen while continuing normal breathing pattern. While holding this contraction the patient was asked to abduct his right leg top approximately 45 degrees towards the floor while keeping the other limb motionless with maintaining this contraction for 10 seconds, then to return his right leg to the starting position then relax

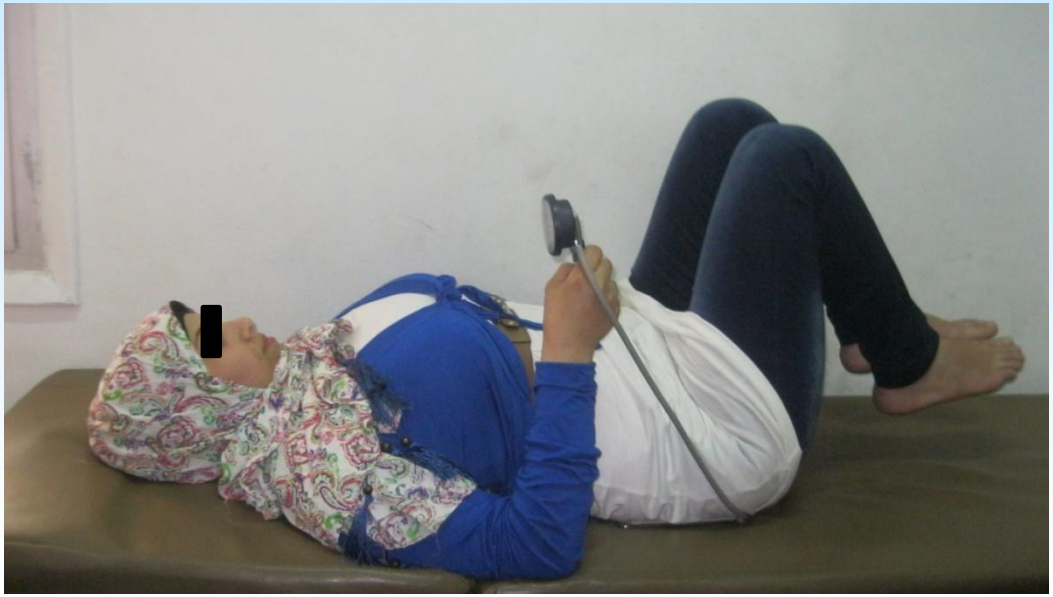
4-Unilateral knee raise

Patient lied in cook lying position. the patient was instructed to contract his lower abdominal muscles while continuing to breath in a normal pattern, while maintaining the contraction, he was asked to raise his right leg towards his chest until it just passes 90 degrees of hip flexion while allowing the knee to flex normally, patient will be instructed not to press with his other foot, to keep breathing, not to move his head, neck, or shoulders and to hold for 10 seconds, then to return to the normal starting position



