



EARLY LOW BACK PAIN CAUSED BY BAD POSTURE AND WEAK BACK AND ABDOMINAL MUSCLES

Physiotherapy

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KEYWORDS

BACKGROUND: -

In few years down the line, we have been noticing a constant increase in the complaints like "Low Back Pain" in students and office workers, without actually having any significant pathological issues.

In majority of cases it is due to the mal – alignments of the spine and both the upper and lower extremities, which causes an unwanted effort on the muscles involved in maintaining the posture resulting in causing Pain. Thus to maintain a painless posture it is very important to have a symmetrical rhythm between the following :-

- The Weight Bearing Portion Of The Lumbar Spine(Functional Unit)
- The Ligaments Of the Lumbar Spine (Funcional Unit)
- The Muscles Of The Lumbar Spine(Functional Unit)
- The Nervers Of The Lumbar Spine(Functional Unit)
- The Core Muscle Strength

Most pain and disability of the low back is "Mechanical In Nature"*. Thus the functional spine must be analysed, understood and examined in its normal state so as to understand the difference in its function and eventually the reason of discomfort and pain.

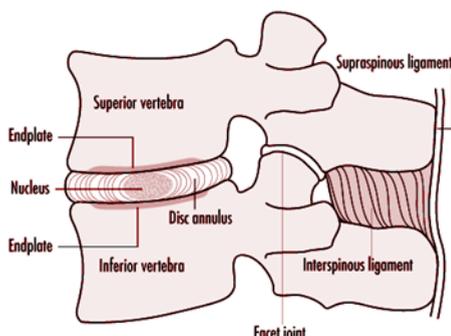
Functional Unit :- The spine or the vertebral column is an aggregate of superimposed segments that is termed as the Functional Unit.

The Lumbar Region Consists Of Five Functional Units. The major cause that we are focusing in this project is the disbalance in these 5 functional units of the lumbar spine, which causes a chronic discomfort and pain in the Low back i.e. the Lumbar Region.

Knowing the basic fundamentals of these functional unit only will help us know more about the importance of right posture and strengthening the muscles around them. The functional unit is composed of two adjacent vertebral bodies, one superincumbent on the other separated by an Intervertebral Disc.

The Anterior Segment of the functional unit is essentially for the weight bearing, shock absorbing and to maintain the flexibility, the entire weight is transmitted through out the vertebral body by the "Wolf's Law"*

Whereas the Posterior segment of the functional unit is non-weight bearing structure that contains and protects the neural structures and the paired joints that function to direct the movement of the unit



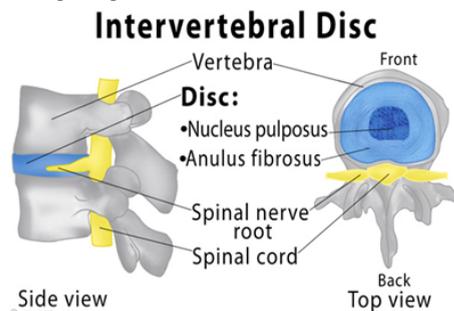
The Inter Vertebral Disc :-

The inter vertebral disc is a hydrodynamic elastic structure that is interposed between two adjacent vertebrae, separating them and acting as a shock absorbing mechanism.

Structurally it is composed of

- Centrally – Nucleus Pulposus
- Outer – Covered by Annulus Fibrous (shown in the diagram below)

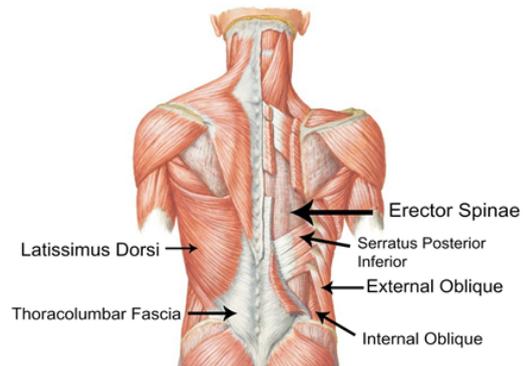
The fluid composed permits the motion.



