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Rotator cuff repair: Impact of Shoulder Therapeutic Exercises on Patients' Outcomes

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Abstract
Background: Following rotator cuff surgery, the goal of exercise therapy is to preserve elbow, wrist, and hand range of motion while enhancing glen humeral joint range of motion. **Aim:** Evaluate the effect of implementing shoulder therapeutic exercises on patients' outcomes (pain, function, active forward flexion, strength, satisfaction and complications).for patients with rotator cuff repair. **Design:** A quasi-experimental research design was used to achieve the study's aim. **Setting:** This study was carried out at Arthroscopy unit, orthopedics surgery department and its outpatient's clinics at Assiut university hospitals**. Subjects:** A convenient sample of 40 patients were divided into two groups (study group and control group) of 20 patients each **Tools:** Three tools were used to achieve the aim of the study. **Tool I:** patient's assessment questionnaire**. Tool II:** Modified UCLA (University of California at Los Angeles) Shoulder Rating. **Tool III:** Shoulder therapeutic exercises. **Results:** The results showed that near to three quarters (70%) had fair level of shoulder rating scale while the control group had two fifth (40%). There was statistically significant difference at follow up between study and control group **Conclusion:** Shoulder therapeutic exercises improved patients' complications and shoulder rating scale among the study groups' patients. **Recommendation:** The study on huge probability sampling should be applied.

Keywords: Outcomes, Rotator cuff repair & Shoulder therapeutic exercises

Introduction
A collection of tendons and muscles called the rotator cuff creates a cuff across the shoulder joint. In addition to supporting shoulder joint motion, these muscles and tendons also hold the arm in place. When tendons are injured or overused, they can tear, causing discomfort and limited arm movement. **(George et al., 2022)**

Up to 70% of all doctor visits related to shoulder discomfort are caused by rotator cuff (RC) tears, which are the most common cause of shoulder pain. Age-related increases in the occurrence of RC tears range from 9.7% in individuals under 20 years old to 62% in patients over 80 years old. Optimal management is still debatable despite this broad prevalence in the general community. **(Naidoo et al., 2020)**

Rotator cuff tears can be classified as partial or full-thickness pathologically. The incidence of full-thickness rotator cuff injuries ranged from 7% to 19%, according to Cadaver investigations. One of the most prevalent shoulder conditions, rotator cuff tears, whether full-thickness or partial-thickness, result in pain, weakness, and joint dysfunction. Because a full-thickness rotator cuff tear typically affects a vast area, surgical therapy may be more involved than for a partial tear. **(Jinlong et al., 2021)**

Reattaching the tendon to the humerus (upper arm bone) is typically the procedure used during surgery to repair a torn rotator cuff. A partial tear, on the other hand, might just require a debridement, which is a clipping or smoothing process. Stitching the tendon back to the humerus's original location fixes a full tear. **(Quinten et al., 2021)**

Open, mini-open, and arthroscopic surgical repair are the methods used to restore shoulder function in patients with noncompliant symptoms following rotator cuff injuries. Arthroscopic repair has become the new standard in rotator cuff procedures, progressively taking the place of the open technique due to advancements in experience and technology. **(Chul-Hyun Cho et al., 2022)**

Anesthesia-related complications, infections (very rare with arthroscopic procedures), nerve injury, blood vessel injury, bleeding (very rare), shoulder stiffness, the incidence of postoperative stiffness following ARCR (Arthroscopic Rotator Cuff Tear) varies from 2.3 to 28.5%, failure of repair (failure of the tendon to heal to bone), failure of the anchors or sutures, complications from anesthesia, and complex regional pain syndrome (a painful condition involving the arm) are among the possible causes of complications. **(Dickinson et al., 2020)**

After shoulder surgery, a gradual return to daily activities and regular exercises to regain shoulder

range of motion and flexibility are essential for a successful recovery**. (Héctor et al., 2020)**

Significance of the study

RC tears result from degeneration or trauma. The main symptoms, which lead to functional impairment, are discomfort and weakness during arm raising. In cases where full- or partial-thickness tears exceed 50% of the transversal or longitudinal tendon size, early surgical repair of traumatic RC tears is advised. Assiut University Hospital recorded 120 cases of rotator cuff repair and surgery annually in its statistical report **(Assiut University Hospital Record, 2023).** Delays in motion can worsen the chance of shoulder stiffness and atrophy following surgery, as well as impede functional recovery **(George et al., 2022).** Therefore, our goal was to try and develop therapeutic exercises for the shoulder to enhance early functional recovery.

