

# To Study the Effect of Postoperative Shoulder Exercise Program in Improving Rom and Decreasing Pain Following Open Thoracotomy

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## 1. Introduction

Thoracotomy is a major surgical maneuver, it is the first step in many thoracic surgeries including lobectomy or pneumonectomy for lung cancer and as such requires general anesthesia with endotracheal tube insertion and mechanical ventilation. Thoracotomies are thought to be one of the most difficult surgical incisions to deal with post-operatively, because they are extremely painful and the pain can prevent the patient from breathing effectively, leading to atelectasis or pneumonia [1].

A thoracotomy is an incision into the pleural space of the chest. It is performed by surgeons to gain access to the thoracic organs, most commonly the heart, the lungs, or the esophagus, or for access to the thoracic aorta or the anterior spine [1].

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## 2. Approached

There are many different approaches to thoracotomy. The most common modalities of thoracotomy follow-

### 2.1 Median sternotomy:

Median sternotomy provides wide access to the mediastinum and is the incision of choice for most open-heart surgery and access to the anterior mediastinum [10]:

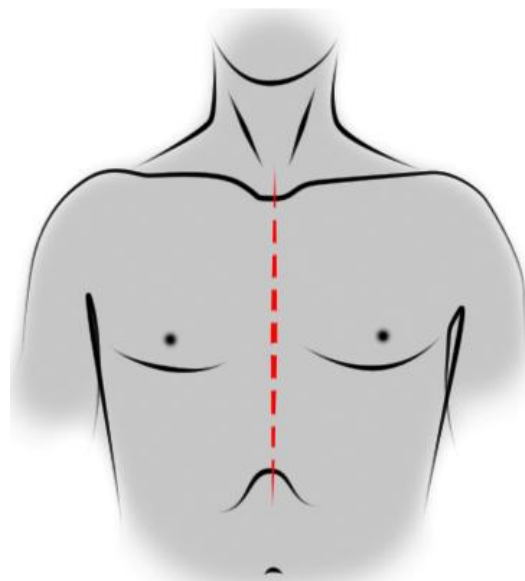


Figure 1: Median thoracotomy

Median sternotomy is a type of surgical procedure in which a vertical inline incision is made along the sternum, after which the sternum itself is divided, or "cracked". This procedure provides access to the heart and lungs for surgical procedures such as heart transplant, corrective surgery for congenital heart defects, or coronary artery bypass surgery [2, 3].

Median sternotomy is often mistakenly referred to as open heart surgery, in which it is a preliminary step. However, open heart additionally involves incision of the pericardium, and many median sternotomy procedures do not require this. Open heart usually involves the use of a cardiopulmonary bypass, also known as a heart-lung machine.

Should this procedure be performed upon an individual more than once, each subsequent sternotomy may be referred to as a "resterotomy" [2, 3].

### Write down your Studies and Findings

- 1) **H. K. WANG, T. COCHRANE, 2001**, conducted a study on mobility impairment, muscle imbalance, muscle weakness, scapular asymmetry and shoulder injury in elite volleyball athletes and concluded that the rotator muscle strength imbalance may play an important role in shoulder injuries in high level volleyball players.

- 2) William D McLeod and James R Andrews 1987 conducted a study on mechanism on shoulder injuries and concluded that the mechanisms are hypothetical, but the kinds of forces found to exist in specific sports have been shown to be capable of producing these injuries. We hope continue to document the correlation of mechanisms of injury to the pathological conditions.
- 3) **Gary L Soderberg, Mary M Pavia-Smith, Angela M Pitz, Jerry F Gillon and Bryon T Ballantyne, Sally J O'Hare, Jodie L Paschall.1993.** Conducted their study on Electromyographic Activity of Selected Shoulder Muscles in Commonly Used Therapeutic Exercises and finally concluded that the pattern of muscle activation during specific shoulder movements in patients with shoulder pain may be related to pathology. Future studies are needed to determine whether an imbalance in neuromuscular control is a factor contributing directly to shoulder dysfunction or whether such an imbalance is secondary to some pathology.
- 4) **Paula M Ludwig and Thomas M Cook, 2000,** conducted a study on Alterations in Shoulder Kinematics and Associated Muscle Activity in People With Symptoms of Shoulder Impingement and concluded that the Scapular tipping (rotation about a medial to lateral axis) and serratus anterior muscle function are important to consider in the rehabilitation of patients with symptoms of shoulder impingement related to occupational exposure to overhead work. [Ludewig PM, Cook TM. Alterations in shoulder kinematics and associated muscle activity in people with symptoms of shoulder impingement.