The nucleus is a homogenous, elastic globoid centrally located within a fibrocartilaginous envelop.

The nucleus is amucopolly sacride homogenous matrix containing a rich network of fine banded fibrils layered in a random manner.

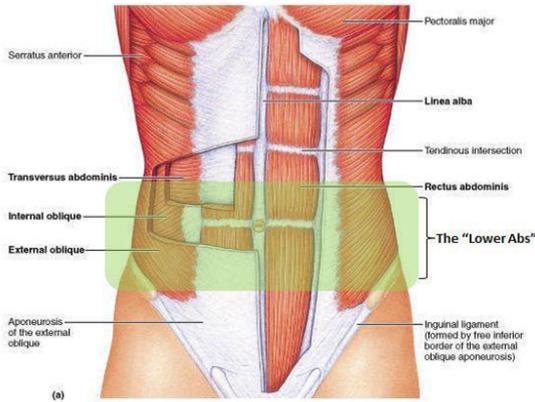
- Muscles Of Low Back and Abdomen



• Muscles of back

1. Erector Spinae
2. Serratus Posterior
3. External Oblique
4. Internal Oblique
5. Latissimus Dorsi
6. Thoracolumbar Fascia

• Muscles of abdomen:



1. Transverse Abdominis
2. Rectus Abdominis
3. Obliques

Introduction

Low Back Pain is a very common disorder, involving muscles, nerves and bones of the back. In most of the episodes of low back pain the underlying specific cause is not identified* (no pathology involved) and thus is believed to be because of the strain or sprain on the muscles and joints because of constant "Bad Posture".

The protocol for pertinent and meaningful clinical examination of patient with "low back pain" is the same as that for the patient with any musculoskeletal complaint, to know the normal function and to recognise the deviation from normal; to establish the exact mechanism that inherited the pain and be able to reproduce the pain by reproducing the abnormal position or motion that elicits the pain.

The history must specifically describe the pain where and or when it is. It must reveal the exact mental and emotional status of the person at the time of causation of the pain as well as describe the exact physical position of the patient when the pain first appeared.

"All these factors constitute and tell us the abnormal deviation of spinal functions causing Low Back Pain and impairment."

The normal spine's definition should be pain free in both static and kinetic status.

A person must stand, sit, bend, walk, climb stairs

Bend, lift, turn, twist in a perfectly balanced and painless fashion. Pain in any of these positions indicate over use, misuse, stretch, strain of the either one or more of the muscular component.

Review Of Literature:-

1. In the systematic review*¹, emphasised the difficulty of establishing causation of LBP, but also identified several methodological weaknesses that likely contributed to the inability to find an inter-relationship between occupational sitting and LBP.

2. Nevertheless, Lis et al. (2007) suggested that the combination of an awkward sitting position and/or body vibration (as might occur during long-distance driving) with a prolonged static sitting behaviour increases the likelihood of suffering from LBP. Despite controversial discussion in the literature, it is conceivable that discomfort or low levels of comfort caused by unfavourable or un-ergonomic sitting positions, sitting behaviour or working conditions, is able to lead to musculoskeletal complaints such as LBP*²

3. The optimal occupational sitting position and sitting behaviour has been extensively discussed in the literature in recent years. The long-standing doctrine of an ideal sitting position that is "as upright as possible" has been strongly questioned*³ and has been slowly replaced by the concept of "Dynamic Sitting", where sitting positions are continuously altered*³.

4. A literature review conducted by Pynnt et al. (2001) suggests that there is no ideal sitting posture. According to these authors, regular

movements and a seated posture with preferred lumbar lordosis is essential for preventing LBP. Changing the sitting position is able to alter spinal geometry*⁴, as well as to change lumbar disc pressure*⁵.