Operational definitions

Surgery, rehabilitation and outcomes

- **Rotator cuff repair** is surgery to replace a damaged shoulder tendon. Shoulder arthroscopy, which makes use of tiny incisions, or a big (open) incision, can be used for the surgery.
- **Shoulder therapeutic exercises:** It includes information on rotator cuff repair, teaching patients about passive range of motion exercises, active assisted exercises, and active, isometric exercises that the researcher provides and that the patient must do in order to reduce pain, improve function, active forward flexion, strength, and satisfaction for patients undergoing rotator cuff repair.
- **Patients' outcomes:** Measurement based on comparisons of outcome measures (pain, function, active forward flexion, strength, satisfaction) and complications for patients after rotator cuff restoration between the two groups (study & control).

Aim of the study

General objective: To evaluate impact of shoulder therapeutic exercises on Patients' Outcomes

Specific objectives:

1. Assess pain, function, active forward flexion, strength, satisfaction) and complications for patients with rotator cuff repair.
2. Implement shoulder therapeutic exercises for rotator cuff repair patients
3. Evaluate the effect of implementing shoulder therapeutic exercises on patients' outcomes (pain, function, active forward flexion, strength, satisfaction) and complications for patients with rotator cuff repair.

Research Hypothesis

H1: The incidence of pain level after application of shoulder therapeutic exercises among patients in the study group will be less than those in the control group.

H2: Function, active forward flexion, strength and satisfaction after application of shoulder therapeutic exercises among patients in the study group will be improved than those in the control group

H3: The incidence of complications after application of shoulder therapeutic exercises among patients in the study group will be less than those in the control group.

Materials and Method

Study design: A quasi-experimental research design was used to achieve the study's aim.

Setting: The study was conducted at Arthroscopy unit, orthopedics surgery department and its outpatient's clinics at Assiut university hospitals.

Study sample:

A convenient sample of 40 patients were divided into two groups (study group and control group) of 20 patients each, who volunteered to participate in the study regardless of gender, education level, or location.

The sample size:

The sample size was calculated using "G power software version 3.1.9.7 based on an expert opinion by Cohen effect size 0.5.the total sample size was 40 adult patient's male and female with rotator cuff repair with power (1-β err prob) 0.8 and α err prob 0.05.

Inclusion criteria

1. Age from 18-65 years
2. Small tear (less than3 cm). Medium (1-3cm), large-sized (3-5 cm)
3. Accept and sign the informed consent form.

Exclusion criteria

Patients will be excluded if they meet the following criteria:

1. Massive tears (more than 5 cm) or tendon retraction
2. Anteroinferior labral (Bankart) lesions.
3. Severe glenohumeral osteoarthritis.
4. Previous surgery on the affected shoulder and re-tears of the RC.

Tools of the study:

Three tools were used to achieve the aim of the study.

Tool I: Patients' assessment questionnaire

This tool was developed by the researcher based on the national and international literature **(Asheesh et al., 2024, Ahmed, 2023)** and used to assess patients with rotator cuff tear, and included 3 parts as follows:

Part 1: Demographic characteristics, such as age, gender, residence, educational level, occupation.
Part 2: Medical assessment: which includes duration of symptoms, risk factors for rotator cuff tear, affected side, type of rotator cuff tear, tear size, previous surgery.
Part 3: Assessment of complications: which include -Surgical complication (regional pain syndrome, stiffness, superficial infection), readmission, reoperation rate

Tool II: Modified UCLA (University of California at Los Angeles) Shoulder Rating

A helpful assessment tool for determining how well a shoulder injury has functioned following therapy is the UCLA Shoulder Scale. A revised version was created **in 1986 by Ellman et al**. through a follow-up investigation of individuals who had rotator cuff surgery. Pain, function, active forward flexion, strength, and satisfaction are evaluated with it. The five distinct dimensions that make up the updated UCLA Shoulder Score are: pain (10 points), function (10 points), active forward flexion (5 points), strength (5 points), and satisfaction (5 points). Together, these domains are scored for a total of 35 points. The UCLA Shoulder Scale as a whole has great reliability (ICC = 0.99, 95% CI 0.97-1.00). The entire UCLA Shoulder Scale (Thai version) shown moderate to high associations with Quick DASH, Western Ontario Rotator Cuff (WORC), and the American Shoulder and Elbow Surgeons (ASES) overall.

