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Effectiveness of Neck and Shoulder Stretching Program among Professionals Working from Home During Covid–19

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Abstract

Objective: To study the effect of neck and shoulder stretching program among professionals working from home COVID– 19. *Methodology:* 40 subjects within age groups 20–45 years both male and female working from home with subclinical neck pain and shoulder pain participated in the study. Subjects who were working minimum 2 hours on computer with a pain duration of atleast 2 months and pain should be mild to moderate on VAS were included. Subjects were excluded if they had any cervical apin with traumatic causes, any history of fractures, history of dislocated cervical spine, rheumatoid arthritis or PIVD of cervical spine, has undergone cervical spine surgery or were undergoing treatment at the time of testing. Improvement were noticed on VAS score. *Results:* Significant results were observed among the subjects. We provide information to the subjects regarding the protocol which they need to follow. Subjects were given some ergonomical and postural guidelines which they need to follow and also subjects were given stretching exercise for neck and shoulder and aslo given isometric exercises for neck. After doing analysis we found that after following the guidelines and exercises for 15 days, subjects experienced less pain as they were experiencing before. *Conclusion:* Stetching program with postural correction tips is effective in relieving neck and shoulder pain if done continuously and it also relieves the stiffness among the subjects.

Keywords: Ergonomical Guidelines; Isometric Exercises; Subclinical Neck Pain.

Introduction

Structure of neck is made up of vertebrea which originates from the skull and reaches till the upper torsal. Our head is supported by the bones, ligaments, and the mucles of the neck and they allow for the motion of the head. Any sort of abnormailities, inflamation or injury in the neck may lead to neck pain or stiffness. There are some people experience neck pain or stiffness occassionally but in most cases, it is mainly due to poor posture or may be due to overuse of the joint. Many a times, neck pain is not a very serious condition to be worried about and which can be relieved within few days by following a proper neck exercise or by performing neck stretching. But in rare cases, neck pain can be a serious condition due to any injury or illness which require proper doctors care.[8] Neck pain is very common musculoskeletal injury which is seen in the general population, especially seen in the office workers.[7] Poorly designed office workstation or poor ergonomics have also been a major reason for neck pain. Over and prolonged use of computer/ laptops/mobile phone and tablets leads to various kinds of health injury including upper extremity pain.[6,10]

It has been suggested by the scientists that the screen work that is beign done on desktop or laptop may lead to neck pain and upper extremity symptoms in office workers.[3,4] For example, awkward or poor body postures and repetitive

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body movements while screen work have been suggested as a major risk factors for musculoskeletal symptoms, as they may lead to increased tension in the msuclesof the forearm and neck/shoulder region.[5]

The ergonomics design of the workstation is applied in every office environment[2] and wherever you find yourself working either you are working from home or may be from any other place.[13] How we set up the working space has a huge impact on reducing the use of awkward or poor postures and also reduce the risk of injury over the body.[16]

Neck pain nowadays is a common problem affecting a vast number of people due to extensive use of computer or laptop at work or home, which causes increased pressure on musculoskeletal system of neck and upper back.[1] Longer duration of working hour in front of the computer or laptop leads to alteration in the posture like rounded shoulder and forward head posture, this faulty posture causes loss of normal lordotic curvature of the upper cervical spine which in turn increases muscle tension and shortening and eventually lead to neck pain.[14] Along with the faulty postures there are other associated factors which aggravate the problems in desktop or laptop users like duration of working hours on desktop, interval or breaks taken during working, setting of desktop, laptop, keyboard and mouse.[15]

Need of the Study

Various studies has been done but one of thestudy states, that there is an improvement in the VAS (Visiual Analog Scale) of the individual after performing a stretching exercise of neck and shoulder for a month among office workers in their neck and shoulder region.[20] But none of the study states that there is a improvement in neck disability or pain among office worker working from home after performing a stretching of neck and shoulder region[18] for 15 days. Hence, our study aims to show effectiveness of neck and shoulder stretching program among profesionals working from home during COVID 19.

Methodology

Study design was pilot study design. 40 subjects within age group of 20–45 years both males and females working proffesionally from their home with subclinical neck and shoulder pain participated in the study.

Subjects who were willing to participate and were who has computer related work experience for a minimum of 6 months to be working for not more than 20 years. Subjects who were selected were working for a minimum of 2 hours/day to not working for more than 18 hours a day and with a minimum duration of pain of atleast 2 months and also experiencing a pain ranging from mild to moderate in VAS in any of the region. They experienced symptoms of neck pain, but not receiving any treatment and so were classified as having minor musculoskeletal or "subclinical" neck pain. They also indicated their percieved pain on a 10 rating visiual analog scale (VAS) anchored with "no pain" (score 0) and "worst possible pain imaginable" (score 10).

Subjects were excluded if they had any cervical apin with traumatic causes, any history of fractures, history of dislocated cervical spine, rheumatoid arthritis or PIVD of cervical spine, has undergone cervical spine surgery or were undergoing treatment at the time of testing. They were not taking medication at the time of the study, thus study was approved by the ethical committee.

Dependant variables were VAS score and Neck Disablity Index. Independent variables were the treatment protocols.

Subjects who met the inclusion criteria were then randomized and then a brochure had been sent to them via E-mail indicating all the ergonical or postural guidelines and exercise and stretching protocol which they needed to follow for next 15 days.

Procedure

Informed consent was taken from the subjects. Pre readings of neck and shoulder region pain from VAS score were taken. Aslo working hours of subjects was also kept in mind.

The selected indiviauls based on the ilcusion criteria received a brochure indicating all the neccesary measures which they need to follow and also we provide them certain stretching exercises of neck and shoulder. Also we give them certain ergonomical guideliens which they need to follow while working. We advise them to follow the protocol strictly for continous 15 days.

We advice them to work in an environment with sufficent natural lighting and also advice them to create a work space at home i.e. using a table and chair with adequate support while working. We ask them to work in a neutral posture and also advice

them to take short intervals in between and during intervals perform stretching exercises whenever possible. Stretching help to reduce muscle soreness and fatigue.[11]

We advice them some stretching exercises for both neck and shoulder. These Exercises were Side bend, Neck rotation (left – right), Shoulder shrugs, Neck rotation (360 degree), Thorasic extension stretch and also advice them neck isometrics exercise which needs to be performed in all direction (forward, backwad and in both sides) and also advice them shoulder isometric exercises like scapular active range of motion, scaption and isometric shoulder internal and external rotaion.[17]

Results and Data Analysis

Table 1: Showing mean and standard deviation with distinct parameters.[21]

General Parameter	Mean ± SD
Age	31.7 ± 6.63
Height	167.52 ± 8.98
Weight	69.25 ± 15.60

Table 2: Shows all the values before we provide them the guidelines for stretching program (pre sample).[21]

Stats Parameter	Mean ± SD
Number of working hours on computer/ laptop/mobile	2.92 ± 0.89
Visiual Analog Scale reading for Neck pain	4.82 ± 1.48
Visiual Analog Scale reading for Shoulder pain	3.45 ± 1.57

Table 3: Shows all the values after we provide them the guidelines for stretching program (post sample).[21]

Stats Parameter	Mean ± SD
Number of working hours on computer/ laptop/mobile	2.92 ± 0.89
Visiual Analog Scale reading for Neck pain	3.75 ± 0.95
Visiual Analog Scale reading for Shoulder pain	2.75 ± 1.15

Table 4: Showing difference in mean and standard deviation between before and after giving the sample stretching program for neck and shoulder region.[21]

Test	Before		After	
	Mean	Stdev	Mean	Stdev
Neck Region	4.82	1.48	3.75	0.95
Shoulder Region	3.45	1.57	2.75	1.15

Table 5: Showing difference in mean and standard deviation between before and after readings of stretching exercise program.[21]

Test	T Test (Paired)	T Test (Unpaired)
Neck Pain	2.76	0.00023
Shoulder Pain	5.40	0.0172

Result

The mean for before and after giving stretching program for neck region are 4.82 and 3.75 (Table 4) and respectively. The standard deviation for before and after giving stretching program for neck region 1.48 and 0.95 (Table 4) respectively. The calculated T-value (paired) is 2.76 and T-value (unpaired) is 0.00023. (Table 5) The mean for before and after giving stretching program for shoulder region are 3.45 and 2.75 (Table 4) respectively. The standard deviation before and after giving stretching program for shoulder region are 1.57 and 1.15. The calculated T-value(paired) is 5.40 and T-value (unpaired) is 0.0172. (Table 5)

Here, T- test shows significant difference in the mean of both neck as well as shoulder region. Which implies that after a treatment and stretching protocol provided for 15 days to the selected sapmle, the individual of sample shows significant improvement in their pain. This shows that if we add stretching in our daily life and if we use proper ergonomics at our home while working we can get relief from musculoskeletal abnormalities or pain.

Discussion

The purpose of the study was to evaluate the effectiveness of neck and shoulder stretching program among professionals working from home during COVID–19 pandemic. Various studies has been done but one of the study shows the effectiveness of stretching program given to the selected sample. The sample was adviced to follow the streching protocol and guidelines for a contious 30 days and after 30 days the pain analyses of the samle was done. The sample was selected based on the pain in neck and shoulder region and then were given the stretching program for neck and shoulder. After 30 days the sample have experienced less pain in the neck and shoulder region and also they become more independent for their work.

The subjects included in the present study were computer users. It has been shown that computer users tend to have more protruded head bringing upper cervical vertebrae under extension moment and exaggerated anterior curve in lower cervical vertebrae. Further it has been shown that disorders originate from muscle degeneration and/ or impaired neuromuscular function resulting from chronic overuse and frequently accompanied by pain, muscle weakness and fatigue.In another study

28% lower extensor and 24% lower flexor muscle strength was observed in patients compared to the healthy volunteers.

Other study propose that proposed that the occurence of pain in the neck is very high in students with extended duration of computer or using the computer for long duration.[9] Therefore, preventive measures like ergonomic advice, postural advice and demonstration of neck exercises are to be integrated in workstations or schools[11] or college[12] can reduce musculoskeletal discomfort and also help in relieving neck pain.[13]

Other study show that there is significant difference in the pain over neck and shoulder region of the subejcts after performing stretching exercise of neck and shoulder for four weeks.[21] All selected subjects received a brochure containing information indicating the proper position and ergonomics which needs to be applied during daily work. Pain, functions of neck and the quality of life of the subjects were evaluated using visiual analog scale, neck disability index and questionnaire. When compared among two gropus the improvement was significantly greater in group among which people performed exercise more than 3 times per week as compared to other group which perform exercise less or equal to three times per week. The study concluded that a regular stretching performed for four weeks can decrease neck and shoulder pain.