5. A dynamic sitting behaviour is able to vary the loading conditions of spinal segments, which induces an effective pump mechanism in the vertebral discs*⁶. This mechanism is thought to be critically important for intervertebral disc nutrition as well as resistance against degenerative changes*⁷. Therefore, it could be concluded that office workers should move more during their working hours. However, overly frequent movements may be also an indication of discomfort and instability.

6. Many people in Western industrial nations suffer from back pain, with a prevalence of up to 90% within their lifetime*⁸

7. Chronic low back pain (LBP) has an international prevalence of 23% and is thereby the most common form of chronic pain.

8. Numerous psychosocial and physical aspects may be responsible for development of Low Back Pain, as well as its progression into a chronic condition*⁹.

9. In combination with these aspects, static loading, physical and psychological stress, are additional pressures present in the office environment*¹⁰. It therefore comes as no surprise that prolonged static sitting is also thought to be associated with an increased risk of developing musculoskeletal disorders in the back, neck, shoulders, arms and legs*¹¹.

10. Recent literature reviews*¹² have found evidence of a causal relationship between sitting and the presence of LBP and therefore concluded that a sedentary lifestyle and lack of physical exercise increase the risk of LBP.

11. According to May and Lomas (2010), the lack of a connection between sitting and LBP is a result of the insidious nature of back pain, since LBP is a highly multi-factorial condition that can hardly be localised precisely.

Posture Pattern And Literature

The posture pattern in a lower body variation is often termed 'lower crossed syndrome', typically including:

- A. Short tight hip flexors
- B. Long weak hamstrings
- C. Gluteus, over arching of the low back (lordosis)
- D. Tight extensors and weak long abdominals (see below).



The typical pattern in a so-called lower crossed syndrome. Either of these are the major reason of Low Back Pain without significant pathology.

In this dissertation we'll improve the strength of back and abdominal muscles and correct the muscle tone of the above.

In 2003 researchers wanted to know if these postures (specifically arching of the low back) were more common in people with back pain. They used magnetic resonance imaging (MRI) and compared 27 people with back pain against 29 who didn't. Interestingly the authors found that there was no difference in how much patients 'arched' their low back between those in pain, and those without. These findings are supported by a 2008 systematic review and another study that looked at

Turkish coalminers where they concluded that not only was low back arch not associated with back pain, neither was pelvic tilt, length of abdominals, hip flexors, hamstrings or leg length discrepancy.

Thus the muscular disbalance was and still is the causative reason for “Early Low Back Pain Without Pathology”

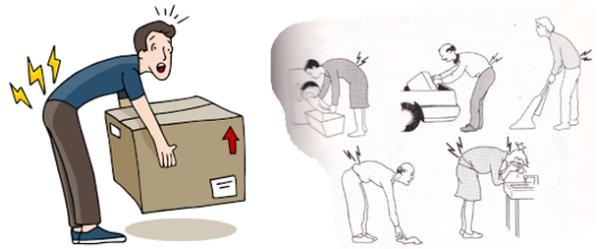
Classification Of Low Back Pain:-

The Low Back Pain can be classified as :

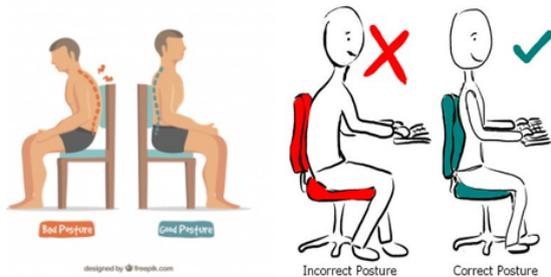
- Acute pain – Pain lasting less than 6weeks.
- Sub-Chronic Pain – Pain lasting 6 to 12 weeks.
- Chronic Pain – Pain lasting more than 12weeks.