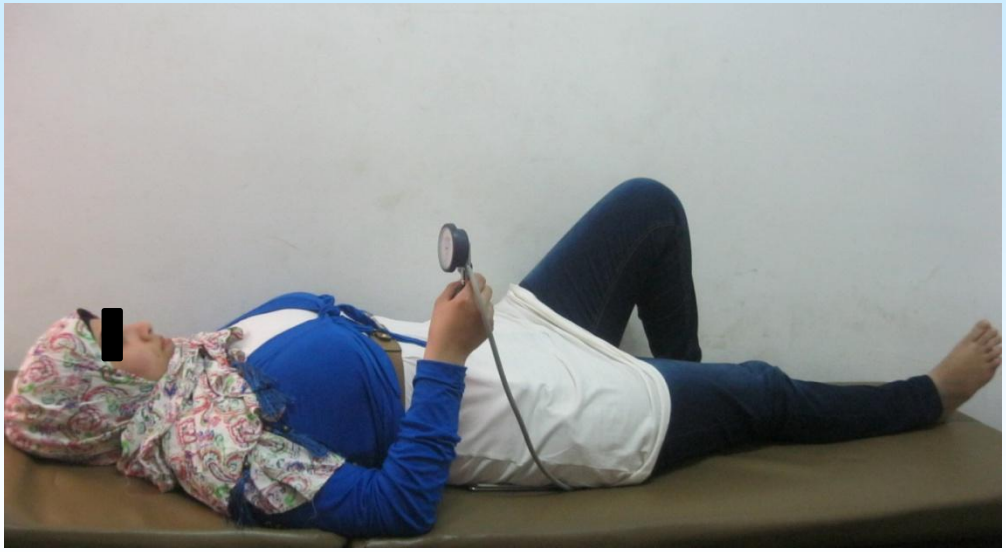
5-Bilateral knee raise

Patient lied in crook lying position. He was instructed to contract his lower abdomen while maintaining breathing in normal pattern. while maintain the contraction, he was asked to raise his right leg towards his chest until it just passes 90 degrees of hip flexion while allowing the knee to flex normally, then to hold his right leg in this position and to lift his leg in the same way, so both legs will be elevated. then to hold this contraction for 10 seconds then to return his right leg to the starting position followed by the left



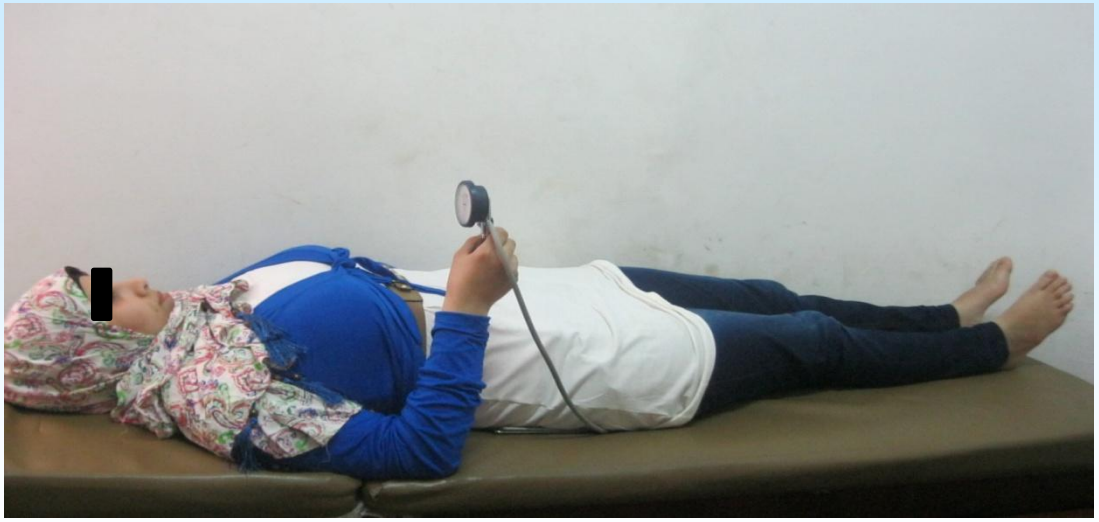
6-Unilateral heel slide

Patient lied in crook lying position .he was instructed to contract his lower abdomen, while continuing to breathe in normal pattern. while maintaining the contraction, he was asked to raise his right leg towards his chest until it just passes 90 degrees of hip flexion while allowing the knee to flex normally and to hold his right leg in his position and then to lift his left leg in the same way, so both legs will be elevated. From this position, he was asked to lower and straight the right leg and slide his heel along the treatment table till his leg becomes flat, then to slide his heel back, and to return his leg to the staring position with both hips flexed then lower your legs down back to the plinth



7-Bilateral heel slide

Patient lied in crook lying position. He was instructed to contract his lower abdomen, to continue to breathe in a normal fashion. While maintaining the contraction, he was asked to raise his right leg towards his chest until it just passes 90degrees of hip flexion while allowing the knee to flex normally, to hold his right leg in this position and then to lift his left leg in the same way, so both legs were elevated. From this position, he was asked to lower and straighten his both legs and to slide his heels along the treatment table till his legs become flat, then to slide his heels back and to return his legs to the starting position with both hips flexed then lower your legs down back to the treatment table