Interpretation of scores

An excellent score is 34 to 35 points; a good score is 28 to 33 points; a fair score is 21 to 27 points and a poor score is 0 to 20 points

Patient satisfaction

0 Patient feels procedure was not successful
1 5 patient feels procedure was successful

Active forward flexion range of motion

0 Less than 30 degree
1 30-45 degree
2 45 -90 degree
3 90-120 degree
4 120-150 degree
5 Greater than 150 degree

Strength of forward flexion

0 No active contraction
1 Evidence of slight muscle contraction , no active elevation
2 Complete active forward flexion with gravity eliminated
3 Complete active forward flexion against gravity
4 Complete active forward flexion against gravity with some resistance
5 Complete active forward flexion against gravity with full resistance

Pain

1 Present always and unbearable, strong medication frequently
2 Present always but bearable, strong medication occasionally
4 None or little at rest, present during light activities, salicylate frequently
6 Present during heavy particular activities, salicylate occasionally
8 Occasionally and slight
10 None

Function

1 Unable to use limb
2 Only light activities possible
3 Able to light housework or most activities of daily living
6 Most house work , shopping and driving possible: able to do hair,to dress and undress
8 Slight restriction only, able to work above shoulder level
10 Normal activities

Total

Excellent 34-35
Good 28-33
Fair 21-27
Poor 0-20

Figure (1): Geniometer adopted from (Dickinson et al., 2020)

Tool III: Shoulder therapeutic exercises: It included three parts

Part 1: Immobilization of shoulder and passive exercise (first 6 weeks):

Part 2: Active Assistive exercises that include (Second 6 weeks)

- Pendular movements forwards and backwards
- Standing arm stretch
- Shoulder elevation
- External rotation
- Internal rotation

Part 3: Active and isometric exercises that include (3 -6 months)

- Walk up exercise (active)
- Shoulder forward elevation (active)

- Shoulder abduction (active)
- Shoulder extension (isometric)
- Shoulder external rotation (isometric)
- Shoulder adduction (isometric)

Ethical considerations*:*

All research ethics guidelines are met in accordance with **the 1997 Helsinki Declaration of the World Medical Association**. After outlining the nature and goal of the investigation, before beginning the study, approval with **IRB no. 1120240572** was acquired from the Research Ethical Committee, Faculty of Nursing, and Assiut University on **February 26, 2023.** The head of Assiut University Hospital's outpatient clinics, orthopaedic surgery department, and arthroscopic department gave their official approval for the study to be carried out. Patients who agreed to participate gave their oral agreement after being reassured that their information would be kept private and used only for the intended purpose of the study. There were no health risks identified in relation to the research issue of privacy during the data collection phase.

Pilot study:

Prior to gathering data, a pilot research with four patients (10%) were conducted in order to assess the clarity, objectivity, relevance, practicality, and applicability of each tool. This was necessary for any queries that called for gathering data, and the appropriate adjustments were made as a result.

Content validity and reliability

All tools were sent to two experts in the field of orthopaedics at Assiut University Faculty of Medicine and three experts in medical-surgical nursing at the Assiut University Faculty of Nursing. The appropriate adjustments were then made.

- Tool II's reliability was evaluated using Cronbach's alpha. The shoulder rating scale for tool II patients had a reliability coefficient of (ICC = 0.99, 95% CI 0.97-1.00).

Procedure:

The study was carried out in four phases:

Assessment phase:

The initial assessment was carried out for both groups (control & study) before rotator cuff surgery at Arthroscopy unit, orthopedics surgery department to collect data about demographic and medical data, shoulder rating scale before application of shoulder therapeutic exercises using all tools. I, II

Planning phase:

- The researchers were divided the participants into two equal groups randomly throughout this phase (study group and control group) (20 patients for each group).
- The purpose of the study was explained to patients of study groups.
- After administrative approval, the data collection was started, and continued from April 2023 to September 2023
- The following details were gathered: age, gender, place of residence, degree of education, employment, and a complete medical history using Tool I parts 1 and 2.
- Using Tool I parts 3, both groups were assessed for complications related to rotator cuff repair in order to document each patient's baseline.
- Shoulder pain and function active forward flexion (using geniometer), strength and satisfaction by using Tool II
- The study group patients was learned shoulder therapeutic exercises and monitored at outpatient's clinics and given a printed copy of a colorful Arabic shoulder therapeutic exercises (tool III) by the researchers.