Individuals with Low Back pain without any pathology show the following symptoms

- Shooting pain while bending forward, which gets better(less painful) with support.
- Pain while lifting even light weight objects.



- Constant dull pain while maintaining a sitting posture, which gets better (less painful) with a pillow support or a good back support chair.



- Pain starts increasing if maintaining a standing posture , person tend to put weight on one limb and relaxing the other or keeps shifting weight from one limb to other.



- Shooting pain while long standing , which gets better (less painful) as soon as the individual sits or lies down.
- Pain decreases if one uses a soft sole foot wear instead of hard sole flat sleepers or heels.
- Individual is unable to perform Activities Of Daily Living (tying shoe laces , using Indian or western toilets , wearing pants , getting up from low height chair or bed , etc)
- Pain increases when lying down supine, and gets better by relaxing the spine by putting a pillow below the knee (hook lying position)

In olden days, age was one of the remarkable reasons of “Non Pathological Low Back” pain due to degeneration of the disc or joint space. But now in modern times according to a survey*14 about 12% of people have Low Back Pain at any given point and about 25% of people had it in recent history.

The symptoms now-a-days are seen in age group of 20- 40 years

This project will help us know about how the various body structures are integrated into a system , that enables the body as a whole to maintain a particular POSTURE.

We have discussed about the muscles involved for maintaining good posture without putting extra efforts.

This will even put light on, how a bad posture can effects our spine, and becomes the root cause of problems like “Low Back Pain” in a very early age without any significant pathology.

Alignment Of Posture:-

For this we would need to know the ALIGNMENT OF POSTURE and STABILITY aspects of posture.

Before we go through the alignment of different joint for maintaining the proper posture , we need to gain knowledge about the “Curves Of Spine”

The adult spine is divided into four curves

- A. 2 Primary or Posterior Curve - They are so named as they are present in the infants and the convexity is posterior. These are present in ‘THORACIC’ and ‘SACRAL’ regions. Kyphosis is the term which is used to denote the primary or posterior curve whereas the term Kyphotic Posture.
 - B. 2 compensatory or Anterior Curve – They are so named because they develop as the infant learns to lift the head and eventually stand. These are present in ‘CERVICAL’ And ‘LUMBAR’ region. Lordosis is the term used to denote the compensatory or anterior curves.
- *The curve and the flexibility in the spinal column are extremely important for withstanding the external stresses including gravity.

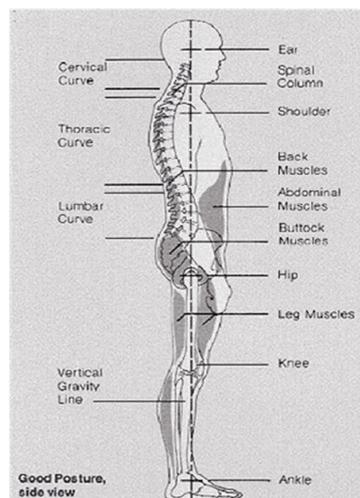
The structure of the bones , joints , muscles and insert tissues of lower extremities are designed for weight bearing and to support and balance the trunk in the upright posture.

It is very important to understand the influence of gravity on all the structures of nody in order to maintain a proper erect posture.Gravity acts as a stress on the structurs and thus acts as a constant challenge on all the structures to maintain the upright posture in a proper alignment.

For the weight bearing joints to be stable and to be in equilibrium, the gravity line of mass must fall exactly through the axis of rotation or there must be a counteracting force against the gravity.

This counteracting forces are either applied by the muscles or by the insert structures, the standing posture usually involves a slight anterior/posterior swaging of the body for about 4centimetres this needs to be maintained and controlled to maintain equilibrium.

The following would describe the Standard Balanced Upright Posture :-



• **ANKLE JOINT:**

Line Of Gravity - Anterior to the joint.

Effect - Tends to rotate tibia forward about the ankle.