Thus, present study shows that there is significant decrease in the pain after perfroming the stretching exerxise for 15 days. Performing stretching in the soft tissues in neck, shoulder and upper back such as levator scapulae, trapezius, upper deltoids and subscapularis; ligamnets and tendon can help us to mobilise the neck, and also it can increase the range of motion of neck. This is because doing stretching over time improves the flexibility of the muscles, tendons and ligaments present inside the neck, which is helpful in increasing the range of motion of the joints.[20] An improved range of motion amongst the patients can assist in improved movement and its ability to complete the daily life activities such as, reading, driving and working on computers/ laptops/ mobile phones/ tablet. Also performing the stretching exercises aids in decreased musclestiffness.[19]

Conclusion

The result suggest that there is improvement in neck pain and neck movement in all the subjects after stretching protocol adviced for 15 days.

Stretching advised for neck and shoulder muscles, gave desired effects of increased flexibilty in neck and shoulder region and it aslo shows improvement in pain of the subjects.

Conflict of Interest: There is no conflict of interest in this study.

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Role of Unilateral Guided Chest Expansion Technique after Decortications in Reversing Unilateral Atelectesis

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Abstract

Background: Decortication is a common surgical procedure done to free a part of fibrous capsule, formed around the lung, secondary to an inflammatory process. The risk of postoperative pulmonary atelectasis following Decortication is relatively high which is recorded at 90%. Therefore this case study has been designed to find out a better physiotherapy technique to reverse atelectasis in short period of time. *Methodology:* This case study was based on two sample subjects. Case I who received Unilateral guided chest expansion after decortication and Case II who did not received Unilateral guided chest expansion after decortication. *Outcome Variables:* Radiological and Auscultation findings collected and compared; and length of hospital stays were considered as outcome variables. *Result:* Unilateral guided chest expansion technique after decortication has much more significant effect in reversing atelectesis than Non-unilateral guided chest expansion technique after decortication. *Conclusion:* This case study has shown that Case I who received Unilateral guided chest expansion after decortication has better improvement than the Case II who did not received Unilateral guided chest expansion after decortication. Therefore this technique should be practices in every unilateral atelectasis, especially after decortication.

Keywords: Decortications; Unilateral guided chest expansion; Chest X-ray.

Introduction

Decortication refers to a fairly invasive surgical procedure done to free a part of fibrous capsule that has formed around the lung, secondary to an inflammatory process, such as an infection. The common indications for deortication are fibrothorax, chronic empyema, trapped lung, restrictive pleuricy and tuberculous Infection. The main aim of decortications is to restore or to improve lung function and chest wall compliance; to allow the lung to expand to a greater capacity; to control infection as in empyema; to prevent deformity which almost always complicates the development and progression of fibrothorax; and to remove cancerous tissue and tumor in advanced stages of the illness.

It is well documented that in some postoperative cases, especially undergone thoracic surgery, patients have an increase risk of developing reduced respiratory function and pulmonary complications through atelectesis, secretion retention, altered chest wall mechanics and abnormal breathing pattern,[1] which is been recorded high at between 19% and 59%, compared with only 16% and 17% for upper abdominal surgery and 0% and 5% for lower abdominal surgery.[2]

The most common complication undergone pulmonary decortication is the pulmonary

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atelectesis, which is recorded at 90% and it remains so today.[3-5] This is because of regional hypoventilation which occurs in the dependent areas of the lung compressed through the effects of supine positioning with concurrent respiratory muscle paralysis[6] and positive pressure ventilation.[7] Similarly during decortications, which necessitate lateral positioning, the dependent lung is more vulnerable to the effects of compression and absorption, and up to double the resting lung volume (functional residual capacity) may be lost compared with that of the lung in a supine subject.[8] Preoperative medications, anesthetic agents, and drugs given in the intraoperative period may also lead to decrease lung compliance, which contributes to diminished lung volume and atelectasis.[9]

Table 1: A summary of postoperative pathophysiologic changes outlined by Tisi.[10]

Factors Measured	Changes			
Lung Volume	TLC	VC	ERV	RV
In Thoracic surgery	↓	↓	↓	↓
Ventilatory Pattern	TV	RR	Compliance	Sigh Mechanism
In Thoracic surgery	↓	↑	↓	↓

Where, TLC = total lung capacity; VC = vital capacity; ERV = expiratory reserve volume; RV = residual volume; TV = tidal volume and RR = respiratory rate.

Other factors that may contribute to atelectasis include supplemental oxygen delivered to a patient at low lung volumes.[11] In the immediate postoperative period, a combination of drowsiness, pain and analgesia may lead to a slow, monotonous, shallow breathing pattern,[12] recumbent positioning and decreased mobility, leading to further regional hypoventilation. Depth of respiration in thoracic surgery patients may also be impaired by chest wall incisions and insertion of intercostal chest drains. As the functional residual capacity decreases, tidal breathing occurs in the range of closing capacity, leading to further collapse of dependent airways. Unless these problems are reversed, atelectasis will progress in a self-perpetuating cycle. Therefore this case study has been designed to find out a better physiotherapy technique to reverse atelectesis in short period of time.

Other complications of decortications are pleural effusion and/or Pneumonia, transient hypoxemia, infections like peri-operative sepsis syndrome, bronchopleural fistulas, bleeding, and persistent air leak due to tearing of pleura. This inability of the lungs can cause severe breathing problems associated with chest pain, tightness, potentially leading to increasing length of hospital stay and can eventually lead to death if not addressed immediately. Therefore pulmonary rehabilitation programme has to be started as early as possible after surgery.

Pulmonary rehabilitation is a nonpharmacological intervention aims to reverse atelectasis and secretion retention. It may include deep breathing exercises, positioning, airway clearance techniques and mobilization. Intermittent, deep, prolonged inspiratory efforts are thought to reinflate collapsed alveoli, increase pulmonary compliance and reduce regional ventilation–perfusion inequalities.[13] Therefore Incentive spirometry is most commonly used which involves deep breathing through a device with visual feedback, thought to maximize accuracy of breathing technique and motivation.[14]

Physiologic changes resulting from atelectasis include increased alveolar surface tension caused by deficient amounts of surfactant in the atelectatic area.[15] With persistent atelectasis and the subsequent decrease in surfactant, increased inspiratory pressures are needed to reinflate the atelectatic area.[16] It has also been documented that pulmonary rehabilitation represents a potentially useful intervention, especially if applied in a period less than one week after the surgery. And when it is performed by specialized therapists, the rates of pulmonary morbidity have been reported to improve from 15.5% to 4.7%.

Therefore through this study we want to see the effect of Unilateral guided chest expansion technique in subjects recovering recent thoracopulmonary surgery for pleural decortications. We also want to see how it differs from the effects of non unilateral guided chest expansion after decortications.

Methodology

Study design: Experimental case study.

Population: Patients admitted in the CTVS ward of Himalayan hospital, Jollygrant, Dehradun.

Sample size: Two.

Inclusion criteria: Both male and female of age 35–40; underwent thoracotomy with intercostal drainage; pulmonary complications like atelectasis, pleural effusion and or hemothorax.

Exclusion criteria: Patients with cardiac implant, rib fracture and cardiac abnormalities.

Instrumentation used: Incentive spirometer, Stethoscope, Inch tape.

Outcome variables: Radiological and Auscultation findings collected and compared; and length of

hospital stay were considered as outcome variables.

Independent Variables: Unilateral Guided Chest Expansion technique.

Dependent variables: Radiological findings, Auscultation findings, and length of hospital stay.

Procedure

Two subjects meeting the inclusion criteria were recruited from CTVS ward of Himalayan hospital, Jollygrant. The purpose of the study was explained to them and an informed consent was obtained from both of them. Then the subjects were divided into two groups as case I and case II having 1 subject in each. Case I included a 40 yrs old male undergone post thoracotomy left lung atelectesis with same side pleural effusion. And Case II included a 38 yrs old female undergone post thoracotomy right lung atelectesis with same side pleural effusion.

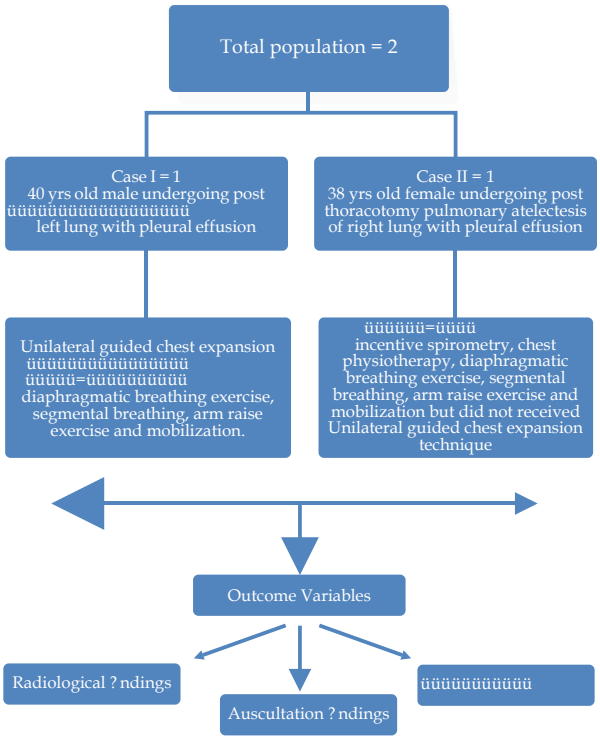
In case I, patient had received Unilateral guided chest expansion technique (as shown in Fig. 1), in which the patient was asked to sit upright in a chair with back free of support and relax quietly for few minutes. Then the patient was provided with an incentive spirometer, holding in front at the level of the mouth and was asked to close his lips tightly around the mouthpiece and inhale as deeply as he can. The patient was then instructed to try to move the ball as high up as he can and hold breathe for 2 to 5 seconds. Meanwhile the therapist, who was standing at the side of the unaffected lung, placing both hands contralateraly over the anterior and posterior aspects of same side of the thorax, applied a forceful compression on contralateral sides of the thorax in order to shift the air from unaffected to the affected lung.

This technique was further followed by Incentive Spirometry that included total 5 sets of 10 repetitions each; 2 sets without Unilateral guided chest expansion technique, 3 sets with Unilateral guided chest expansion technique, and was practiced for duration of 5–10 minutes per set in every 3 hourly; Chest physiotherapy including percussion, vibration followed by huffing and coughing; Diaphragmatic breathing exercise including 1 set with 10–15 repetitions in every 2 hourly for duration of 5–8 minutes per set; Segmental Breathing including bilateral costal, apical and posterior basal expansion; Arm raising exercise including 1 set with 10–15 repetitions in every 2 hourly for duration of 5–8 minutes per set; and lastly Mobilization i.e., corridor walking within 100 meters.