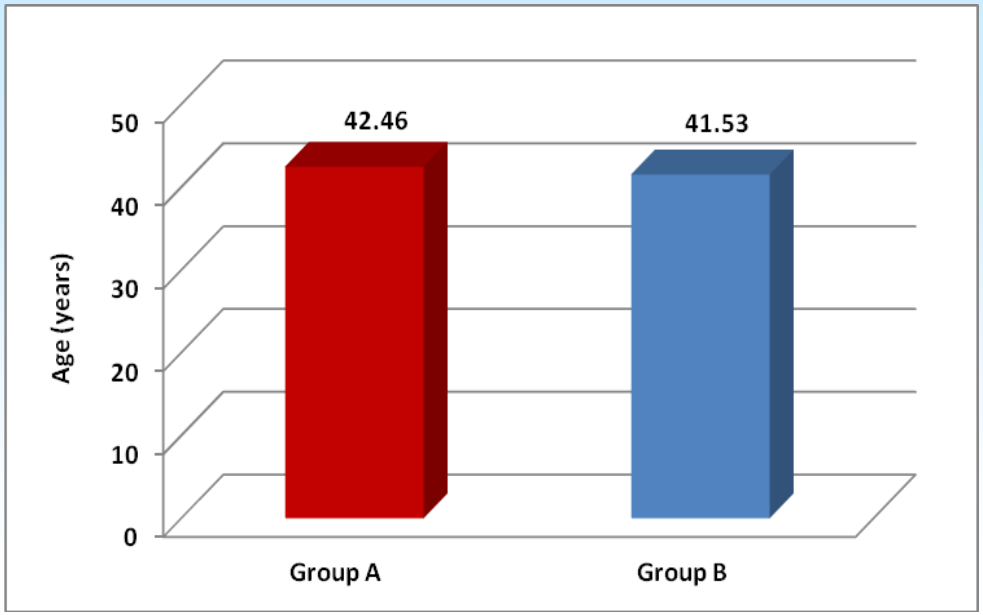
8-Bilateral heel hover

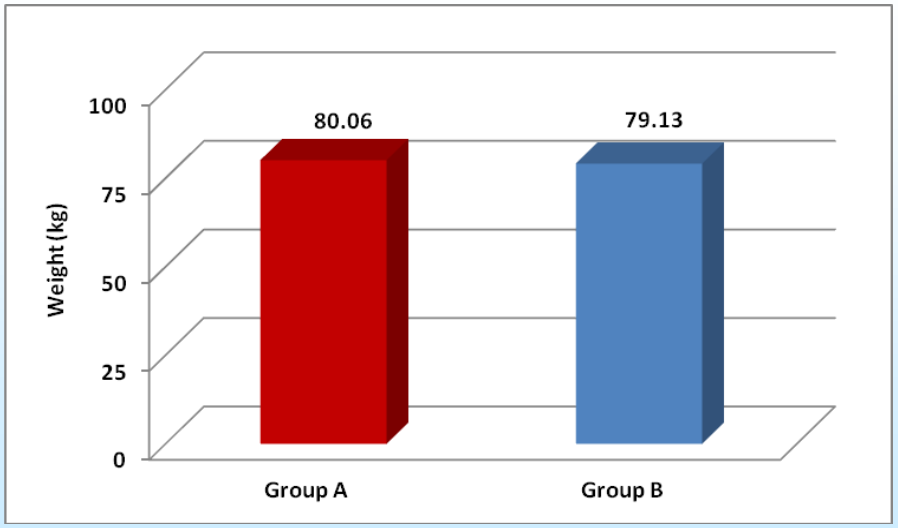
Patient lied in crook lying position .he was instructed to contract his lower abdomen and to continue to breathe in a normal pattern. While maintaining the contraction, he was asked to raise his right leg towards his chest until it just passes 90 degrees of hip flexion while allowing the knee to flex normally, to hold his right leg in this position and then to lift his left leg in the same way, so both legs were elevated. From this position, he was asked to lower his both feet toward the floor so both heels are approximately 3 inches from the ground and not to touch the floor with his feet then to straighten his both legs until his knees become straight while keeping them elevated approximately 3 inches from the treatment table. Then to return his knees slowly towards his chest