Stability - Stability is provided by planter flexor muscles, especially the Soleus Muscle.

• **KNEE JOINT:**

Line Of Gravity - Anterior to the joint normally(when knee is in extension). Posterior to the joint(when the knee is slightly flexed)

Effect - Tends to keep the knee in extension, thus no muscle support is required at the joint to maintain the upright posture.

Stability – Stability is provided by the anterior cruciate ligament, posterior capsule (locking mechanism of the knee) and the tension in the muscles posterior to the knee (gastrocnemius and hamstrings muscles).

The soleus provides active stability by pulling the tibia posteriorly.

If the knee flexes slightly during the upright posture the quadriceps femoris muscle contracts to prevent the buckling of the knee.

• **HIP JOINT:**

Line Of Gravity – Gravity line at the hip varies with the swaging of the body, when the line passes through the hip joint there is an equilibrium and no external support.

Effect And Stability – When the gravitational line shifts posterior to the joint, some posterior rotation of pelvis occurs, which is controlled by the flexors of the hip joint (especially the Iliopsoas)

During relaxed standing, the iliofemoral ligament provides passive stability to the joint and no muscle tension is necessary.

When the gravitational line shifts anteriorly, the stability is provided by the active support of the hip extensor muscles.

• **TRUNK:**

Line Of Gravity - The line of gravity passes exactly through the centre (Anterior to the S2)

Throughout the project we would discuss in relation to a patient's ability to function with a proper posture with respect to both the upper and the lower extremities in standing, sitting as well as lying postures.

We would do a detail study of the muscle involved in maintaining the posture and the effects of maintaining any particular posture for a longer period of time, and how we can reduce the stress on the muscle while doing so.

This project will also bring into notice the strength of specific Abdominal muscle which play a very important role in maintaining the posture and in almost every activity in our day to day life. The abdominal muscles weakness generally goes unnoticed as a cause of Low Back Pain.

We would even discuss about the effects of routine exercises on the strength of the postural muscle and how these exercises tend to help us in directly maintaining good postures in a daily basis.

We would even know about how to correct and maintain an effortless good posture in our daily routine

AIM AND NEED OF THE STUDY:-

This study was designed to analyse postural aberrations of the back and lower back region in patients with acute and chronic low back pain and to investigate the accordance of clinical and radiological assessments. 30 patients with acute and 30 with chronic low back pain and 30 controls were studied and a detailed spinal physical examination was performed. In addition, the lumbar lordosis and sacral inclination were assessed. Differences among groups, correlations with each other and with clinical parameters such as age, gender and body mass index, and the accordance of clinical postural assessments are investigated.

Exercises and maintenance of posture play a very important role in delaying the complains of early low back pain in modern times, due to

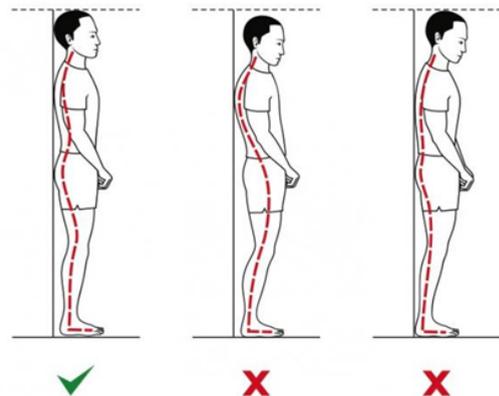
various life style hazards etc. Exercise would help in relieving the pain and increasing the joint mobility and the overall strength of the muscle.

Various researches show that the physical therapy (exercises and the modalities if required) are very helpful in decreasing pain and increasing the ROM.*¹⁵

This study would also give us details about how bad standing or sitting posture or a wrong way of bending and lifting a weight or object aggravates the Low Back Pain and becomes one of the major cause for the same.

