

Impact of Active Release Technique and Core Strengthening on Pain, Muscle Stiffness, Muscle Hardness and Quality of Life on Non-Specific Low Back Pain: An Experimental Study

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Abstract

Background:- Bad posture while working puts excessive stress and strain on low back. These in turn contribute significantly to the development of the spasm–pain–spasm process, which ultimately results in the development of myofascial trigger points (MTrPs) in the muscle fibers. This is due to the reduced blood supply that leads to a decrease in the supply of oxygen and also minerals and vitamins to the muscle. Active release technique (ART), a non-invasive soft tissue restoration procedure includes reducing the scar tissue that induces discomfort, stiffness, muscle weakness and unusual pain like mechanical dysfunction of the myofascial and soft tissue.

Methodology:- This experimental study will be conducted with population of 40 aging from 18 to 25 dividing them equally into two groups with simple random sampling. The participants of one group will be given active release technique with hot fomentation while the other group will receive hot fomentation. Core strengthening exercises will be given to both the groups.

Conclusion:- This study intends to find the effectiveness of active release technique in reduction of pain, muscle stiffness and muscle hardness in patients with non-specific low back pain and also the resultant improvement in their quality of life.

Key Words:- Nonspecific lowback pain, ART (Active Release Technique), Myofascial Trigger Points, Quality of life

Introduction

Lowback pain (LBP) a critical issue affecting quality of life is one of the main reasons of work insecurity in developing countries¹. It is commonly reported in late teens, early twenties or adult age². Non-specific low back pain or “simple backache” is characterized as LBP not due to any identifiable disease such as pain in nerve root and infection such as spinal pathologies, tumour, rheumatoid arthritis, osteoporosis fracture or inflammation³. Bad

posture while working puts excessive stress and strain on low back. This position of prolonged stress may lead to a continuous low intensity stimulation of the core muscles which in turn will contribute to the development of the spasm–pain–spasm process ultimately resulting in Myofascial Trigger Points (MTrPs) in muscle fibers due to the reduced blood supply as it affects the supply of oxygen, minerals and vitamins to the muscle⁴.

Myofascial Trigger Points in skeletal muscles, identified with a hypersensitive palpable nodule or “knot” in the middle of the muscle belly are described as hyperirritable⁵. They are together with appreciable nodules in tight muscle fibre bands³. Myofascial Pain Syndrome also described as soft tissue pain syndrome with pain present in a single quadrant are often

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caused due to myofascial Trigger Points⁴. Myofascial trigger points cause tenderness in the muscle and can lead to characteristic referred pain, spasm and movement restriction⁶. These trigger points are often correlated with low-back pain, weakness of back muscles and subsequently restriction of motion. They can be a major causes of lack of mobility in individuals with nonspecific lowback pain thus impairing normal active movement control and causing sloppy trick action due to irregular patterns⁷.

Despite low back pain being very common, the root cause of such aches is not well understood in many of the patients and are thus called as “nonspecific lowback pain”. Stability of spine and muscular strength are prominent factors involved in the initiation and persistence of nonspecific LBP. Core musculature which is important for spinal stabilisation and also pelvic control play a cardinal role while performing functional movement. Alterations in the task of core muscles will lead to the spine becoming mechanically unbalanced with compressive forces. When the core muscle perform their task to the optimal level the muscle fibers are recruited adequately and the result is a maximal force production but with minimum shearing and compression forces when performing the functional movements⁸. The “core” is defined as a box of muscles with the abdominals on anterior and para spinals and gluteal on the posterior side. The diaphragm forms the roof and the pelvic floor along with the hip-girdle musculature is the framework⁹.

Active Release Technique(ART) is a non-invasive soft tissue restoration procedure that includes reducing the scar tissue that would induce discomfort, stiffness, muscle weakness and unusual pain like mechanical dysfunction of the myofascial and soft tissue¹⁰. Locating and breaking down the scarred tissue and adhesions help in reducing the pain and discomfort as these adhesions and scar tissues are the primary cause of pain, stiffness, weakness as well as physical dysfunction commonly associated with soft tissue injuries. ART involves a combination of motions performed by the patient to release the adhesions between the tissue layers¹¹.

ART focuses on the soft tissue mobilisation by fibrosis removal, scar tissue eradication and breaking

of adhesions formed in tissues through excessive and unpredictable tissue tension¹². Deep digital pressure is applied over tender or trigger point asking the patient to move the muscle actively from a shortened to lengthened position thus breaking adhesions^{4,13}.