Implementation phase:

- Shoulder therapeutic exercises were implemented individually for each patient in the study group in 2 sessions. The first session was done before rotator cuff repair surgery and include immobilization and passive exercises. Motions include forward elevation, external rotation, and abduction. All within a comfortable range. These exercises are taught for relatives up to 3 times each week.
- The second session was done post two weeks in the outpatient clinic of the previous setting, and each session took 30-60 minutes. Shoulder therapeutic exercises were distributed to each patient of study group and include active assisted exercises, active and isometric therapeutic exercises of rotator cuff.

Active assisted exercises

- Six weeks following surgery, the second phase of shoulder therapeutic exercises starts with active assisted range of motion. In a supine position, the patient elevates, rotates, and abducts the postoperative arm using the unaffected arm (or a stick or cane). You can complete these every day.
- Shoulder forward elevation: Either sitting or lying down was the preferred position. Raise your arms above your head and clasp your hands. Elbows should be kept as straight as possible. After holding the arms up for ten to twenty seconds, progressively lower them. Three repetitions of this exercise were done per session.
- Pendulum exercises: The patient was told to bend forward, rest one arm freely at the side, and place one hand on a table for support. Swing the arm in a gentle circular motion forward and back. Three times of this workout were performed each day.
- Supported shoulder rotation: The patient was told to maintain a straight elbow and a downward, unified shoulder blade. Slide forearm back and forth. This exercise was repeated 3 times, 3 sessions a day.

- Internal rotation: The patient was told to start by touching his hip and work his way up to his midback. Three sessions of this workout were completed each day.

Active and isometric exercises that include (3 -6 months): At this point, the patient starts actively engaging in abduction, external rotation, and forward elevation. Exercises for isometric strengthening also start at this point. You can perform these workouts every day.

- Side lying shoulder external rotation exercise: The patient was told to lie on one side with the shoulder that needed to be worked on top, keep the elbow tucked in at the side the entire time, and bend it to a 90-degree angle.
- Side lying shoulder internal rotation exercise: The patient was told to lie on one side with the elbow bent to a 90-degree angle, the palm facing up, and to slide the arm forward by one or two inches to avoid sleeping directly on the arm or elbow.
- Isometric shoulder extension: The patient was told to stand with their arms straight at their sides and their backs against the wall. Push the arms back against the wall while maintaining a straight elbow position. Hold for five seconds, then let go. Three bouts of this workout were performed each day.
- Isometric shoulder external rotation: The injured arm was to be placed at the patient's side, with the hand resting on a wall. Bend the elbow to a ninety-degree angle. Gently press the hand's back against the wall. Hold for five seconds, then let go. Three bouts of this workout were performed each day.
- Isometric shoulder internal rotation: The patient was told to take a position at a wall's corner. Bend the elbow 90 degrees and place the afflicted arm against the wall around the corner. Press your hand against the wall. Hold for five seconds, then let go. Three bouts of this workout were performed each day.

Method of teaching:

- The practical session employed demonstration and re-demonstration.
- Media used: The information was supported with PowerPoint slides, films, posters, and a colored booklet with shoulder therapy exercises.
- The control group has follow-up care in a rehabilitation clinic and is given only routine hospital care (rotator cuff surgery).

Evaluation phase

- Following six months of shoulder therapy exercises, each patient underwent evaluations for strength, contentment, active forward flexion, discomfort, and function (Tool II and complications Tool I part 3).

Statistical analysis:

Before undergoing additional statistical analysis, the data were checked for homogeneity variances and normalcy using the Anderson-Darling test. Whereas continuous variables were characterized by mean and standard deviation (Mean, SD), categorical variables were described by number and percent (N, %). When comparing two categorical variables, the chi-square test or Fisher's exact test were utilized appropriately; when comparing two continuous variables, the "independent-samples t-test" and the ANNOVA test were used. A statistically significant result was defined as a two-tailed "$p < 0.05$". The relationship between the variables was displayed using Pearson correlation. IBM SPSS 23 was used to conduct all of the analyses

Results

Table (1): Distribution of demographic characteristics of the studied patients (n=40)