INSTRUMENTS, TOOLS AND METHOD USED FOR THE STUDY:-

- The postures would be analysed by "Wall Test" and the following would be noticed and noted (if we find a deviation).
- For the Wall Test the patient would be requested to lean on the wall.



- The Ear, Shoulder and the Hip Joint should fall in a straight line.
- The cervical curve should be clearly visible (in normal fashion)
- There should be no space visible between the upper back of the patient and the wall i.e. the kyphotic posture should be seen.
- There should be visible space between the wall and the lumbar region the normal lordotic manner.
- The knee should be in completely extended position.
- The ankle should remain in the neutral position.

The posture may also be analysed by the help of "A Plumb Line", and the standard balanced posture as described above should be observed carefully and even the slightest change should be noted along with the details of the lifestyle of the patient.

• **Questionnaire To Check Chronic Pain And Level Of Exercises**
General Questions.

1. Name: .
2. Your Age: .
3. Your Gender: M/F
4. Your Weight: kgs.
5. Your Height: ft. inches.

Questions From Your Life Style

6. How many hours do you sleep a day: 5-7/7-9.
7. How do you wake up everyday : Always fresh / Feel lethargic / Have stiffness in body.
8. How do you travel to your work (more than one answer is possible): Walk/2wheeler/4weeler/self driven/with driver.
9. How much time it takes to reach your work place : 10-15min/15-20min/20-30mins/more than 30mins
10. What kind of work do you usually have : prolonged Sitting/walking/ Standing/sitting with mild walking.

Questions About Your Fitness

11. How is your health status in general : good/very good/not bad/poor
12. How is your physical fitness now-a-days:good/bad/not bad/poor
13. How do you consider your posture in general : good/bad/never noticed
14. How do you consider you muscle strength in general : good/very good/not bad/poor
17. What do you need at your work : strength/endurance/both

18. How tired you are at the end of the day: not tired/bit tired / very tired
19. Are you diagnosed with :Hypo thyroidism/Diabetes/sickle cell anaemia/anaemia/other
20. Have you consulted a doctor in past 6months for any muscular pain : yes/no

Questions For The Muscle Health

21. Do you get up with morning stiffness : yes/no/often/daily
22. Do you have heaviness in your joints when you leave your bed : yes/no/often/daily
23. Are you muscles more painful in the morning:yes/no/often/daily
24. Do you follow any exercise regime: yes/regularly/not regularly/No
25. Which part of the body is more stiff(more than one answer if needed) : shoulder/upper back/knee/low back
26. Do you go for walk : yes/regularly/not regular/no
27. What do you find difficult : Standing/sitting from standing/sitting straight/standing from sitting.
28. How often do you find your back ache: it's regular/often/once a month/once in 6months
29. what kind of foot wear you use: flats/heels/sports shoes/slippers
30. Does the pain make you change your posture often: yes/no
31. which is more painful : standing for long time/sitting for long time
32. Do you pick heavy bags/load/kid daily: yes/regularly/not regular/no
33. Do you stretch you arms and back while in work : yes/ hourly/ once/no
34. In what posture do you think you usually sit:



35. Your back aches often :yes/no
36. Your often find it difficult to bend and lift things: yes/no
37. Your are conscious about your back: regularly/while sitting/while standing/while lying down

Total survey is done in 130 people (office workers, students and businessmen) both male and female all divided in 3 different groups.

- Group A : people under 20 with no pain.
- Group B : people between age 20 to 30 ,with pain,no exercises and compared after training
- Group C : people between age 30 to 40 with pain ,no exercises and compared after training
- Group D : people in the age group of 40 and above with mild exercises and compared after training.

Tests used were:-

- Straight Leg Raise : The patient is asked to lie in a supine posture, and raise his leg straight upwards without bending the knee.

If there is no involvement of disc or nerve the patient would complaint of pain in the entire back but no specific area.