### 3. Objectives

- 1) To find out the effect of shoulder exercises for decreasing shoulder pain.
- 2) To find out the effect of shoulder exercises for improves Range of motion (ROM) of shoulder.

### 4. Methodology

#### Population

Open thoracotomy patients.

#### Sample

40-50 years both male and female open thoracotomy patients.

#### Study Design

Experimental.

#### Sample Size

60 patients.

#### Sampling Method

Simple Random sampling

#### Place of Study

- 1) Forties hospital Jaipur.
- 2) Anantshree hospital Bhopal.

#### Study Duration

6 months.

#### Sampling Criteria

#### Inclusion Criteria-

- In patients undergoing elective pulmonary resection via open thoracotomy.
- Age group between 40 to 60 years.
- Not participating in any experimental rehabilitation or drug studies.

#### Exclusion Criteria

- Unwilling or unable to participate, unable to understand Hindi & English.
- Tumor invasion into the chest wall or brachial plexus.
- Receiving physiotherapy for respiratory or shoulder problems within the 2 weeks Prior to admission.

### 5. Experimental therapy protocol consists of Shoulder and chestwall exercises

It is important during your postoperative recovery that you keep your posture, shoulder and chest as mobile and flexible as possible to ensure you do not get shoulder or chest wall problems. In the first few days this may be difficult and uncomfortable because of the chest drain and incision, ensure you exercise only within your comfort limits [12].

Do the following exercises twice daily until they are easy and pain free. Do not exercise beyond your level of comfort, they may be uncomfortable but should not be painful to do.

All exercises should be done in sitting or standing and repeated into 3 initially, increasing each into 5. Progress the exercises at your own pace with advice from physiotherapist. Before discharge physiotherapist will give you exercise program to progress your physical recovery [12, 14].

Follow this exercise-(shoulder exercise) [9].

- 1) (A) Sit in a chair or upright in bed. Clasp your hands together, raise your arms in front of you (elbows straight or slightly bent). lift them as high above your head as you can. Lower slowly. This can also be done lying flat on your bed which may be easier in the first couple of days.

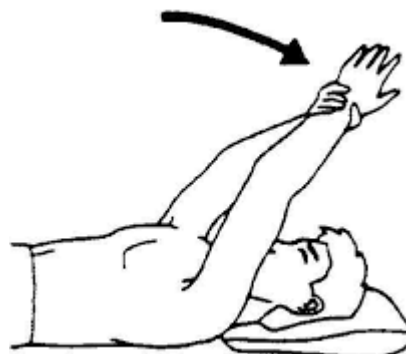


Figure 6.1

(B) When 1st exercise is easy progress this by raising the arm without the support of the other arm. Lift your arm so that your elbow comes as close to your ear as possible [9].

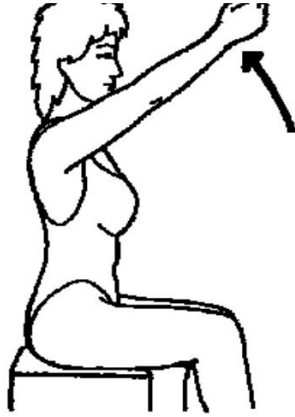


Figure 6.2

2) Sitting up straight (or lying on your back on the bed), take both hands to the back of your neck, raise your elbows and spread your elbows out as far as possible, pinching your shoulder blades together. With hands still clasped behind your neck, bring your elbows together to touch in front of your face.



Figure 6.3

3) (A) With your hands on your shoulders, raise both elbows sideways as high as you can. Slowly lower. (B) When 3a is easy and your chest drains are removed progress to straight arms, lifting your arms out sideways and gently up and over your head. Aim to try to touch hands above your head. Slowly lower.

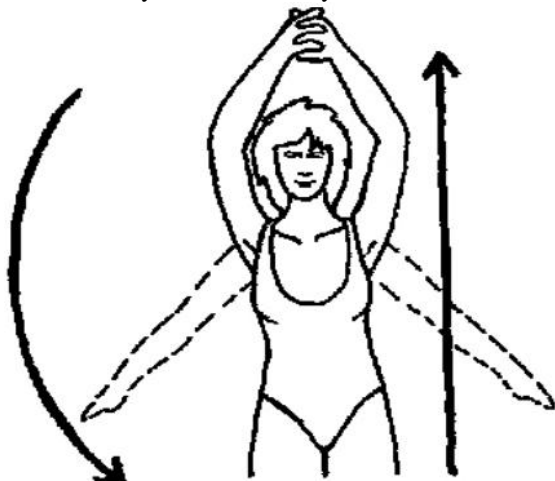


Figure 6.4

4) (A) In standing, take the arm on you opposite side behind you and reach across as far as possible to your opposite buttock.