The role of musculoskeletal pain is significant in health related quality of life(HRQoL), primarily focuses on physical fitness and function. Hence, it is exceedingly instrumental in obtaining a pertinent metric assessing the quality of life of LBP patients from the patient’s perspective. These utility ratings should be interpreted as quality adjusted life-years (QALYs) to enable cost-effectiveness analysis and cost-effectiveness of different LBP related interventions. The EQ-5D-5L is a standardized preference based metric for calculating HRQoL by the EuroQol committee and provides five-dimensional representation of health status. The EQ-5D-5L includes five significant indicators for each area (pain, self-care, mobility, daily tasks and distress, and depression and anxiety) and five level feedback. The questionnaire also include a visual analog scale (EQVAS) labeled with 0 (worst possible state of health) to 100 (highest practicable state of health) to determine general well-being.¹⁴

There is a paucity of research regarding the relevance and effectiveness of ART on lowback pain. It has proven to be helpful in pain reduction. This study aims to find out the impact of ART in nonspecific lowback pain and the expected positive results will certainly add to the treatment options available for treating nonspecific lowback pain.

Aim & Objectives

Aim:-

Through this research, we aim to evaluate impact of active release technique and core strengthening on pain, mobility and quality of life in non-specific low-back pain.

Objectives:-

- i. Evaluating the impact of active release technique and core strengthening on non-specific low back pain.
- ii. Analyzing the impact of active release

technique and core strengthening on muscle tenderness and hardness

iii. Examining the impact of active release technique and core strengthening on flexibility and range of motion.

iv. Studying the impact of active release technique and core strengthening on quality of life on subjects with non-specific low back pain.

v. Studying the long term effectiveness of active release technique.

Methodology

Study Design

This experimental study will be conducted in Musculoskeletal OPD of Ravi Nair Physiotherapy College, DMIMS(DU), Sawangi(Meghe), Wardha, the approval of which has been taken from Institutional Ethics Committee of DMIMS, DU, Wardha (ICE No:- 8977). Prior to participation, all subjects will be briefed on the purpose and protocol of the study and informed consent will be obtained from the subjects fulfilling inclusion criteria. This experimental study will be conducted with population of 40 aging between 18 to 25 divided equally into two group of 20 subjects each through simple random sampling. One group will be given active release technique in addition to hot fomentation and core strengthening exercises that will be given to both groups. Pre- test values will be noted followed by post test values which will taken after 6 sessions of ART. The patients will then be called for a follow-up every week for the next 4 weeks and all the parameters measured to know the long term effect of the treatment .

Experiment design

Experimental study in which the patients will be randomized into two group independent design. Group A or control group will undergo the classical rehab of hot fomentation with core strengthening exercises while Group B, the experimental group will receive active release technique in addition hot fomentation and core strengthening exercises.

Inclusion Criteria:- Subjects with nonspecific lowback pain aged 18 to 25 years.

Exclusion Criteria:- Subjects not willing to participate or having radiculopathies with or without neurological deficits, degeneration of spine, tumours or malignancies of back or thorax, pregnancy, any surgeries in back or thorax, anatomical deformities of spine and chest wall

Sample Size Consideration:- In this experimental study, two-group design that examines the effect of active release technique in nonspecific lowback pain. 40 individuals will be registered to the control group or experimental group and will be randomized using simple random sampling.

Interventions

40 participants will be selected from among the patients with nonspecific lowback pain coming to OPD and will be tested for algometer tenderness, durometer muscle hardness and biofeedback pressure muscle strength. They will then be randomly divided equally by sampling formula in experimental and control groups. Pre and post- test results will be reviewed¹⁵⁻¹⁸.

Experimental group

These patients will receive ART in addition to the conventional treatment of hot fomentation and core strengthening exercises. The subjects will first be palpated for tender points in prone lying. They will then be given hot fomentation in supine. The subject will then be asked to sit and the therapist will palpate the tender point standing behind the patient and the subject will contract the muscle by doing its action. Pressure is added while the patient relaxes or does the muscle action and it will be done for 6 sessions of 8- 10 min. Core strengthening exercises will be given to prevent re-occurrence of pain^{10-12,19-24}.

Control group

This group subjects will also first be palpated for tender points in prone lying followed by hot fomentation. Core strengthening exercises will be given to prevent re-occurrence of pain.

Core Strengthening (to both groups)

This will include both static and dynamic exercises. The static exercises will be repeated 10 times with hold time of 10 sec in one set. The subjects should hold

the core muscle by drawing in manoeuvre. They will perform abdominal drawing-in manoeuvre⁸. Dynamic exercises will be repeated 10 times with hold time of 10 sec in one set²⁵.

The following exercises will be included in core strengthening:

Bridging:-Participants will maintain a supine position and with shoulder and elbow assistance they need to raise their hips so that a straight line is achieved. Hips are raised and lowered continuously at a slow level for 10 repetitions.

Quadrupedal stance:- Participants to remain in a quadruped posture with their knees and hands placed on surface and raise one arm and the contralateral leg in a horizontal position at a medium speed.