- If there would be involvement of the disc or nerve the patient would complaint of a shooting pain on the exact point.
- Patient is asked to stand straight and bend forward without support, and he is observed if the pain increases or decreases during bending or coming back to normal posture. The patient is also observed for if the intensity of his pain decreases with support to the back during the movement.

INCLUSIVE CRITERIA:-

The following would be the Inclusive Criteria for this project

- Must be a student or an office worker, with minimum of 3 hours seating/constant standing job daily.
- Age should be between 20 to 50.
- Low back is considered below T6.
- Should not be a patient of sciatica, arthritis , spinal stenosis or any

other pathological condition

- Should not have gone through any recent major surgery (atleast 5 years)
- Females participating should not be pregnant or lactating.
- General low muscular strength.
- Females with use of high heels.
- Prolonged standing in daily life style (this would include , females working in kitchen , guards, traffic police etc with long standing.
- He / She should not be under cover of any NSAIDs.

EXCLUSIVE CRITERIA:-

The following would be the exclusive criteria for this project

- Prior treatment for low back pain.
- Trauma to the back.
- Pregnancy.
- Renal Impairment.
- Hepatic Impairment.
- Any obstructive disease.
- Orthopedic pains or problems.
- Under any Pain killers.

Techniques and exercises given to patient

The techniques are used in this project in order to :

1. Decrease the pain.
2. Release muscular spasm.
3. Increase ROM.
4. Improve posture.
5. Increase strength of the antigravity muscles.
6. Decrease the chances of sudden jerk to the muscles due to faulty posture.
7. Train the muscles.
8. Exercises program and home training in order to increase strength of both abdominal and low back muscles.

The techniques used are as follows :

1. IFT (to decrease pain)
2. Massage (to release spasm and comfort the muscles)
3. Hot Water Fomentation (to release spasm by moist heat)
4. Alexander Technique (postural corrections for different activities)
5. Strengthening Exercises (abdomen and low back)

IFT : Interferential Therapy ,is a mid frequency electrical stimulation to treat muscular stiffness or spasm.

The basic principle of Interferential Therapy (IFT) is to utilise the strong physiologic portable iftl effects of low frequency (<250pps) electrical stimulation of nerves without the associated painful and somewhat unpleasant side effects sometimes associated with low frequency stim.

To produce low frequency effects at sufficient intensity at depth, patients can experience considerable discomfort in the superficial tissues (i.e. the skin). This is due to the impedance of the skin being inversely proportional to the frequency of the stimulation. In other words, the lower the stimulation frequency, the greater the impedance to the passage of the current & so, more discomfort is experienced as the current is 'pushed' into the tissues against this barrier.

This stimulation will help decreasing the pain. The electrodes are always placed in cross manner only, to cover the entire low back area.

2. Massage : Massage uses pressure to direct venous and lymphatic flow back towards the heart. It is therefore important that the movement is always in this direction so that there is no undue pressure on the closed valves in the veins. These valves prevent backflow of blood by only allowing blood to move in one direction (i.e. toward the heart). As the pressure from the heart pumping subsides and the blood moves back, the valves close and prevent any further back flow.

3 .Alexander technique: The Alexander Technique (A.T.), named after Frederick Matthias Alexander, is an educational process that attempts to develop the ability to avoid unnecessary muscular tension by retraining physical movement reactions. Alexander believed the individual's spatial self-awareness was related to psychological conditioning; questionably trained foundation habits of posture can be unsuitably added into procedural skills. Alexander observed that those whose goals justified it necessary to have trained themselves to

overcompensate could not trust their judgment of physical orientation and required effort, (their "sensory appreciation.").