Figure 6.5

(B) When 4a is easy, clasp both hands behind your back, try to lift your clasped hands as high up your back (towards your waist) as possible. Hold for 3 seconds and then return to the start position [9].

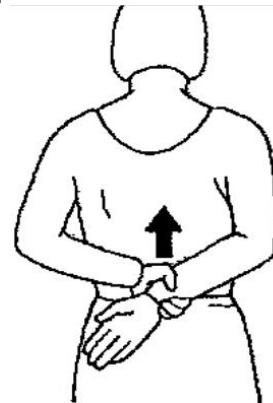


Figure 6.6

5) Sit in a chair or stand with your feet apart, cross your arm across your chest, sit/stand up straight and bend sideways to the right as far as is comfortable. Repeat to the left.



Figure 6.7

- 6) Sit in a chair, place hands on your waist, slowly turning, twisting to the left as far as is comfortable. Repeat this to right.

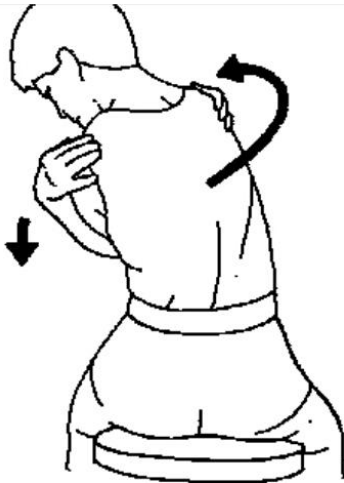


Figure 6.8

- 7) Before discharging from hospital you should be raising your arm straight in front of you with your thumb leading the way. Your elbow should reach as close to your ear as possible. Repeat 3-5 times at first progressing to into 10. When this is easy, you can repeat it 10 times and it remains pain free you can progress to exercise forward [9].

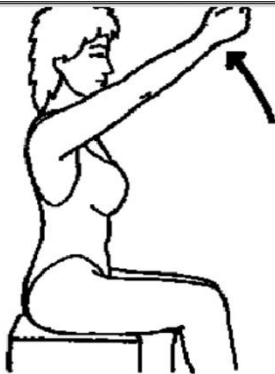


Figure 6.9

- 8) Stand or sit holding a stick with your arms down and in front of you. Lift your arms straight up above your head and then lower the stick behind your neck. Do not lean forwards. Lift your arms up and return to the starting position. Repeat 3-5 times at first progressing to into 10 within your comfort limits.

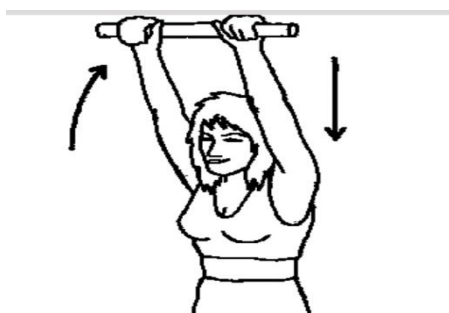


Figure 6.10

- 9) In sitting or standing. Bring one hand behind your neck and one hand behind your back. Get your hands as close to touching as possible. Swap your hands round and repeat. Repeat the exercise with each hand into 3-5 progressing to into 10. When the exercise is pain free, you can repeat it 10 and it is easy to perform with your hands close to touching, progress to exercise to next.



Figure 6.11

- 10) Stand or sit. With one arm bring a piece of string/rope or stick over the shoulder on the unoperated side behind your back. hold the stick with the other hand. Pull upwards, bringing the lower arm up as possible. Hold for 10 seconds. Then pull down bringing the upper arm down as far as possible. Hold again for 10 second. Repeat into 3. Swap your hands over and repeat again. Progress steadily to 5 repeats of each exercise.



Figure 6.12

- 11) Sit on a chair or stool with your feet firmly on the ground. Fold your arms across your chest and slowly rotate to the left taking your head in the same direction. Attempt to look behind you. Hold the stretch of the chest wall for 10 seconds and then repeat to the other side. Repeat into 3-5 each side, gently progressing to into 10. When you can rotate and look behind you, the exercise is pain free and you can repeat as above, progress to exercise next. This should not be before 2 weeks following your surgery.