RESULT

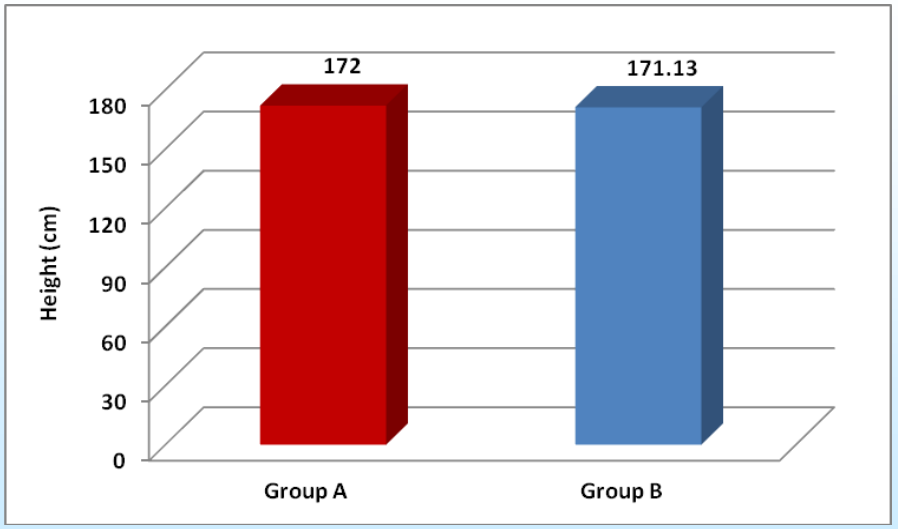
Physical characteristics of patients in both groups (A and B).

	Group A	Group B	MD	t- value	p-value	Sig
	±SD	±SD				
Age (years)	42.46 ± 9.59	41.53 ± 5.7	0.93	0.32	0.74	**NS**
Weight (kg)	80.06 ± 2.91	79.13 ± 3.29	-1.8	0.82	0.41	**NS**
Height (cm)	172 ± 3.64	171.13 ± 3.73	0.65	0.64	0.52	**NS**
BMI (kg/m²)	27.09 ± 1.49	27.03 ± 1.19	0.33	0.12	0.9	**NS**



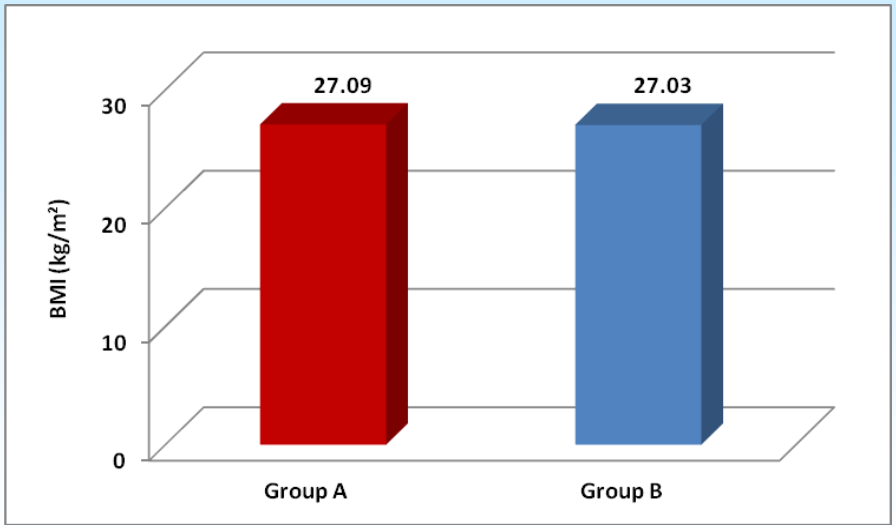


Mean weight (kg) for both groups (A and B).



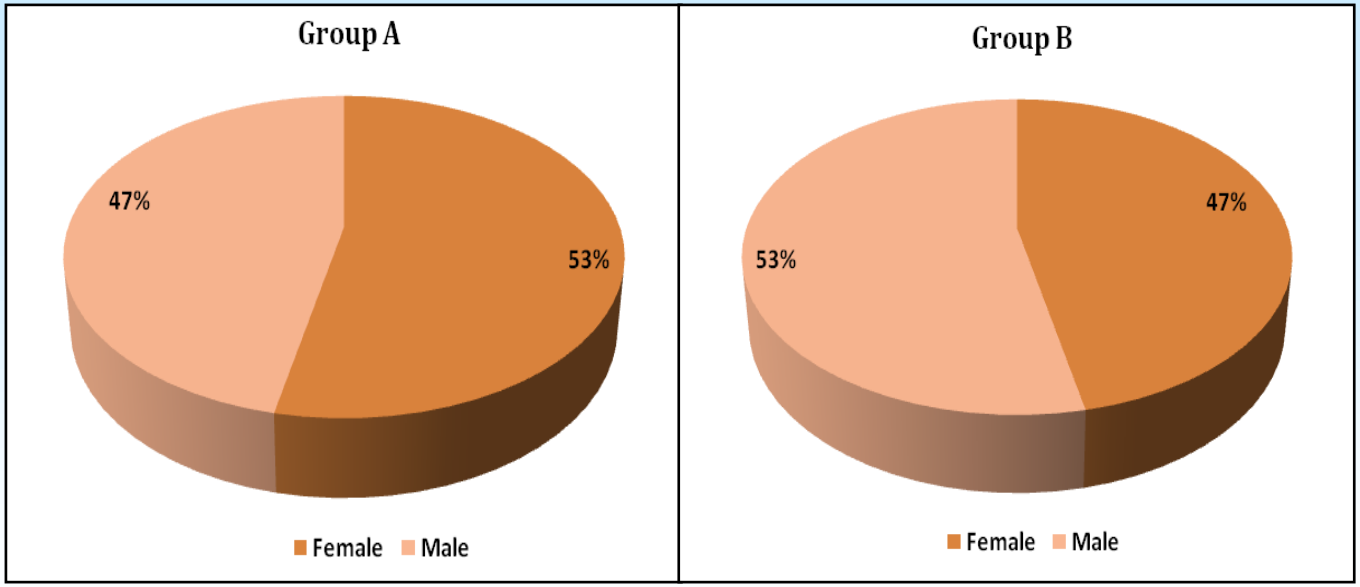
Mean height (cm) for both groups (A and B).