Cross curl-ups:- Participants will be supine with the hands crossed behind the head and elbows pointing towards the sides. With the legs in a flexed posture and feet on the surface, the individuals will turn left and right and rotate at a moderate speed^{26,27}.

Data Analysis

NPRS

	ART	Conventional	p	chi
Pre-test				
Post-test				
First Week				
Second Week				
Third Week				
Fourth Week/ 1 month				

ROM

	ART	Conventional	p	chi
Pre-test				
Post-test				
First Week				
Second Week				
Third Week				
Fourth Week/ 1 month				

Algometer

	ART	Conventional	p	chi
Pre-test				
Post-test				
First Week				
Second Week				
Third Week				
Fourth Week/ 1 month				

Durometer

	ART	Conventional	p	chi
Pre-test				
Post-test				
First Week				
Second Week				
Third Week				
Fourth Week/ 1 month				

Pressure biofeedback

	ART	Conventional	p	chi
Pre-test				
Post-test				
First Week				
Second Week				
Third Week				
Fourth Week/ 1 month				

Oswestry Low Back Pain Disability Questionnaire

	ART	Conventional	p	chi
Pre-test				
Post-test				
First Week				
Second Week				
Third Week				
Fourth Week/ 1 month				

EQ-5D-5L

	ART	Conventional	p	chi
Pre-test				
Post-test				
First Week				
Second Week				
Third Week				
Fourth Week/ 1 month				

Outcome Measures

o **Algometer:-** An equipment used to measure muscle tenderness.

o **Durometer:-** An equipment used to measure muscle hardness.

o **Oswestry Low Back Pain Disability Questionnaire:-** A questionnaire used to assess and evaluate the challenges encountered by people with low-back pain (with permission)²⁸.

o **EQ-5D-5L:-** It is a scale often used to evaluate health related quality of life and understand which component the patient is suffering due to his pain or disability (with permission).

o **Pressure Biofeedback:-** An equipment used to measure pressure given by the body while doing a particular exercise. It can be used to record the improvement by measuring the pressure applied.

o **Numeric Pain Rating Scale:-** Used for pain measurement. It has eleven point rating from 0- 10 where 0 is no pain 5 is normal or tolerable and 10 being worst bearable pain²⁹.

Follow- up

All patients will be monitored continuously for 4 weeks following the 6 therapy sessions. The time of the last rehabilitation training session will be recorded. When patients drop out of the study, the reasons for withdrawal will be recorded in detail. Comprehensive and supportive patient communication will be undertaken to avoid drop out. Data of individuals withdrawing from the trial would be included in the final report on the basis of the intention-to-treat analysis concept.

Data Management:- The data from the study will be stored in a safe, restricted storage facility where a bio-statistician and the researcher will have restricted access for later examination.

Statistical Analysis:- To perform the comparison between the two groups, collected data will be noted in tabular format. Data analysis will be done using SPSS.

Discussion

In this report we seek to establish the impact of the active release technique and core strengthening on pain, muscle stiffness, muscle hardness and quality of life in nonspecific low back pain. Active Release Technique works by simultaneously locating and breaking down of scarred tissue and adhesion which is one of the primary cause of pain, stiffness, weakness, as well as physical dysfunction associated with soft tissue injuries. It is a combination of motions performed by the patient to release the adhesions between the tissue layers. This should release the pain coming from myofascia and myofascial trigger point by breaking the adhesions in soft tissue thus re-lengthening the taught muscles and reducing spasm ultimately contributing to an enhancement in quality of life. Studies have been done on trapezius and hamstring

but limited study in low back pain specifically in those with non-specific origin.

This study thus seeks to assess the efficacy of the Active Release Technique in nonspecific low back pain and also the impact on quality of life. This study will help to enhance the credibility of ART as a treatment alternative for patients with nonspecific low back pain.

Ethical Approval - Approval has been accorded by the IEC, DMIMSU

Consent - The principal investigator will obtain informed consent from all the participants of the study and the consent form will also include confidentiality statement with signature of the principal investigator.

Conflict of Interest – The authors claim no conflict of interest.

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Recruitment:- Ethics and dissemination

Study Period								
	Enrolment	Allocation	Intervention					Result
Duration			Pre	1w	2w	3w	4w	
Enrolment:-								
Pre-test Screen	X							
Obtained Consent	X							
(List other procedures)								
Allotment	X							
Interventions:-								
ART + HPK				X				
HPK				X				
Assessments:-								
Algometer			X	X	X	X	X	
Durometer			X	X	X	X	X	
Biofeedback			X	X	X	X	X	
ODI			X	X	X	X	X	
EQ-5D-5L			X	X	X	X	X	
NPRS			X	X	X	X	X	

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