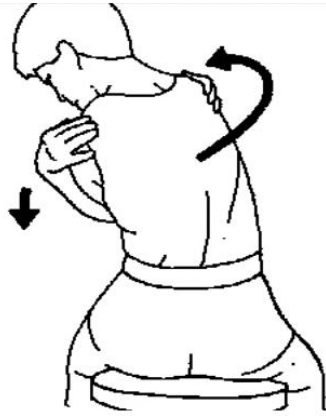


Figure 6.13

- 12) Sit on a chair with your legs apart and feet firmly on the ground. Hold a stick behind your neck as shown in the picture. Twist your upper body slowly from side to side. Let your head follow the movement. Hold for a count of 10 seconds at each side. Progress to repeat into 5-10 within your comfort limits.

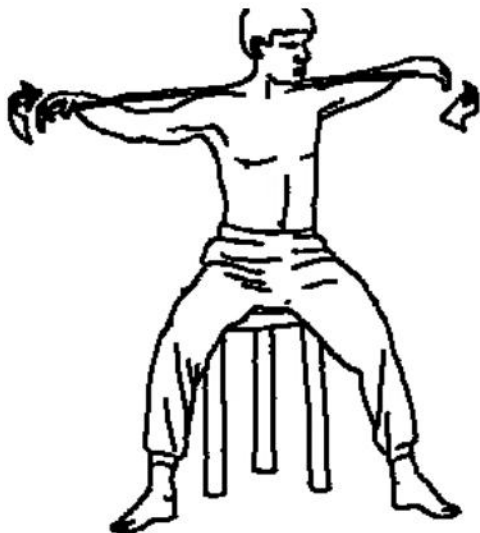


Figure 6.14

- 13) In sitting on a stool or standing with both hands your back with your palms facing outwards. Lift your hand away from your body without tipping your body forwards. Hold for 10 seconds before returning to the start position. Repeat into 3-5 progressing to into 10. When you can do this exercise easily and comfortably, giving your chest a good steady stretch, progress to exercise next.

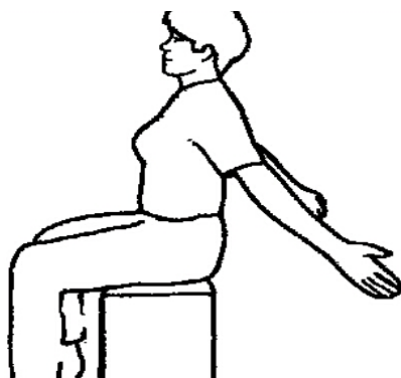


Figure 6.15

- 14) Stand holding a stick behind your back, elbows straight and hand facing upward. Keep your hand close together on the stick. Lift the stick upwards away from your body. Repeat into 3 holding for 5 seconds. Turn your hands over on the stick to face the floor and repeat. Progress to into 5 holding for 10 seconds. Alter the width of your grip on the stick occasionally, both width and narrow, to alter the stretch on your chest and shoulders.

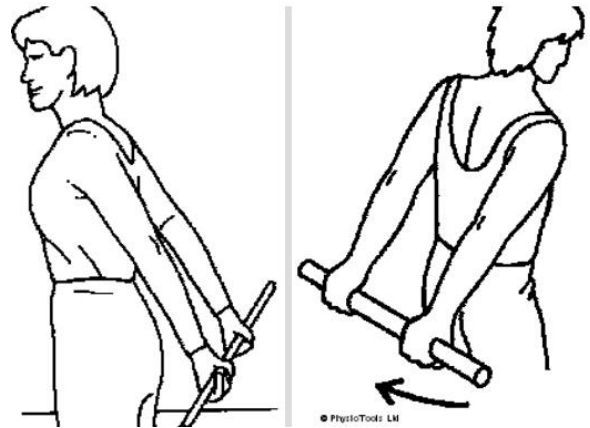


Figure 6.16

- 15) Sit on a stool feet on the floor or stand with your feet apart. Hold stick with both hands close together facing the floor. Lift the stick to your chin, your elbows should point outwards and upwards whilst doing the exercise. Repeat into 3-5 and repeat it 10 times.