Fig. 1: Showing the patient with Unilateral guided chest expansion technique.

And in case II, patient had received the same protocol including Incentive spirometry, Chest physiotherapy, Diaphragmatic breathing exercise, Segmental Breathing exercise, Arm raising exercise and Mobilization but did not received unilateral guided chest expansion technique (Fig. 2).

Fig. 2: Showing the patient without Unilateral guided chest expansion technique.



Discussion

In this study we demonstrated that Case I who received Unilateral guided chest expansion after decortication had a significant improvement than Case II who did not received Unilateral guided chest expansion after decortication.

In previous studies, some authors choose only one criterion i.e., radiography[17] as an outcome variable, others choose a combination of factors like radiography, temperature changes, breath sound changes, pulmonary function changes and length of hospital stay.[18–20] Similarly in this study, we took 3 variables which are radiography, breath sound changes and length of hospital stay.

Radiological and Auscultation findings

After comparing the radiological and auscultation findings of both case I and case II, we saw that Case I who received Unilateral guided chest expansion after decortication has shown an immediate and significant improvement in reversing atelectesis than Case II who did not received Unilateral guided chest expansion after decortications. The results are as follows:

Table 2a: Case I– 40 yrs/Male. Post-op Thoracotomy with Unilateral guided chest expansion.

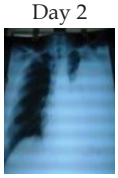
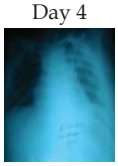
	X-ray Findings-	Auscultation findings-
Day 1 	Lungs are mildly congested. Homogenous opacity is seen in lower zone of left lung.	Vesicular sound absent in left upper and lower lobes. Crackles are present all over the lung field.
Day 2 	Left Pleural effusion with underlying pulmonary atelectesis. Left Hemothorax. Left costophrenic angle obliterated	Vesicular sound diminished in left upper lobe; absent in left lower lobe. Crackles present all over the lung field.
Day 3 	Left Pleural effusion with underlying pulmonary atelectesis. ICD tube seen on left lung.	Vesicular sound present in left upper lobe; diminished in left lower lobe. Crackles present in left lower lobe.
Day 4 	Mild Pleural effusion of left lung. Underlying pulmonary atelectesis. ICD tube seen on left lung.	Vesicular sound present in all over the lung field. Crackles present in left lower lobe.
Day 5 	Clear left lung. Atelectesis reversed. ICD tube seen on left lung. Chest leads are seen in situ.	Vesicular sound present in all over the lung field. Crackles absent.

Table 2b: Case II– 38 yrs /female. Post-op Thoracotomy without Unilateral guided chest expansion.

	X-ray Findings	Auscultation findings
Day 1 	Right pulmonary atelectesis associated with right pleural effusion.	Vesicular sounds absent in right upper, middle and lower lobes associated with Crackles present all over the lung field. Transmitted sounds are present.
Day 3 	Right pulmonary atelectesis associated with right pleural effusion. Right costophrenic angle obliterated	Vesicular sound present in right upper lobe; diminished in right middle and lower lobes. Crackles present in right middle and lower lobes. Transmitted sounds absent.
Day 5 	Right pulmonary atelectesis. Mild pleural effusion of right lung. Right costophrenic angle obliterated ICD tube seen on right lung.	Vesicular sound present in right upper lobe; diminished in right middle and lower lobes. Crackles present in right middle and lower lobes only.
Day 10 	Right pulmonary atelectesis. Right Pleural effusion reversed. ICD tube seen on right side.	Vesicular sound present in right upper and middle lobe; diminished in right lower lobe. Crackles present in right lower lobe only.
Day 15 	Right lung field clear. Atelectesis reversed. ICD tube seen on right side.	Vesicular sound present in all over the lung field. Crackles absent.

Length of hospital stay

After comparing the radiological and auscultation findings of both case I and case II, we saw that Case I who received Unilateral guided chest expansion after decortications took only 5 days to reverse atelectesis completely whereas the Case II who did not received Unilateral guided chest expansion after decortications took 15 days to reverse atelectesis completely (Fig. 3).

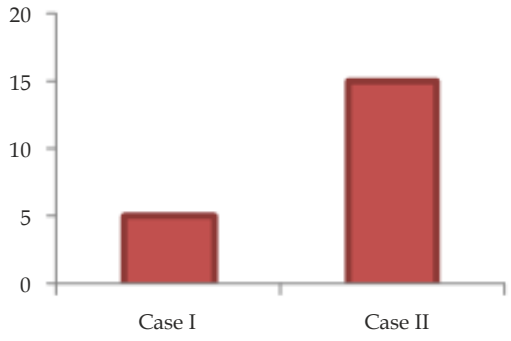


Fig. 3: □howing the graph of □ength of hospital stay.

On the other hand, we did a pilot study also. We selected a normal subject randomly from HIHT University, and his chest expansion measurements were taken with an inch tape at the level of nipples while performing incentive spirometer along with it. Then we applied unilateral guided chest expansion technique and again took the chest expansion measurements. Total three chest expansion measurements were taken- Bilateral chest expansion measurement without technique (Fig 4a), Unilateral chest expansion measurement without technique(Fig. 4b) and Unilateral chest expansion measurement with technique (Fig. 4c).

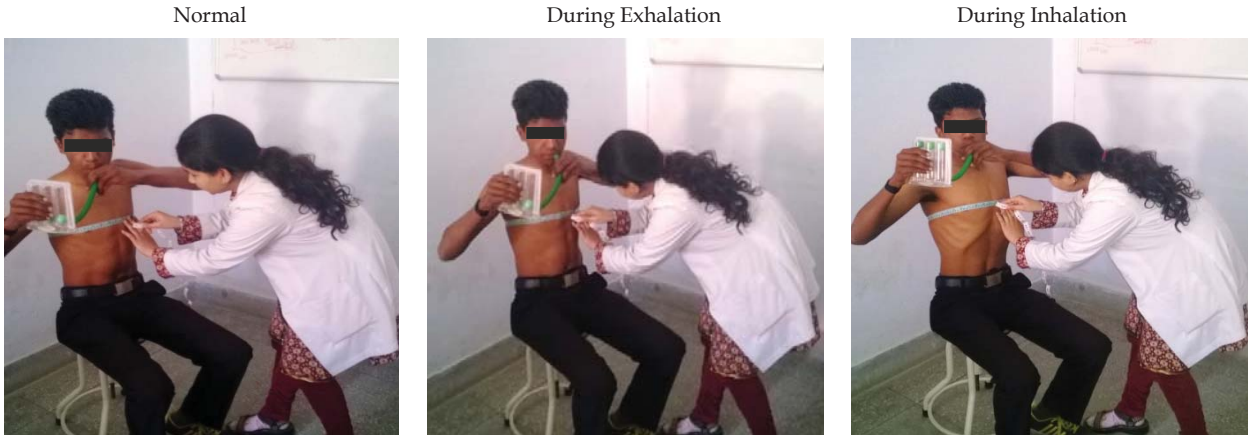


Fig. 4a: Showing Bilateral chest expansion measurement without technique.

Fig. 4b: Showing Unilateral chest expansion measurement without technique.

Fig. 4c: Showing Unilateral chest expansion measurement with technique.

After collecting and comparing all the three results of chest measurements, we saw that there was a marked difference in the chest expansion before and after applying the unilateral guided chest expansion tecnique. Normaly with bilateral chest expansion during exhalation and inhalation, the difference was of 5 cm only. With unilateral chest expansion without technique the difference was of 4 cm and with unilateral chest expansion with technique, the difference was of 6 cm. This 2 cm increase in the chest expansion after applying unilateral guided chest expansion technique shows that it has a significant effect in the inflation of collapsed alveoili and thus helps in reversing atelectesis. The results are as follows-

Table 3: Showing Chest expansion measurements in normal subject.

	Chest expansion measurements	During exhalation	During inhalation	Difference
1.	Bilateral without technique	69 cm	74 cm	5 cm
2.	Unilateral without technique	41 cm	45 cm	4 cm
3.	Unilateral with technique	41 cm	47 cm	6 cm

Conclusion

This case study has shown that Case I who received Unilateral guided chest expansion after decortication has a significant effect in reversing atelectesis than Case II who did not received Unilateral guided chest expansion after decortication. Therefore this technique should be practices in every unilateral atelectasis, especially after decortication.

Limitation and Future study

This study is limited to small sample size and also there is lack of review of literatures related to unilateral guided chest expansion technique so this study can be extended in future by taking this technique to a large sample size and other possible surgeries and/or conditions causing unilateral lung atelectesis can be involved .

Conflict of interest

There is no conflict reported amongst all the authors.

Acknowledgement

I owe my greatest regards for the immense help and valuable guidance of my guide Dr. Ravinder Narwal, Lecturer at Physiotherapy Department, H.I.H.T. University, U.K., who helped and encouraged me throughout the period of my study and for all the time he spent on going through my study and making necessary corrections as and when required. I am also thankful to my parents, my juniors and seniors specially Dr.Shashi chouhan who provided their great support and encouragement in completion of this study.

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Effects of Foam Rolling and Static Stretching on Lower Back, Hamstrings and Calf Muscles

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Abstract

Objective: To study the effect of static stretching and foam rolling among male collegiate who are recreational players. *Methodology:* 20 male subjects within age group of 18–25 yrs with bilateral hamstring tightness and who were recreational athletes participated in the study. Subjects were excluded if they had any lower limb musculoskeletal disorder or surgery, back and lower limb injury, neurological dysfunction, and those who were involved in any other stretching exercise or sports. Improvements were noted through sit and reach test and active knee extension test. *Result:* There was improvement in hamstring flexibility in all subjects, however static stretch for active lengthening of hamstring considering the muscle's strong fascial attachments. *Conclusion:* Foam rolling in combination with static stretching, when done on lower back, hamstrings and calf muscles gave desired effects of increased flexibility of hamstrings when measured with SRT after the intervention was done.

Keywords: Static Stretching; Foam Rolling.