Mean BMI (kg/m²) for both groups (A and B).



Comparison of sex distribution of both groups (A and B):

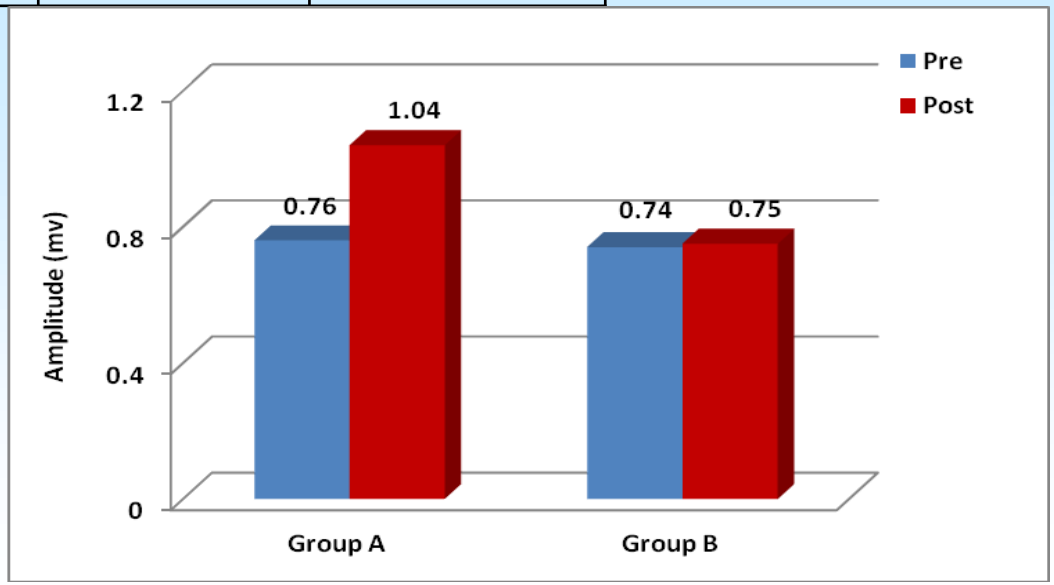
	Group A	Group B	χ^2	p-value	Sig
Female	8 (53%)	7 (47%)	0.13	0.71	**NS**
Male	7 (47%)	8 (53%)			



Comparison of Amplitude in both group A& B

Variable	Time of measurements	Group (A)	Group (B)	Univariate Test	
				P-value	Significance
Amplitude (mv)	Pre treatment mean	0.76 ± 0.27	0.74 ± 0.28	0.87	NS
	Post treatment mean	1.04 ± 0.43	0.75 ± 0.28	0.03	S
	P-value	0.0001	0.87		
	Significance	S	NS		