The patient in this is made to learn the correct manner for :

Picking up object (Heavy or Light) from the ground

Wrong

Corrected



Getting up from a supine posture



Weight bearing Wrong

Distributed equally on both the lower limbs (Corrected)



Exercises:-

1-Hook Lying

2-Abdominal Crunch



3-Abdominal Curl

4- starting position for piriformis stretch



5-piriformis stretch

6-Side bends With back support



7-Extension



8-Superman Posture

9-Cat Camel pose



10-Baby pose, to stretch the entire back



11-Extension

12-Bridging



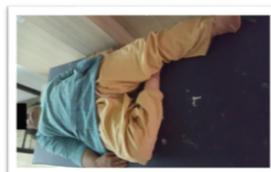
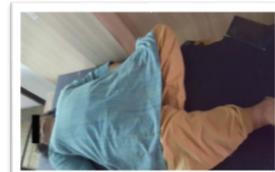
13- For patients who can not do baby pose



14-Abdominal strenghtening



15-Abductor Stretch for releasing back



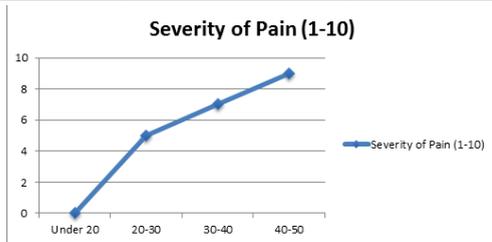
Result

By studying the questionnaire and the different groups before and after training their abdominal and lower back muscles we found out **,"Increase in the strength of the abdominal muscles decreases the Low Back Pain"**

The graphs below will help us understand the comparison of age,muscle strength and LBP.

Graphs and Table showing the comparison:

No	Age Group	Severity of Pain (1-10)	No of Patients
1	Under 20	0	30
2	20-30	5	30
3	30-40	7	30
4	40-50	9	30

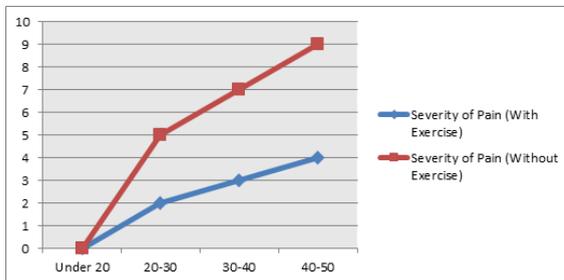


The graph denotes the increasing level of pain in non exercising individuals according to the age of the subjects divided in 4 groups

1. Under 20
2. Between 20-30
3. Between 30-40
4. Between 40-50

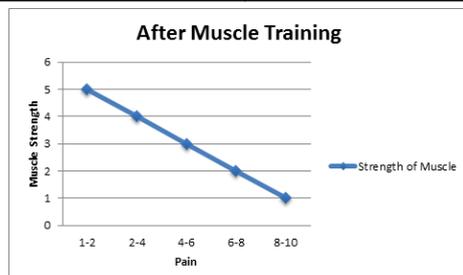
The graph below shows the comparison between non exercising and exercising individuals.

No	Age Group	Severity of Pain (With Exercise)	Severity of Pain (Without Exercise)	No of Patients
1	Under 20	0	0	30
2	20-30	2	5	30
3	30-40	3	7	30
4	40-50	4	9	30



The graph below shows the increasing muscle strength decreases the LBP.

Strength of Muscle	Pain (1-10)
5	1-2
4	2-4
3	4-6
2	6-8
1	8-10



*The muscle strength is measured according to the **Grades Of Manual Muscle Testing**¹⁹*

- Grade 5 : Normal ROM with maximum resistance
- Grade 4: Full ROM against gravity and moderate resistance
- Grade 3: Full ROM against gravity and no resistance
- Grade 2: Full ROM in gravity eliminated position
- Grade 1 : Visible and palpation contractions.

*The **Pain Scale**¹⁸ is described below*

- 0 :- No Pain
- 1-3 : Mild Pain increases with ADLs (Nagging , interfering , annoying)
- 4-6 : Moderate pain, interferes significantly with ADLs
- 7-10 : Severe Pain, unable to perform ADLs