Introduction

The relative tightness of the soft tissue structures in the body, joint capsules, muscles and their fascia can affect flexibility. Found surrounding the muscle, myofascia is a connective tissue that can restrict ROM and decrease strength and endurance if injured, inactive, or inflamed. Clinicians use manual pressure over the tissue to effect therapeutic change in this tissue using a variety of techniques including osteopathic soft-tissue manipulations, structural integration, various forms of massage, muscle energy techniques, and Graston. Alternatively, a technique to treat fascia independent of a practitioner, self-induced myofascial release (SMR), can be facilitated with a foam roller or roller massager. Foam rollers are cylinders made of varying densities and textures of foam and roller massagers are plastic rollers held in the hands. These tools utilize the same mechanism of treatment as traditional myofascial release, but pressure is applied by the individual externally or using body weight.[15]

Hamstring muscles are an important group of posterior thigh muscles. They include semimembranosus, semitendinosus, and biceps femoris. The hamstring muscles are important contributors to control the human movement and involved in wide range of activities from running and jumping to forward bending during sitting or standing and a wide range of postural control actions. The length of the hamstring muscles is considered to play an important role in both the effectiveness and the efficiency of basic human movements, such as walking and running.[19]

Adequate range of motion is necessary for activities of daily living, success in athletic competition, injury prevention, and occupational demands. These activities commonly require trunk

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flexion movements and lower-body extensibility. Therefore, numerous studies have investigated trunk and lower extremity flexibility. The most widely used lower-extremity flexibility assessment is the standard sit and-reach test (SRT). Several studies have demonstrated that this test exhibits greater criterion-related validity for hamstring, rather than lower back flexibility. It was also determined that subjects exhibited significantly greater flexibility performance in the plantar flexed ankle position. These findings support previous investigations that also reported higher flexibility scores when the ankle was permitted to plantar flex. It has been proposed that dorsiflexion increases sciatic nerve activation resulting in a reflexive decrease in lower extremity range of motion. Therefore, the plantar flexion ankle position can be used to negate the sciatic nerve reflex and subsequently provide an increase in lower-extremity flexibility.[8]

Need of the Study

Recreational players undergo injury because there muscles and aren't warmed up properly, stretching is a very basic warm up exercise which decreases muscle viscosity and thus allows for rapid and forceful muscle contraction and relaxation which enhances its mechanical efficiency. Connective tissue surrounding the muscles such as fascia also affect its ROM. Thus foam rolling is a self inducedmyofascial release technique which uses an individual's body weight to release fascia.

Methodology

A pilot study design consisting of 20 male subjects within age group of 18–25yrs who were in college and were recreational players participated in the study.[18–19]

Subjects who were willing to participate and were having bilateral hamstrings tightness which isdefined by an incomplete knee extension in the active-knee-extension test, when the subject failed to straighten the knee to its full extension by 20°.[19]

Subjects were excluded if they had any lower limb musculoskeletal disorder or surgery, back and lower limb injury, neurological dysfunction, subjects involved in any other stretching exercise or sports.[19]

Subjects who met the inclusion criteria were then asked to perform foam rolling and then static stretching over lower back, hamstrings and calf muscles.

Procedure

Written consent was taken from subject who fulfilled the inclusion criteria and who volunteered to participate in the study. Subject's demographic data was recorded.

A pretreatment Goniometry and SRT was performed to evaluate flexibility and knee extensiontest to evaluate the tightness of hamstring.

The subjects were made to foam roll over the lower back by lying supine on the roller using arms and posterior muscles to support body weight. Proper draw in position is important in order to stabilize the spine. Subjecta were asked to roll from where "belt crosses pants" down to the PSIS joint[11], then over hamstrings the subjects were required to roll the right leg from the ischial tuberosity to the back of the knee. The hands were set on the floor and did not move during the rolling motion. The body shifted back and forth to a metronome cadence, with the left leg acting as a stabilizer. Subjects were instructed to keep maximum weight over the right leg. Pilot testing established a rolling cadence of 40 bpm. Rolling from ischial tuberosity to knee was considered one beat and then same procedure was followed on the left leg.[12] then the foam rolling was done on the calf muscles by rolling between the popliteal fossa and the myotendinous junction of the Achilles tendon[6] was considered one beat. 20 seconds for rest[14] was given after every 40 bpm of foam rolling.[5,6,10,11,12,13,14]

Then the subjects were asked to be in long sitting position with knees fully extended and the ankles together in dorsiflexion, and the feet flat against the wallthe subjectswere asked to bend forward from the hips to reach towards the feet, with the head in flexion. The examiner stood behind the subject and pushed him/her forward to stabilize the patient's position and knees[9] and held the position for 30 s and repeated for five sets, and the interval between each set was 20 s. To exclude the influence of pre-stretching and exercise, all subjects were instructed not to perform stretching and exercise just before the measurement.[14]

Results and Data Analysis

Data was compiled and exported to Microsoft excel for analysis. The data collected was arranged for comparison of pre and post results of foam rolling and static stretching which was analysed using descriptive statistics. Descriptive statistics was checked using mean and SD. The results were

analysed pre and post technique by using paired and unpaired t test. The p=<0.05 was taken as the level of significance for checking the significant differences in means. Data analysis was done by SPSS software.

A total of 20 subjects were taken. Analysis is done on the post treatment reading of the active knee extension and sit and reach test.

Table 1: Showing mean and standard deviation with distinct parameters.[15-16]

Stats. Parameter	Mean+SD
Age	21.85±1.72
Height	172.97±9.62
Weight	62.10±11.89
BMI	20.85±2.69

To summarize, this table shows mean and standard deviation of various parameters like, age, height, weight and BMI.

Paired T-Test:

Table 2: Showing difference in mean and standard deviation between pre and post test readings of sit and reach and active knee extension test for right leg.[15-16]

Test	Pre		Post	
	Mean	Stdev	Mean	Stdev
Srt	29.055	7.485	35.725	5.807
Ake	71.35	7.883	81.85	4.545

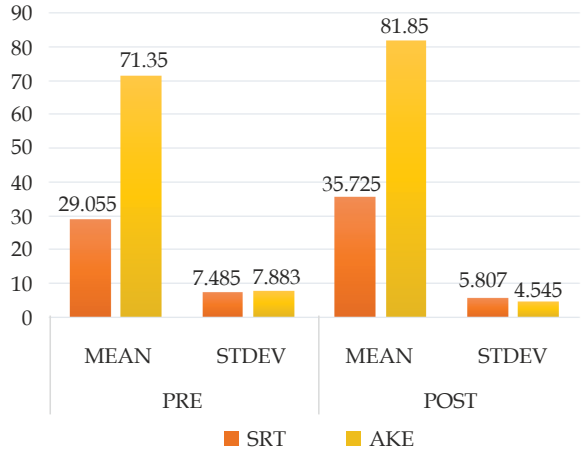

Fig. 1: Showing difference in mean and standard deviation between pre and post test readings of sit and reach, active knee extension for right leg.[15-16]

To summarize, this graph shows comparison of pre and post-test mean and standard deviation of sit and reach, active knee extension for right leg. The pre and post-test mean with standard deviation in sit and reach was 29.055±7.485 and 35.725±5.807 □P<0.05□and in active knee extension was 71.35±7.883 and 81.85±4.545 □P<0.05□which shows that there is highly significant difference between S□T and A□□ in improving hamstring □exibility.

Table 3: Showing difference in mean and standard deviation between pre and post test readings of sit and reach and active knee extension test for left leg.[15-16]

Test	Pre		Post	
	Mean	Stdev	Mean	Stdev
Srt	29.055	7.485	35.725	5.807
Ake	73.65	6.976	83.20	3.054

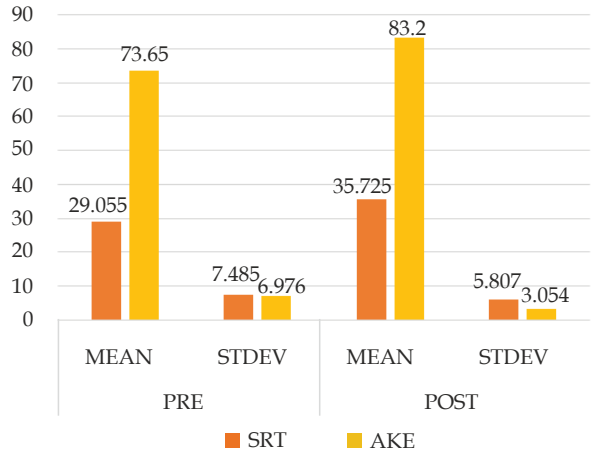

Fig. 2: Showing difference in mean and standard deviation between pre and post test readings of sit and reach, active knee extension for left leg.[15-16]

To summarize, this graph shows comparison of pre and post-test mean and standard deviation of sit and reach, active knee extension for right leg. The pre and post -test mean with standard deviation in sit and reach was 29.055±7.485 and 35.725±5.807 □P<0.05□and in active knee extension was 73.65±6.976 and 83.2±3.054□P<0.05□which shows that there is highly significant difference between S□T and A□□ in improving hamstring □exibility.

Discussion

The present study compared the pre and post effects of foam rolling and static stretching on the lower back, hamstring and calf muscle □exibility using A□□ and S□T. 20 male participants were selected on the basis of inclusion and exclusion criteria. Various criteria included variables like extent of tightness in muscles, decreased range of motion, age group 18□25.

The procedure was explained to each participant and the possible risk involved. A written informed consent from each participant was obtained. All subjects well tolerated the interventions given and no one was dropped out of the study.

Active knee extension test and Sit and reach was collected before the protocol □preintervention□and after the protocol □post intervention□.