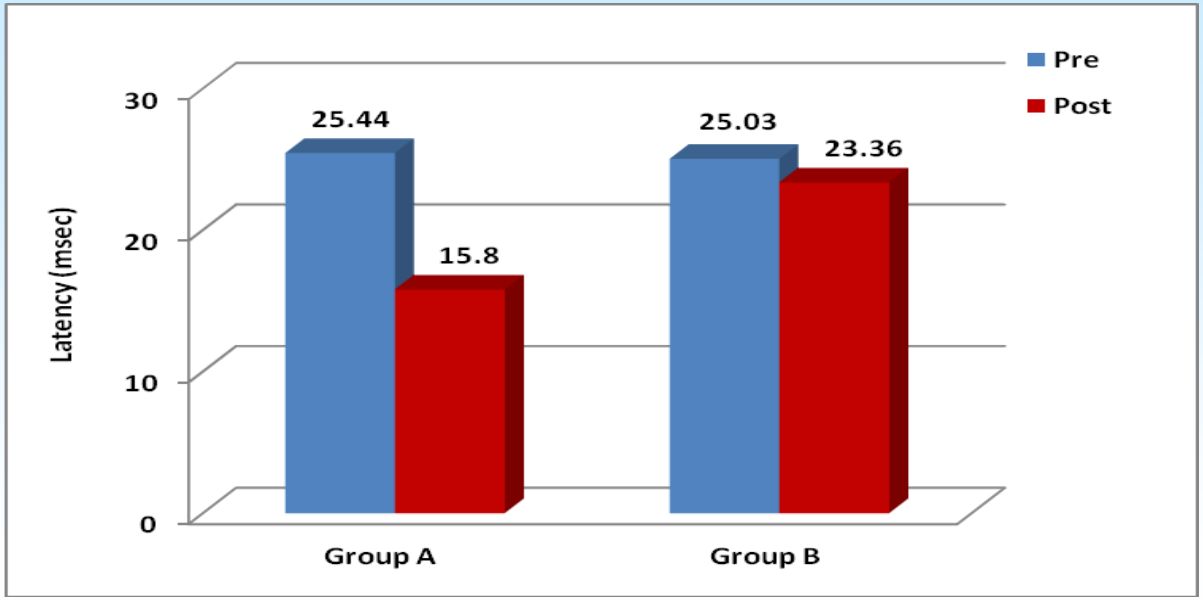
Pre and post treatment mean values of amplitude of H reflex (mv) of group A and B.



Comparison of Latency in both group A&B

Variable	Time of measurements	Group (A)	Group (B)	Univariate Test	
				P-value	Significance
Latency (msec)	Pre treatment mean	25.44 ± 6.63	25.03 ± 2.44	0.82	NS
	Post treatment mean	15.8 ± 7.89	23.36 ± 2.66	0.002	S
	P-value	0.0001	0.39		
	Significance	S	NS		

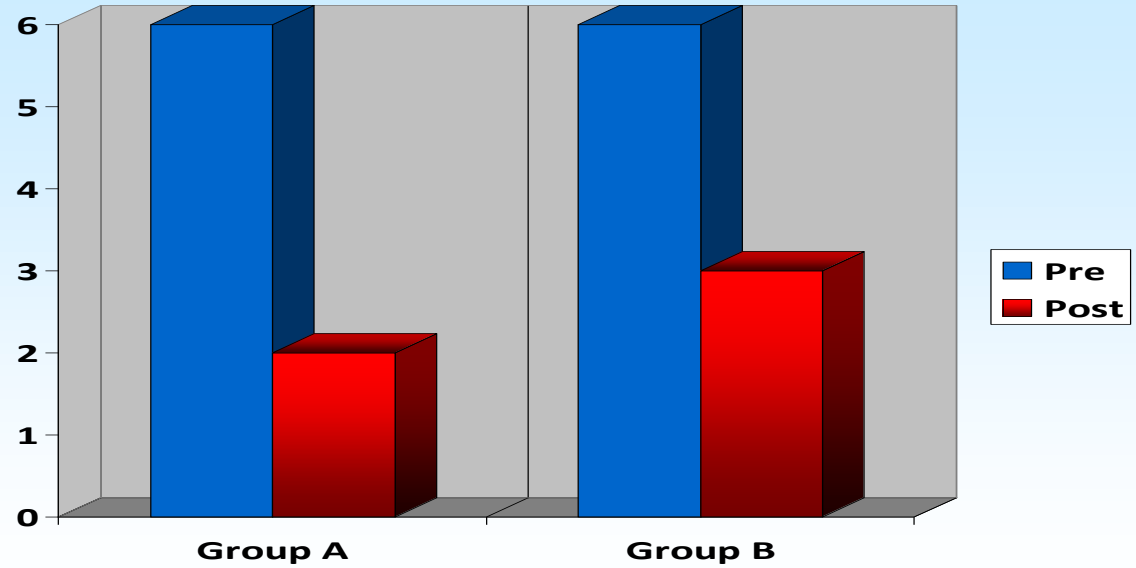
Pre and post treatment mean values of latency of H reflex (msec) of group A and B



Comparison of pain intensity in groups (A&B).