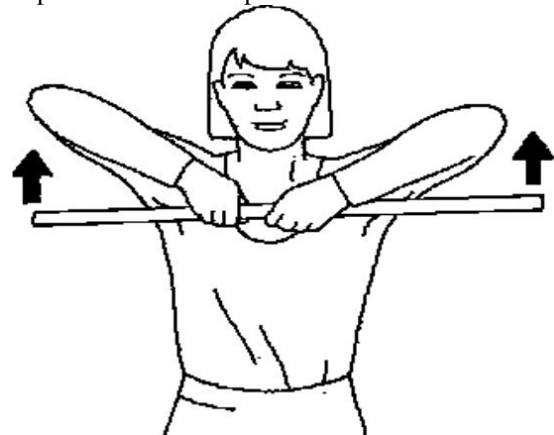


Figure 6.17

- 16) Stand holding a stick with a wide grip, hands above your head. Bring the stick slowly down behind your back until you feel a comfortable stretching in your chest muscles. Hold for a count of 5-10 seconds and repeat into 3-5 within your comfort limits. Keep your elbows straight throughout the exercises.



Figure 6.18

- 17) Standing or sitting with your feet apart, place your hands on your shoulders. Sit in a chair or stand with your feet apart, cross your arms across your chest, sit/stand up straight and bent sideways to the left as far as is comfortable. Hold the straight of the chest wall for 10 seconds and then repeat to the other side. repeat the exercise into 3-5 to each side, gently progress to into 10.

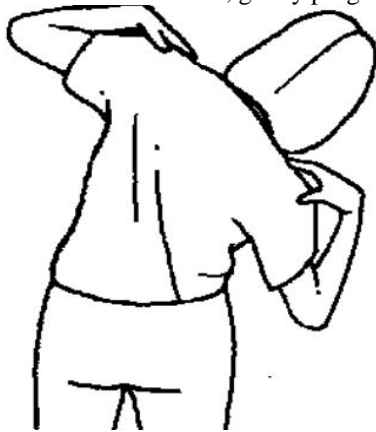


Figure 6.19

- 18) Stand up straight with your feet slightly apart, one hand on your hip and the other straight up above your head. Bend to the side with the opposite hand reaching over your head. Keep your hips in the mid position. Hold for 5-10 seconds and repeat to the opposite side. Repeat into 3-5 progressing as comfortable to into 10 holding for up to 10 seconds.



Figure 6.20

- 19) You should only undertaken this exercise if you have GOOD BALANCE and are NOT DIZZY. Stand straight with your feet apart. Support your back with your hands whilst bending your back as far back as comfortable. Hold the stretch of the back for 5-10 seconds. Return to the upright position. Repeat the exercise into 3-5 gently progressing to into 10.

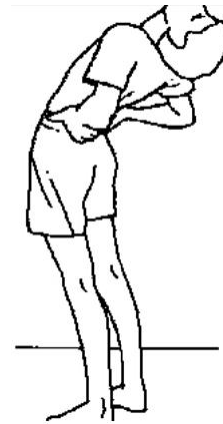


Figure 6.21

- 20) PROGRESS TO THIS EXERCISE GENTLY AND COMMENCE NO SOONER THEN 3 WEEK AFTER YOUR SURGERY. Sit holding onto a stick handle in front of you, as far away as possible from your body. Have the end of the stick resting on the floor in front of you. Lean forwards and stretch your chest and shoulders. Hold for 3-5 seconds as comfortable. Repeat into 3-5, progressing this to into 10 with a 10 seconds hold within your comfort limits.

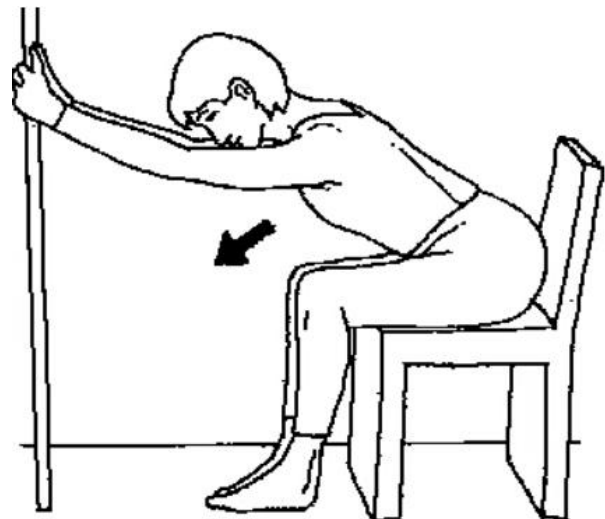


Figure 6.22

## 6. Results & Analysis

Data analysis was carried out after collecting the data for the two outcome measures of the patients of both the groups. The comparison was to be done between the pain and shoulder ROM (flexion). As the comparison was between two groups and the sample size was small (n=30) so unpaired t test was used.