Comparison of the data obtained before and after the protocol for both groups was statistically analyzed for significant difference among groups using paired T testwas done to explore the effects of interventions in respect of effectiveness of it. The paired t test is used to compare the data obtained before and after the interventions as per the protocol and there have been significance difference is seen in the results. ($p<0.05$)(Table 1 & 2) (Fig 1 & 2).[17]

The study conducted by the Jung J. who studied immediate effect of self myofacial release on hamstring flexibility on 25 individuals with mean age of 22 years. Then the researcher explained the technique of foam rolling was conducted for 4 minutes on the specified area and then outcome were measured. Significant difference in the pre and post treatment valued were observed by them by using ANOVA but we have seen significance in paired t test.($p<0.05$).[21]

The study conducted by Mohd Waseem who studied improvement of Hamstring flexibility by using static stretching and eccentric training on 20 normal healthy collegiate males. Then the reseachers explained the technique of static stretching and eccentric stretching which was conducted for 30 seconds 3 times per limb. Significant difference in the pre and post treatment values were observed.[20]

A few hypotheses have been proposed to explain the gender differences in neuromuscular properties and viscoelastic changes. These include fluctuations in hormone levels, discrepancies in muscle cross-sectional area (CSA) and anthropometry, and differences in passive properties such as viscoelastic stress relaxation or viscoelastic creep. Many studies have examined the effect of estradiol and progesterone on active MTS and anterior cruciate ligament (ACL) laxity throughout the menstrual cycle with equivocal findings. When a change in MTS or ACL laxity was observed across the menstrual cycle, it was generally at or near ovulation when estradiol levels peak.[1,2,3,6] Therefore, when tested during menses when estradiol levels are lowest, the observed gender differences may have been even greater if it was tested at or near ovulation. Overall, it indicated that an acute bout of passive stretching increased ROM for the women, but not for the men. There were no changes in MTS, which is commonly used to assess the viscoelastic properties of the muscle. It has been suggested that a decrease in MTS reduces the total amount of strain through a given ROM, which may reduce the risk of strain injuries.[4]

Stretching the soft tissues in the back, legs and buttock such as the hamstrings, erector muscles of[7,9] the spine and hip flexor muscles, ligaments and tendons can help to mobilise the spine, and an increase in the range of motion of the spine can assist back pain. This is because stretching can improve the flexibility of the muscle-tendons and ligaments in the back, which is important to increase the range of motion of the joints. Therefore an improved range of motion assists with patients' movement and ability to complete activities of daily living, as most everyday tasks such as lifting and bending require trunk flexion, which involves a complex movement combining lumbar and hip motion. Also stretching exercises decrease the muscle stiffness as a result of changes in viscoelastic properties, due to the decreased actin-myosin cross-bridges and the reflex muscle inhibition.[11]

Limitations of the Study

- Number of subjects were less due to COVID 19.
- Due to the difference in the weight, the pressure exerted during foam rolling is mainly subjective in nature.
- Long term effects weren't measured.
- Since it's a pilot study, results weren't impressive.
- Due to small sample size only two parameters (pre and post-test of sit and reach and active knee extension) were measured, more parameters (comparison between foam rolling and static stretching and intensities with which both the techniques are being used) could be measure with large sample size.

Conclusion

The results of this study show that there is improvement in hamstring flexibility in all subjects, however static stretch for active lengthening of hamstring considering the muscle's strong fascial attachments (Table 1 & 2).[17]

Foam rolling in combination with static stretching, when done on lower back, hamstrings and calf muscles gave desired effects of increased flexibility of hamstrings when measured with SRT after the intervention was done.

Conflict of Interest: There are contradicting theories about foam rolling on lower back. Some say its safe and some thinks the opposite is right.

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Mindfulness Based Stress Reduction in Diabetic and Non-Diabetic Frozen Shoulder Conditions

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Abstract

The term "frozen shoulder" was first introduced by Codman in 1934. He described a painful shoulder condition of insidious onset that was associated with stiffness and difficulty sleeping on the affected side. Codman also identified the marked reduction in forward elevation and external rotation that are the hallmarks of the disease. Long before Codman, in 1872, the same condition had already been labelled "periarthritis" by Duplay. In 1945, Naviesar coined the term "adhesive capsulitis."[2] The pathophysiology of idiopathic adhesive capsulitis (frozen shoulder) is poorly understood. Most authors have reported various degrees of inflammatory changes in the synovial membrane. Adhesions between the shoulder capsule and the humeral head have been noted by some, but not all, authors.[4] The aetiology of periarthritis of the shoulder, however, is not clearly understood. Amongst the factors suggested are trauma myocardial infarction hemiplegia, pulmonary tuberculosis, thyrotoxicosis, cerebral tumor, and epilepsy.[7] The diagnosis of frozen shoulder is probably less frequent, but recognition of this abnormality has an important effect on therapeutic decisions and may prompt invasive therapy.[19] Mindfulness is the common ground of several complementary therapies. Derived from Buddhist spiritual tradition, mindfulness has been secularized and integrated into behavioral treatment approaches.[20]

Keywords: Frozen shoulder; Mindfulness Based Stress Reduction (MBSR).

Introduction

Musculoskeletal shoulder pain is the third most frequent reason People seek treatment from a healthcare professional and while there is evidence that suggests conservative interventions can reduce pain and improve function, 50% of patients report persistent pain at six months and 40% still have pain at one year.[1]

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Frozen shoulder, also known as adhesive capsulitis, is a disabling disease. It is characterized by shoulder pain and limitations of both active and passive range of movement in all directions. Limitation of glenohumeral movement is due to decreased intra-articular volume. It is the result of fibrosis and thickening of the joint capsule and adherence to the humeral head. Frozen shoulder is self-limiting in almost all cases. The natural

course takes 12–42 months before resolution. Fifteen percent of the patients experience long-term disability as a result of chronic loss of shoulder mobility (Fig. 1).[3]

Fig. 1: Frozen Shoulder

Patho-physiology of Frozen Shoulder

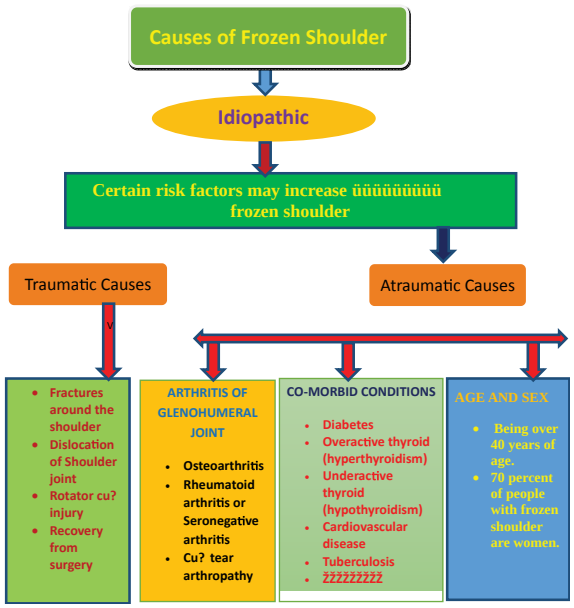
The pathophysiology of idiopathic adhesive capsulitis (frozen shoulder) is poorly understood. Most authors have reported various degrees of inflammatory changes in the synovial membrane. Adhesions between the shoulder capsule and the humeral head have been noted by some, but not all, authors. The optimum management of adhesive capsulitis has been the subject of great debate, particularly since the condition tends to resolve spontaneously over months to years. Intra-articular corticosteroid injections and/or physiotherapy programs combining exercise, physical agents, mobilization and simple home exercise programs are the most common treatment options used in patients with adhesive capsulitis.[4]

The pathology of frozen shoulder has been examined more recently by Bunker and Anthony who describe a 'Dupuytren's-like' contracture of the coracohumeral ligament and capsule which prevents external rotation. It is characterized by severe pain and insidious shoulder stiffness, which can cause almost complete loss of passive and active forward elevation and external rotation of the glenohumeral joint. The natural history of the condition follows a pattern of recovery which moves through three phases: the 'painful phase' lasting three to eight months, the 'adhesive phase' lasting four to six months, and the 'resolution phase' lasting 5 to 24 months. However, the literature suggests that for many patients the symptoms do not resolve completely, leaving them with prolonged pain or stiffness. The pain interferes with sleep and is increased by movement, the patient becoming more aware of limitation of movement as time passes. Some patients may be left with some restriction of movement, but in most there is no residual impairment. Recurrence in the same shoulder has never been reported, though up to 20% of affected persons develop the condition on the opposite side.[5,6]

Aetiology

The aetiology of periarthritis of the shoulder, however, is not clearly understood. Amongst the factors suggested are trauma myocardial infarction hemiplegia, pulmonary tuberculosis, thyrotoxicosis, cerebral tumor, and epilepsy. In this paper, an association of periarthritis of the shoulder with diabetes mellitus is described. The incidence of this condition in diabetic patients is compared with that in nondiabetic medical patients seen during the same period of time.[7,8]

Frozen shoulder can be either primary (idiopathic) or secondary. Secondary frozen shoulder is defined as that associated with trauma; rotator cuff disease and impingement; cardiovascular disease; hemiparesis; or diabetes (although some classify this in diabetics as primary frozen shoulder). The incidence of frozen shoulder in people with diabetes is reported to be 10% to 36%, and these tend not to respond as well to treatment as in nondiabetic.[9]



Flow Chart of aetiology of frozen shoulder

The aetiology is unknown. Lunberg and Helbig et al classified frozen shoulder as primary and secondary. The primary form is idiopathic, usually seen in women older than 45 years of age. Many predisposing factors can lead to secondary frozen shoulder, including upper extremity fracture with

immobilization, cervical disc disease, diabetes mellitus, head injury, and stroke. Double contrast shoulder arthrography is the definitive diagnostic test for adhesive capsulitis. Joint capacity, normally 14 mL or greater, is usually less than 10mL in adhesive capsulitis.[10]

Clinical Feature

Frozen shoulder limits the daily activities of the patients by causing pain around their shoulder and reducing the range of motion (ROM) of their joints. Limitation of ROM is due to the adhesion of the joints, hyperplasia of the synovial membranes through reduction of the area of the joint cavity, contraction of the articular capsule, and historical tissue proliferation. Such musculoskeletal system pain results in motor control disorders and degrades the balance control capability. These can cause secondary problems and weakening as well as psychological problems that will further limit the movements and weaken the muscles.[11]

Cyriax claimed that these symptoms occur in a natural cycle which cannot be altered by physical treatment. Phase 1: Pain at the limit of active movement leading to decreased Gleno-humeral range. Phase 2: Constant and severe pain referred down the arm, further decrease in Gleno-humeral joint range, slight jarring causing excruciating pain. Phase 3: Constant pain decreasing to pain on movement only. Range of glenohumeral movement unaltered. Phase 4: Decreasing pain on movement and increasing range of glenohumeral joint leading to full painless function. Each stage varies in duration, but it is rare for the constant pain to disappear in less than eight months, while it is common for all symptoms to remain for twelve to eighteen months.[12]

Differential Diagnosis

In early (freezing) stage might be a diagnostic challenge as it may mimic subacromial pathology and rotator cuff tendinopathy. Regarding shoulder impingement and rotator cuff pathology, patients report predominantly pain with less pronounced passive range of motion. Several facets help to distinguish frozen shoulder from other shoulder disorders. Regarding the causes other than Adhesive capsulitis, patients often state lifting a heavy object or performing repetitive overhead movements. In contrast, frozen shoulder patients usually describe spontaneous onset without an apparent cause or a history of overuse activity. Extra precaution should be paid in case of the history of malignancy.

Common conditions that may mimic early adhesive capsulitis:

- Subacromial pathology and rotator cuff tendinopathy.
- Post-stroke shoulder subluxation.
- Referred pain (cervical spine or malignancy, e.g., Pancoast tumor).