	Study		Control		Total		X2	P. value
	No	%	No	%	No	%		
Age group								
Less than 50 year	4	20.0	6	30.0	10	25.0	0.53	0.465
(50-65) year	16	80.0	14	70.0	30	75.0		
Mean±SD(range)	48.84±9.22(28-58)		53.27±6.09(44.63)		51.06±8.03(28-63)		T=3.20	0.081
Gender								
Male	6	30.0	4	20.0	10	25.0	0.53	0.716
Female	14	70.0	16	80.0	30	75.0		
Marital status								
Married	20	100.0	20	100.0	40	100.0	.	-
Level of education								
Illiterate	4	20.0	2	10.0	6	15.0	7.33	0.119
Primary	6	30.0	12	60.0	18	45.0		
read and write	0	0.0	2	10.0	2	5.0		
Secondary	6	30.0	2	10.0	8	20.0		
University	4	20.0	2	10.0	6	15.0		
Occupation								
Housewife	12	60.0	12	60.0	24	60.0	1.07	0.587
Employer	2	10.0	4	20.0	6	15.0		
Skilled work	6	30.0	4	20.0	10	25.0		
Residence area								
Rural	16	80.0	11	55.0	27	67.5	2.84	0.176
Urban	4	20.0	9	45.0	13	32.5		

Chi square test for qualitative data between the two groups.
Fisher Exact Test test for qualitative data between the two groups
- Independent T-test quantitative data between the two groups
**=statistically significant (p<0.05)*

Table (2): Distribution of studied groups related to medical data of patients (n=40)

	Study		Control		Total		X2	P.value
	No	%	No	%	No	%		
Type of rotator cuff tear								
Small	0	0.0	2	10.0	2	5.0	2.29	0.319
Medium	12	60.0	12	60.0	24	60.0		
Large	8	40.0	6	30.0	14	35.0		
Risk Factors for rotator cuff tear								
Shoulder arthritis	8	40.0	10	50.0	18	45.0	6.79	0.147
Over use	10	50.0	4	20.0	14	35.0		
Older age	0	0.0	2	10.0	2	5.0		
Fall	2	10.0	2	10.0	4	10.0		
Accident	0	0.0	2	10.0	2	5.0		
Affected side								
Rt side	12	60.0	8	40.0	20	50.0	1.60	0.206
Lf side	8	40.0	12	60.0	20	50.0		
Tear size								
1-3 cm	12	60.0	13	65.0	25	62.5	0.11	0.744
3-5 cm	8	40.0	7	35.0	15	37.5		

Chi square test for qualitative data between the two groups
Fisher Exact Test test for qualitative data between the two groups

Table (3): Distribution of complications for studied groups (n=40)

Complications	Study		Control		Total		X2	P. value
	N.	%	N.	%	N.	%		
pain	5	25.0	13	65.0	18	45.0	3.64	0.025*
Bone fracture	0	0.0	0	0.0	0	0.0	-	-
Nerve injury	0	0.0	0	0.0	0	0.0	-	-
Stiffness	0	0.0	0	0.0	0	0.0	-	-
Superficial infection	0	0.0	4	20.0	4	10.0	4.44	0.106
Readmission	0	0.0	4	20.0	4	10.0	4.44	0.106
Reoperation rate	0	0	0	0	0	0	-	-

Fisher Exact Test test for qualitative data between the two groups
**=statistically significant (p<0.05)*

Table (4): Comparison between study and control group related to shoulder rating Scale before operation and at follow up (6 months) (n=40)

Shoulder rating scale	Before operation				X2	P. value	Follow up				X2	P. value
	Study		Control				Study		Control			
	No	%	No	%			No	%	No	%		
Poor	20	100.0	20	100.0	-	-	4	20.0	12	60.0	7.63	0.022*
Fair	0	0.0	0	0.0			14	70.0	8	40.0		
Good	0	0.0	0	0.0			2	10.0	0	0.0		
Mean±SD	6.00±0.65		5.90±2.17		T=0.19	0.845	24.20±3.81		20.85±3.97		T=2.72	0.001*

Chi square test for qualitative data between the two groups.
- Independent T-test quantitative data between the two groups.
*=statistically significant (p<0.05)

Table (5): Correlation Co-efficient between shoulder rating scale with complication at Follow up 6 month (n=40)

Correlations	Shoulder rating scale			
	Study		Control	
	R	P	R	P
pain	-.809-**	.000	-.327	.159
Superficial infection	-	-	.019	.935
Readmission	-	-	-.563-**	.010

Table (6): Relation between shoulder rating scale and demographic data for studied groups at Follow up (6 months) (n=40)