Variable	Time of measurements	Group (A)	Group (B)	P-value	Significance
Pain analogue scale	Pre treatment median	6	6	0.93	NS
	Post treatment median	2	3	0.04	S
	P-value	0.0001	0.001		
	Significance	S	S		

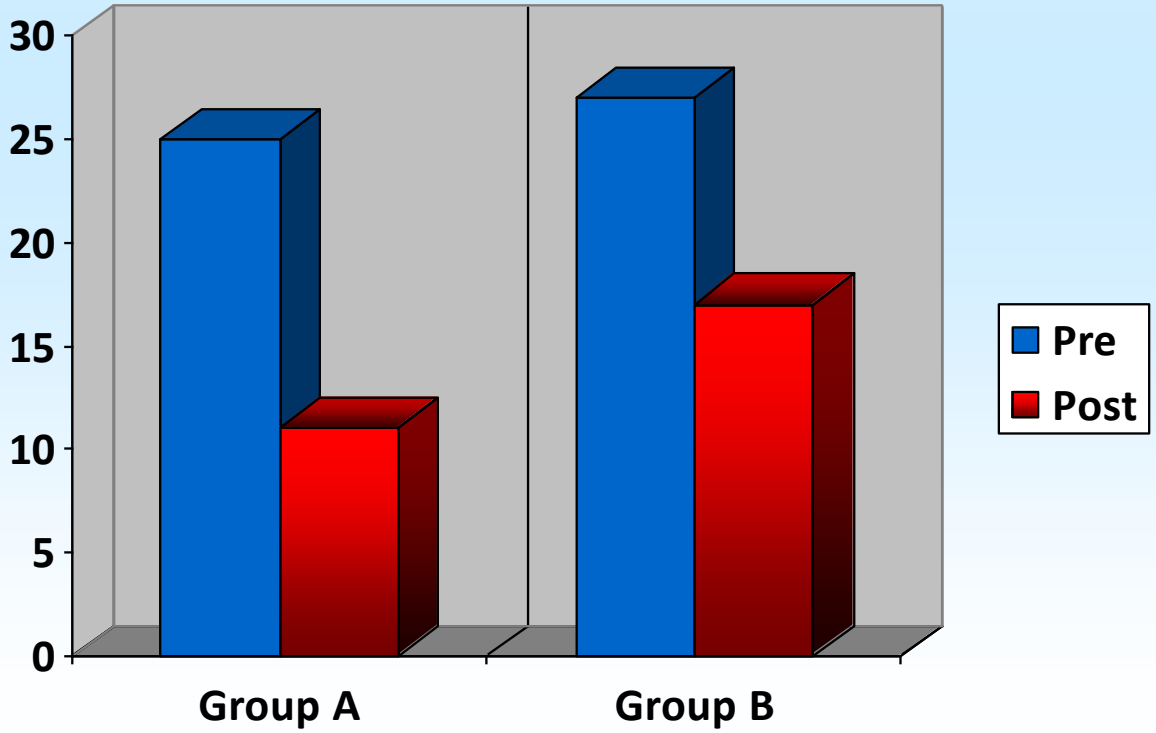
Pre and post treatment median values of pain analogue scale of group A and B.



Comparison of functional disability in both groups (A&B)

Variable	Time of measurements	Group (A)	Group (B)	P-value	Significance
Oswestry disability index	Pre treatment median	25	27	0.85	NS
	Post treatment median	11	17	0.005	S
	P-value	0.001	0.001		
	Significance	S	S		

Pre and post treatment median values of Oswestry disability index of group A and B




Conclusion

From the obtained results it was concluded that lumbar stabilization exercises combined with US&IR is effective on H-reflex, pain and functional disability in patients with discogenic sciatica.

Recommendations

According to the results of this study, the following recommendations may be suggested:

1. Larger sample is recommended to be used.
2. The effect of lumbar stabilization exercises on patients after spinal surgery.
3.Long term follow up.


Thank you