Later in the course of frozen shoulder, as severe restriction of motion comes to predominate, the diagnosis becomes more apparent. However, glenohumeral joint arthritis should also be considered, which can be ruled out by free shoulder movement following lidocaine injection to the glenohumeral joint.

Age of onset provides additional clues to diagnose AC. Frozen shoulder is unlikely in patients younger than 40 years of age, and patients older than 70 are more likely to develop rotator cuff tears or glenohumeral osteoarthritis instead of Adhesive capsulitis.[13]

Features of frozen shoulder are commonly present in patients with calcific tendonitis, fractures of the proximal humerus (especially those of the greater tuberosity), tears of the rotator cuff and early osteoarthritis of the glenohumeral joint. These pathologies can usually be detected using conventional radiographs and ultrasound examination. There are several causes of shoulder pain, but few shoulder disorders are associated with a markedly limited range of passive motion. Frozen Shoulder (FS) is differentiated from reflex sympathetic dystrophy by the vasomotor and trophic changes in the latter. It may be necessary to perform blood tests and radiography to exclude rheumatoid arthritis and bone diseases. Arthrography should be done in case of doubt. It is uncertain whether electromyography may be of value in a few cases with suspected neurological disease. Arthroscopy seems not to be useful in diagnosis of frozen shoulder. Since diabetes mellitus is over represented in patients with frozen shoulder, this disease should be considered in patients with frozen shoulder.[14,15]

The differential diagnosis of Frozen Shoulder.[16]

Traumatic and Infectious Causes	Degenerative and other Causes
Fracture of clavicle	Acute calcific tendonitis/ bursitis
Fracture of scapula	Secondary Bursitis of the shoulder

Traumatic and Infectious Causes	Degenerative and other Causes
Fracture of shaft of humerus	Arthrosis of the shoulder,
Fracture of upper end of humerus	Osteoarthritis of the acromioclavicular joint
Contusion of shoulder and upper arm	Osteoarthritis of the cervical spine
Impingement syndrome of the shoulder	Osteoarthritis of the glenohumeral joint
Injury of blood vessels at shoulder and upper-arm level, including avascular necrosis	Cervicobrachial syndrome
Osteoporosis with pathological fracture	Rheumatoid arthritis
Injury of nerves at shoulder and upper-arm level, including supra-scapular nerve entrapment	Radiculopathy, Cervicalgia & Cervical disc disorders
Injury of muscle and tendon at shoulder and upper-arm level, including Labral lesions	Juvenile rheumatoid arthritis
Sprain and strain of acromioclavicular joint	Neoplasm
Sprain and strain of sternoclavicular joint.	Fibromyalgia
Diseases of the digestive system	Persistent somatoform pain disorder
Pyogenic arthritis	Psychological and behavioural factors associated with disorders or diseases
Pain in thoracic spine	Somatoform autonomic dysfunction

Diagnosis

The diagnosis of painful stiff shoulder (capsular syndrome) was made using the standard diagnostic guidelines for shoulder complaints, that is, passive glenohumeral mobility must be painful and limited, lateral rotation must be relatively more restricted than abduction and medial rotation, and there must be no clear signs (painful arc, positive resistance tests, loss of power) that the shoulder pain was caused by another condition. After enrollment prognostic indicators and baseline values of outcome measures were assessed.[17]

Adhesive shoulder capsulitis is a clinical diagnosis made on the basis of medical history and physical exam and is often a diagnosis of exclusion. Other causes of a painful stiff shoulder must be excluded before a diagnosis of adhesive capsulitis is rendered, including septic arthritis, mal-position of orthopedic hardware, fracture malunion, rotator cuff pathology, glenohumeral arthrosis or cervical radiculopathy. Clinically, patients with this condition usually first present with shoulder pain followed by gradual loss of both active and passive range of motion (ROM) due to fibrosis of the glenohumeral joint capsule. BoyleWalker et al. observed that the majority of patients (90.6%) reported developing shoulder pain before loss of motion. External rotation is often the first motion affected on clinical examination, with steady global loss of ROM with disease progression. Pain is generally worse at the extremes of motion, when the contracted capsule is stretched. Passive ROM is lost with firm painful endpoints of motion, suggesting a mechanical rather than a pain-related restriction to motion. Imaging studies are not necessary for the diagnosis of adhesive shoulder capsulitis but may be helpful to rule out other causes of a painful and stiff shoulder. Plain films of the shoulder may reveal osteopenia in patients with prolonged adhesive capsulitis secondary to disuse (i.e. disuse osteopenia). Magnetic resonance imaging (MRI) and magnetic resonance angiography (MRA) may reveal thickening of capsular and pericapsular tissues as well as a contracted glenohumeral joint space. Mengiardi et al. reported that MRA findings of coracohumeral ligament (CHL) ligament thickness 4mm (95% specificity, 59% sensitivity) or capsule thickness 7mm (86% specificity, 64% sensitivity) may aid in the diagnosis of adhesive capsulitis. Dynamic sonography may reveal thickening of the joint capsule and limited sliding movement of the supraspinatus tendon. These findings correlate with intraoperative direct visualization, documenting thickening of primarily the rotator interval and CHL.[18]

The diagnosis of frozen shoulder is probably less frequent, but recognition of this abnormality has an important effect on therapeutic decisions and may prompt invasive therapy.

Magnetic resonance (MR) imaging is widely used to assess shoulder pain. A large number of publications have described the MR imaging assessment of the rotator cuff, labrum, capsule, and biceps tendon, and abnormalities of these structures are frequently described in radiology reports.

MR arthrography was performed in all patients to demonstrate additional pathologic condition. The referring clinician initiated MR arthrography to rule out an additional rotator cuff tear in 20 patients with frozen shoulder and to rule out an additional lesion of the long biceps tendon in two patients. At arthroscopy, all patients showed signs of synovitis in the area of the rotator cuff interval. Eight patients had an intact rotator cuff. Three patients had a full-thickness tear of both the supraspinatus and the infraspinatus tendons, seven patients had

a full-thickness supraspinatus tendon tear, and four patients had a partial-thickness tear of the supraspinatus tendon. In five patients an additional partial or complete tear of the subscapularis tendon was present. In one patient the tendon of the long head of the biceps was torn.

MR arthrography reveals characteristic findings in patients with frozen shoulder. Thickening of the CHL and the capsule at the rotator cuff interval and complete obliteration of the fat triangle under the coracoid process (subcoracoid triangle sign) are the most characteristic MR findings in frozen shoulder.[19]

Management

Mindfulness is the common ground of several complementary therapies. Derived from Buddhist spiritual tradition, mindfulness has been secularized and integrated into behavioral treatment approaches. In this study total 117 patients has taken and MBSR given 8 weeks programmes for 90 minutes session. This systematic review found only inconclusive evidence of short-term effectiveness of MBSR in improving pain intensity and disability in patients suffering from low back pain. However, there is limited evidence from 2 wait-list controlled trials that MBSR can improve pain acceptance.[20]

MBSR has been seen to manage chronic pain as highlighted by Kabat-Zinn (2003). A study in Manitoba conducted by Carlson et al. (2003) has shown that MBSR in primary care setting with chronic pain patients has shown a decline in intensity of pain, psychological distress, disability, willingness in life activities, acceptance of pain and subjective rating of current pain. A few other studies conducted by the founder of MBSR in patients with chronic pain (Kabat Zinn, et al., 1982, 1985, 1987). The results suggested some relief in pain however self-reported pain did increase following completion of MBSR in some cases but did not return to pre interventional levels.

A significant decrease in psychological distress was also reported and also the benefit was maintained over an extensive follow up period of 4 years. Zatura et al. (2001), carried out a study of patients with rheumatoid arthritis who participated in MBSR programme and achieved the understanding of one's mood and emotions had better clinical outcomes. Another study in fibromyalgia patients by Kaplan et al 1993 also reported that there was a significant reduction (39%) in psychological distress however lack of control group in the study points to methodological limitations (Bishop, 2002).[21]

Body and Mind Dimensions of Diabetes Before we address the applications of MBSR to those with diabetes, it affect both body and mind. Diabetes poses a major life stress that requires considerable physical, emotional, and psychological accommodation and coping. This heavy burden is related to at least four principal factors: Anxiety, Depression, Social burden & Diabetes complications.

MBSR improve glucose control, much more work is needed to better understand the myriad possible applications of MBSR to diabetes care. The ability of MBSR techniques to lower stress and improve coping could have very broad applications in the care of diabetes and related conditions.[22]

All study participants were adults with chronic diseases, including conditions such as fibromyalgia, chronic pain, rheumatoid arthritis, type 2 diabetes, chronic fatigue syndrome, multiple chemical sensitivity, and cardiovascular diagnoses.

Published studies have demonstrated that while MBSR programs might not reverse underlying chronic disease, they can make it easier to manage and cope with symptoms, improve overall well-being and quality of life, and enhance health outcomes. MBSR as an adjunct to standard care has potential for much wider application in Australian primary care settings.[23]

MBSR intervention as a psychosocial intervention done in cancer patient for a period of 6–15 weeks, We retrieved 15 original studies that involved cancer populations, but only 10 reports, comprising 583 individuals who completed pre- and post-assessment, were included in the meta-analysis. With 9 of the 10 eligible studies focusing on breast cancer, majority of the patients who participated were female, comprising 79% of the total cancer patient population meta-analyzed. The modal stage of various types of cancer was Stage II, with patients either still in active disease or in remission while participating in the MBSR programs. Of the total pre-intervention patient population from seven studies that reported the breakdown of cancer staging (two studies overlapped patients), 81% of participants were in early stages (Stages 0–II), with the remaining 19% in late stages (Stages III–IV).

The small number of studies included in this meta-analysis point to our inability to generalize these results to the overall cancer population. However, the homogeneity of results found

among the mental health variables allows us to conclude that MBSR is effective in improving the psychosocial conditions of breast cancer patients.[24]

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Case Report

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Rehabilitation of Post Traumatic Intra-Articular Elbow Fracture in Osteoporotic Patient: A Case Report

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Abstract

Isolated fractures of capitellum are often more complex and involve lateral epicondyle, trochlea and posteriorly distal part of humerus. The intra-articular complexity of these fractures requires optimal surgical exposure and implants for successful outcomes. When the fracture is displaced, unfavourable outcomes can occur and lead to early arthritis. Additionally, elbow pain and stiffness due to immobilization or surgical reduction and stabilization can limit one's overall upper extremity function. Superior results are attributed to anatomic reduction and stable fixation with early ROM exercises. Rehabilitation following such a fracture is complex and can be challenging. Therefore, the aim ofthis case report is to present the evaluation and rehabilitation of a 51-year-old female following acomplicated comminuted capitellum and trochlea of humerus fracture post reduction and instrumentation. The rehabilitationover a 6 months course was done and the benefits of joint specific manual therapy in the rehabilitation were emphasized.