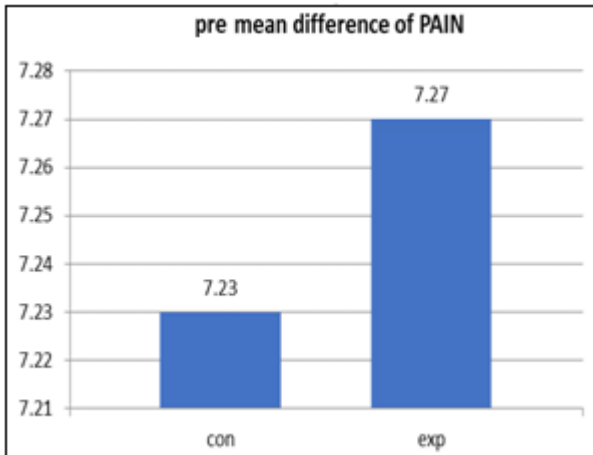
Student t-test is considered an appropriate test for judging the significance of a sample mean or for judging the

significance of difference between the means of two samples when population variance is not known. The relevant t test statistics is calculated from the data and then compared with its probable value based on the t-distribution at a specified level of significance for concerning degrees of freedom for accepting or rejecting the null hypothesis (Kothari, 2007).

6.1 Pre Treatment Finding

Table 1: Pain (Pre Treatment)

Group	Mean	SD	Significant
Control (A)	7.23	1.25	t =2.571
EXP. (B)	7.27	1.26	P =0.00



Graph 7.1

6.2 Pre Treatment Finding

Table 2: Flexion Rom (Pre Treatment)

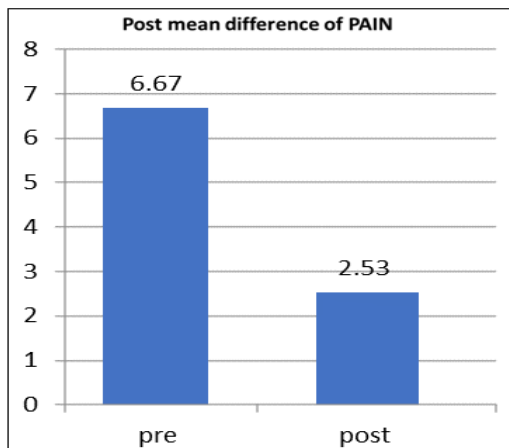
Group	Mean	SD	Significant
CON. (A)	39.4	4.836	t =16.843
EXP. (B)	39.5	6.621	P =0.00

Graph.7.2

6.3 Post Treatment Finding

Table 3: Pain (Post Treatment)

Group	Mean	SD	Significant
CONTROL (A)	6.67	1.27	t =10.895
EXP. (B)	2.53	1.67	P =0.00



Graph 7.3

It is concluded from all the above graphical representation and tables that there is a significant difference between the mean values in experimental group as compared to the control group. Experimental group shows better improvement in outcome measures such as pain in Numerical pain rating scale and ROM in Goniometry scale.

Control Group "A"-

From the above graph it is clearly shown that mean value for PAIN and ROM for control group "A"-on day 1 before treatment is 7.23 and 39.2 respectively and after 6 weeks it is 6.67 and 93.6 for the control group.

Experimental Group "B"-

From the above graph it is clearly shown that mean value for PAIN and ROM for experimental group "B"-on day 1 before treatment is 7.27 and 39.5 respectively and after 6 weeks it is 2.53 and 143.2 for the experimental group.

Therefore it is proved from above calculations that total improvement in PAIN and ROM is statistically more significant in experimental group then compare to control group.

7. Conclusions

Hence the alternate hypothesis were expected believing that Thoracotomy cause pain and restricted range of motion on shoulder joint, therapists gave shoulder and chest wall exercises to patients for reduce pain and improve ROM.

My data suggested that shoulder and chest wall exercises are giving a satisfactory result in thoracotomy patients and with the help of this protocol we found that the pain is reduced and ROM is improve. Given high adherence, positive outcomes and solid theoretical foundations, these programs could be helpful become an outpatient protocol for rotator cuff injury also in India.

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### **Author Profile**



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