Keywords: Humerus fractures; Osteoporosis; Intra-articular.

Introduction

In adults, most distal humerus fractures are intra-articular and involve both medial and lateral columns.[1] These fractures are more evident among women because of higher rate of osteoporosis and difference in carrying angle between men and women.[1] There have been variable reports as regards to functional outcome of open reduction and internal fixation of these fracture.[1]

Achieving a good functional range of motion at the elbow with stability are the primary objectives in managing a comminuted distal humerus fracture. Hence, it is very necessary to determine if fracture fixation is successful in achieving a stable mobile joint.[2,3,4]

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Elbow is the intermediate joint of the upper limb constituting the mechanical link between upper arm and hand. Elbow joint forms an important link of kinematic chain to carryout activities of daily living such as eating, combing, bathing dressing etc.

Loss of ROM at elbow post trauma results in difficulty and loss of upper limb functions and makes the person dependent on other person for his ADLs. Residual post-traumatic joint incongruity may lead to elbow osteoarthritis.[5] Additionally, it is well documented that elbow stiffness ensues following elbow fracture.[2,6,7] Outcome research on rehabilitation following elbow fracture treated conservatively or surgically is limited although most protocolsrecommend both active and passive range of motion (ROM). This case report presents the examination findings of a comminuted capitellum and trochlea of humerus fracture with subsequent open reduction internal fixation (ORIF), the interpretation of the examination findings, interventions used during the rehabilitation process, and the outcomes of treatment. More

specifically, this case report highlights the addition of joint specific manual interventionto the patient management to restore mobility and full elbow function.

Case Report

A right handed 51-year-old medical doctor was referred to physical therapy for evaluation and treatment of a comminuted capitellum and trochlea fracture post ORIF secondary to a fall while descending a staircase two weeks prior. Upon injury, she landed with direct impact to right elbow by hitting against a wall. She was been taken to emergency care. Elbow Radiographs and CTscans were taken at that time, however a comminuted fracture of right capitellum and trochlea of humerus was diagnosed with computerised tomography. A day later, she was operated for open reduction internal fixation. One-week Post surgery she was referred for Physical Therapy with a cast extending above elbow to the hand, for mobilization of uninvolved shoulder & wrist joints of right upper extremity, which included active and active assisted movements. Six weeks post operation ensuring visible bony union on radiographs Intensive Physiotherapy was started. Following cast removal, the patient had begun to use her arm for simple activities but reported significant stiffness and moderate pain in her right elbow, forearm, wrist, and hand. The patient reported increased symptomsin the morning with mild increase in flexibility as the day progressed; however, the stiffness and sorenesswere present throughout the day. She reported difficulties while bathing and self-care tasks due to her limited ROM and weakness also she had to rely on others for same. She was unable to use her right upper extremity for most activities of daily living (ADL's) and lifestyle tasks such as cooking, cleaning and laundry. Her primary complaints at the time of the initial evaluation were: significant restrictionin ROM, weakness in the upper extremity, and increased pain, tingling sensation along ulnar border of forearm and little finger. She rated her pain on a VAS as 7/10 at the time of the initial evaluation. This patient's goal was to regain normal use of herright arm for her work and lifestyle activities.

She was been diagnosed with osteoporosis and was accordingly given medication for the same. She did not have any contraindications to begin physical therapy, and was referred for physical therapy. Instructions for Physical Therapy included for full AROM and gentle PROM, so a modified elbow examination was completed.

Clinical Examination

The patient was evaluated for the initial examination.

Fig. 1: Preoperative CT showing fracture of capitellum and trochlea.

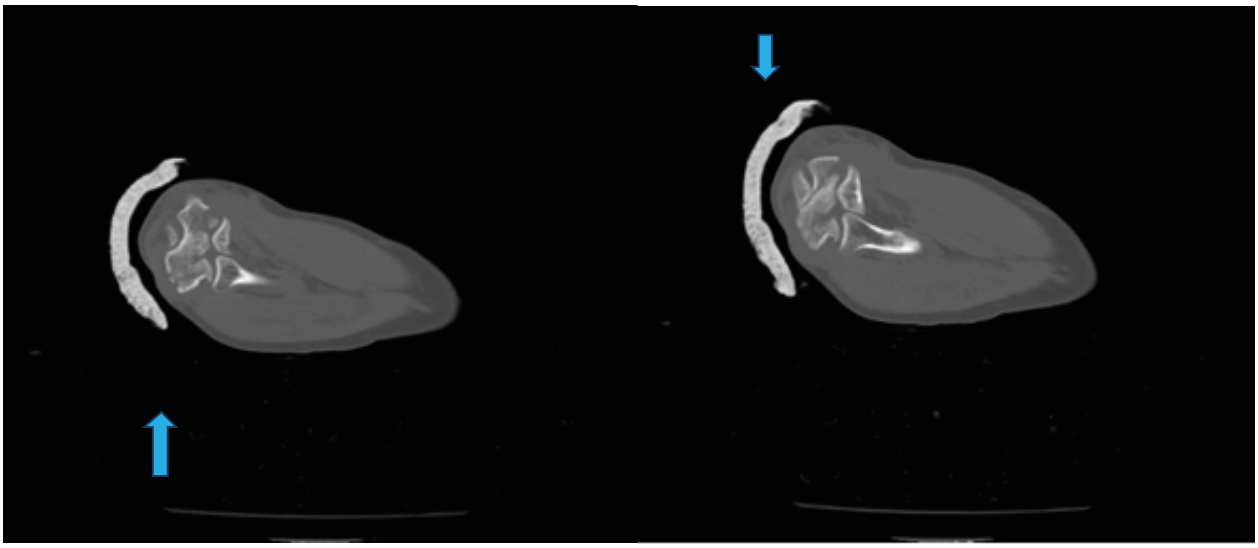

Fig. 2: Post-operative radiographs of comminuted fracture of capitellum and trochlea of humerus post instrumentation.

Lateral view AP view

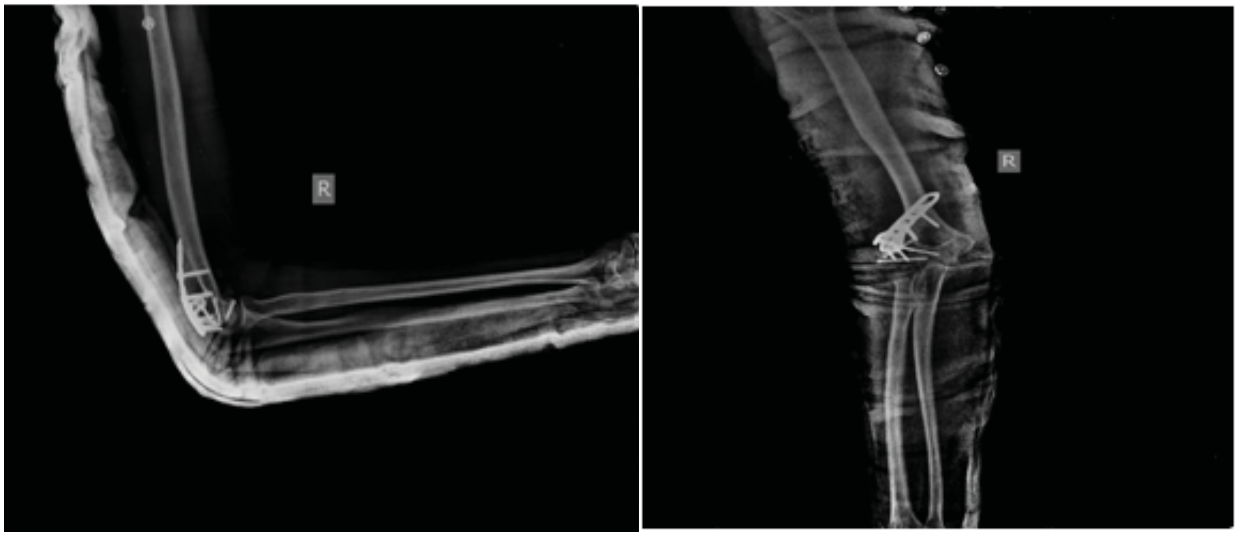

Fig. 3: Post-operative radiographs ofcomminuted fracture of capitellum and trochlea of humerus 3 months post instrumentation.

AP view Lateral view

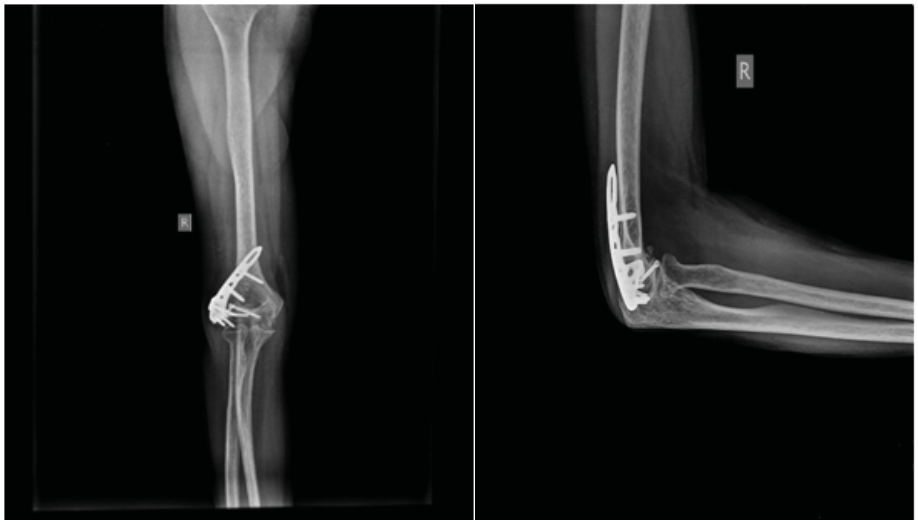

Fig. 4: .

Initial Physical Examination.

Inspection

Girth Measurement: above elbow, 9 cm from olecranon

Right 24.5cm Left 23 cm

Below elbow, 5 cm from olecranon.

Right 21.cm Left 20 cm

Range of Motion

Initial evaluation	Rt arm		Lt arm		Endfeel
	AROM	PROM	AROM	PROM	
Elbow					
Flex/extension	60º–75º	65º – 80	0 –145	0 – 150	Firm
Forearm					
Pronation	0 –20	0 – 25	0 – 85	0 – 90	Firm
Supination	0 –35	0 – 45	0 – 90	0 – 90	Firm
Wrist					
Flexion	0 – 70	0 – 80	0 – 85	0 – 90	Firm
Extension	0 – 70	0 – 85	0 – 90	0 – 90	Firm
Ulnar deviation	0 – 20	0 – 30	0 – 35	0 – 40	Firm
Radial deviation	0 – 5	0 – 10	0 – 20	0 – 20	Firm

Palpation: Palpable tenderness and increased muscular tone noted. Skin was warm to touch. Muscle testing was not performed during the initial evaluation due to surgical precautions, and due to the post-surgical nature of her injury.

Increased warmth and tenderness to palpation were noted around the entire elbow joint.

Scar examination

Location: lateral aspect of right elbow joint.

Extends from above capitellum to radial head.

Well healed measures 10 cms.

Tenderness over scar with minimal adherence to underlying tissue.

The Mayo Elbow Performance score (MEPS) was found to be 45/100 before the rehabilitation.

Muscle testing was not performedduring the initial evaluation due to surgical precautions.

Interpretation of Clinical Examination Findings and Diagnosis

The capsular pattern of limitation for the elbow is flexion limited much more than extension.[8] On examination, it was found that there was limitation of motion into elbow flexion, extension, supination, and pronation. Based on the examination findings, the patient presented with a non-capsular pattern of limitation status post immobilization. This patient had significant limitations of motion in both flexion and extension during active and passive ROM. End-feel at the end-range of both flexion and extension was firm. A non-capsular pattern of limitation at elbow joint due to the immobilization was considered as the primary physical therapy diagnosis.

Prognosis and Treatment Plan

The prognosis for this patient was good. She was highly motivated to return toher active lifestyle. Due to the elbow tendency for stiffness[6,9,10] following a traumatic injury,and due to immobilization post operatively, there was a significant probability she would not regain full elbow range of motion and function. However, the physical therapy expectation was that shewould gain functional mobility of the elbow and be able to return to her prior level of activity without limitation. The primary goal was to allow her to return to her full work duties as Medical Professional.

Treatment strategy: Multi-treatment approach was incorporated to treat the patient time to time regularly over 6 months duration. Patient was given Paraffin wax bath therapy to relieve pain and increase extensibility of the tissues surrounding joint. During the first six to eight weeks, the physician's prescription consisted of AROM within limits of pain and mobility and strength training exercises for shoulder and wrist. Consequently, ranges at elbow improved, however tingling sensation along the ulnar nerve distribution along little finger intensified with extreme ROM at elbow. As a result, we were not able to progress PROM and were able to continuewith gentle active hold relax techniques and soft tissue mobilization. After one-week following above, manual interventions including soft tissue management andjoint mobilizations were used to achieve her ROM goals. Passive ROM included elbow flexion, extension, supination andpronation of forearm. Joint specific mobilization to improve elbow ROM were added to the treatment plan. However utmost caution was exercised in terms of pressure exerted during mobilization as patient was osteoporotic.

Joint specific manual techniques included:

Humeroradial joint dorsal & volar glide.

Humeroradial joint: compression mobilization, quick thrust with simultaneous supination and compression of radius.

Distal radioulnar joint: dorsal (supination)

Humeroulnar joint: distraction volar glide (pronation)

Humeroulnar joint: distraction with glide (scoop motion)

Mobilization with movement (MWM): lateral glide applied to proximal ulna while patient actively flexes, followed by passive end-range stretch.

Task oriented multiple angle isometrics.

Active hold relax technique.: (a) elbow extensors (b)elbow flexors

Theraband exercises for strengthening elbow flexors

Joint specific mobilizations were performed for 4 – 5 bouts of 40 seconds per mobilization. Exercises included general strengthening for the shoulder complex, biceps, triceps, and forearm supination and pronation.

Outcomes: Outcomes of the Final Examination.

Inspection: Healthy appearing female in no apparent distress.

Girth Measurement: above elbow, 9 cm from olecranon.

Right- 23.cm Left- 23 cm

Below elbow, 5 cm from olecranon.

Right- 20.cm Left - 20 cm

Range of Motion

	Rt arm		Lt arm		End-feel
	AROM	PROM	AROM	PROM	
Elbow					
Flex/extension	35º–130º	30º – 135	0 –145	0 – 150	Firm
Forearm					
Pronation	0 –85	0 –90	0 – 85	0 – 90	Firm
Supination	0 –75	0 – 85	0 – 90	0 – 90	Firm
Wrist					
Flexion	0 – 85	0 – 90	0 – 85	0 – 90	Firm
Extension	0 – 85	0 – 90	0 – 90	0 – 90	Firm
Ulnar deviation	0 – 30	0 – 35	0 – 35	0 – 40	Firm
Radial deviation	0 – 15	0 – 20	0 – 20	0 – 20	Firm

Palpation: No palpable tenderness or increased muscular tone noted at extremityNo pain and swelling at elbow joint.

Muscle power:

Shoulder	Right	Left
Flexors	5/5	5/5
Extensors	5/5	5/5
Abductors	5/5	5/5
Adductors	5/5	5/5
Internal rotators	5/5	5/5
External rotators	4+/5	5/5
Elbow		
Flexors	4+/5	5/5
Extensors	4/5	5/5
Forearm		
Pronators	4+/5	5/5
Supinators	4+/5	5/5

Scar examination: well healed without any adherence to underlying tissue.

The Mayo elbow performance score(MEPS) was found to be 85/100post rehabilitation.

Discussion

Intra–articular capitellar fractures are often more complex and involve the lateral epicondyle, trochlea, and posterior aspect of the distalhumerus.The complexity of these fractures is better appreciated by computed tomographic (CT) scans.[4,11,12] Closed reduction, immobilisation and fragment excision are known to cause poor outcomes.[13] Fractures of the capitellum and trochlea are prone to non-union when they create multiple articular fragments and there is posterior comminution.[10] The intra-articular and complex nature of these fractures require optimal surgical exposure and implants for successful outcome measures.

Patient education[14,15] is an important factor which is essential in the rehabilitation of elbow fractures.[14] However, there are limited references in the literature to any fixed protocol in postoperative management, and thesources do not show a unanimous consensus on the implementation of a rehabilitation program[14,16] because there is still a controversy on whether early or delayed rehabilitation is anoptimum approach for greater functional recovery.

There are no established protocols regarding beginning of rehabilitation.[14,16,17] However,a rehabilitation program after an operation for comminuted fracture of capitellum and trochlea may represent the difference between a functional and a non-functional extremity.[14] Also, good communication is essential between the surgeon and the team responsible for the rehabilitation[4] for the implementation of a systematic rehabilitation protocol.[16] Moreover, the treatment must be individualized and adapted to each of the stages of recovery in patients. With regard to the onset of treatment, although some authors prefer immediate mobilization[17] (after the surgical intervention), most of them recommend mobilization within 10 to 20 days after the operation.[7,15,18] The delay in mobilization allows the soft tissue to scar during that period. Somesurgeons prefer an active movement of the elbow after surgery as it promotes the stability of the elbow through the recruitment of motor units which help to achieve a dynamic stabilization of the elbow.[14] The active motion of the joint stimulates arterial flow and venous and lymphatic fluid return.[20] The immobilization period and the onset of the rehabilitation treatment is still subject under debate, although it is a known fact that long immobilization may contribute to higher rigidity and functional loss, and to poorer results [14,15,16] caused by a higher adherence of joint capsule and the surrounding soft tissue.[19] In our case, the average immobilization time was 6 weeks.

There is no established consensus either with regard to the different modalities of rehabilitation treatment or treatment techniques.[14,15,17] The findings may be summarized as follows:

The initial objective of the treatment is the control of pain and oedema, as well as joint release.[14] In our caseshe had approximately 1.5 cm of swelling about the elbow joint. Once the oedema and the pain have subsided, the activemobility program can be started at an early stage.[16] Active ROM and active-assisted ROM is more commonly used and preferred than passive ROM for joint improvement and release, with better functional outcomes.[14,15,16,18] The muscles which surround the elbow become weak as they lose the ability to generate enough tension after the trauma, and the treatment strategy directs exercises for muscle strengthening to strengthen the joint.[20] These exercises may be implemented in the fibroblastic stage of scarring, approximately at week 6 after the surgical intervention.[20] Task oriented multiple angle isometric exercises played a key role in achieving the functional range at elbow joint. The use of superficial thermotherapy is beneficial[14,15,20] to add elasticity to the capsule and soft tissue, also to improve tissue extensibility.[14] In our case we had used Paraffin wax bath Therapy to serve the purpose. Cryotherapy is used after the treatmentsession to provide analgesic effect

and relieve soreness post exercises.[14] Ultrasounds, magnetotherapy, acupuncture, laser are not indicated in this fracture with implants in situ.[14] Scar mobilization should only be used in the treatment of wounds and scars, around 3–4 weeks after surgery, in order to desensitize the area, and to reduce scar hypertrophy and assist in the remodelling of the scar tissue.[16] It is essential to educate the patients and to teach them a program of home exercises, both in the immobilization stage, in order to prevent the rigidity of the associated joints (wrist and shoulder) and during the rehabilitation treatment.[7,16] With regard to the duration of the treatment, the optimum time of rehabilitation and the number of sessions required is an unknown factor which varies according to the type of patient.[15] In our series the average time was six months, though it may take up to 6–12 months to recover the strength and function.[14]

Functional Results

With regard to the recovery of range of motion, the final ROM was flexion /extension around 135 – 30 degrees and with pronation of 0 – 90 degrees and a supination of 0 – 85 degrees. This is considered to be good mobility in comparison with similar studies.[19] A flexion and extension arc close to 120/–30 degrees with approximately 50/50 degrees of pronation and supination was considered acceptable for most daily living activities [DLAs].[7,15] For their part, some authors claim that a range of 120/–60 degrees would be enough to carry out most DLAs with minimum difficulty.[7] With regard to the results assessed through theMayo index, a good result was obtained in most cases, like studies of Pugh and McKee and Mullati.[19,21,22] However, the combination of a surgical treatment protocol and an individualized rehabilitation protocol may account for the good results.

Conclusion

Isolated fractures of the capitellum are often more complex and, when the fracture is displaced, can result in unfavourable outcomes leading to early arthritis and limited ROM. This reported case presented thesuccessful management of a 51-year-old female following a complicated capitellum and trochlea of humerus fracture. The rehabilitation was conducted over asix-month period with the inclusion of joint specific manual therapy to restore elbowrange of motion, and gain independence in functional activities.

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Article in supplement or special issue

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