	N	Shoulder rating scale				
		Study		Control		
		Mean±SD	Range	N	Mean±SD	Range
Age group						
Less than 50 year	4	20.5±4.04	17-24	6	20.33±3.72	17-25
(50 -65) year	16	25.13±3.24	20-30	14	21.07±7.17	16-27
Test Used		**T= -2.44 P.V= 0.025***			**T=-0.37 P.V= 0.714**	
Gender						
Male	6	23.67±5.82	17-30	4	21.75±5.50	17-27
Female	14	24.43±2.82	20-27	16	20.62±3.68	16-26
Test Used		**T=-0.40 P.V= 0.693**			**T=0.49 P.V= 0.458**	
Level of education						
Illiterate	4	23.5±4.04	20-27	2	17±0	17-17
Primary	6	25.33±1.37	24-27	12	21.58±3.96	16-27
Read and write	0	-	-	2	17.0±0.0	17-17
Secondary	6	23.67±5.82	17-30	2	26±0	26-26
University	4	24±3.46	21-27	2	19±0	19-19
Test Used		**F= 0.23 P.V= 0.872**			**F=2.72 P.V= 0.069**	

	N	Shoulder rating scale				
		Study		Control		
		Mean±SD	Range	N	Mean±SD	Range
Occupation						
Housewife	12	24±2.83	20-27	12	20.00±3.51	16-25
Employer	2	27±0	27-27	4	22.50±4.04	19-26
Skilled work	6	23.67±5.82	17-30	4	21.75±5.50	17-27
Test Used		**F=0.59**	**P.V= 0.565**		**F=0.70**	**P.V= 0.509**
Residence area						
Rural	16	23.88±3.52	17-27	11	20.45±4.52	16-27
Urban	4	25.5±5.2	21-30	9	21.33±3.35	17-26
Test Used		**T=0.11**	**P.V= 0.460**		**T=-0.48**	**P.V= 0.635**

Independent T-test quantitative data between the two groups -
- One-way Anova T-test quantitative data between the Three groups or more
**Significant level at P value < 0.05.*
***Significant level at P value < 0.01*

Table (7): Relation between shoulder rating Scale and medical data for studied groups at Follow up (6 months) (n=40)

	N	Shoulder rating Scale				
		Study		Control		
		Mean±SD	range	N	Mean±SD	Range
Type of rotator cuff tear						
Small	0	-	-	2	19±0	19-19
Medium	12	24.33±4.5	17-30	12	23.25±3.25	19-27
Large	8	24±2.73	20-27	6	16.67±0.52	16-17
Test Used		**F=0.03**	**P.V= 0.854**		**F=13.08**	**P.V= <0.001****
Risk Factors for rotator cuff tear						
Shoulder arthritis	8	27±2.27	24-30	10	19.50±3.89	16-27
Over use	10	22.6±3.81	17-27	4	21.5±5.19	17-26
Older age	0	-	-	2	24.0±0.0	24-24
Fall	2	21±0	21-21	2	25.0±0.0	25-25
Accident	0	-	-	2	19±0	19-19
Test Used		**F=5.55**	**P.V= 0.014***		**F=1.39**	**P.V= 0.282**
Affected side						
Rt side	12	26±3.19	20-30	8	21.87±4.25	17-27
Lf side	8	21.5±3.07	17-24	12	20.16±3.78	16-26
Test Used		**T=3.13**	**P.V= 0.006****		**T=0.94**	**P.V= 0.359**
Tear size						
1-3 cm	12	24.33±4.5	17-30	13	22.46±3.43	19-27
3-5 cm	8	24±2.73	20-27	7	17.85±3.18	16-25
Test Used		**T=0.18**	**P.V= 0.854**		**T=2.39**	**P.V= 0.009****

Independent T-test quantitative data between the two groups -
- One-way Anova T-test quantitative data between the Three groups or more
**Significant level at P value < 0.05.*
***Significant level at P value < 0.01*

Table (1): Reveals that the majority of the researched groups (the study and control groups) were 80%, 70% of whom were between the ages of 50 and 65, and whose mean age was between 48.84±9.22 and 53.27±6.09.70% and 80% of the members of both groups were married women. While more than half (60%) of the control group had only completed primary school, just 25% of the study group had completed both primary and secondary education. In terms of occupation, housewives made up more than half (60%) of the study groups. The majority of the research groups (80%, 55%) were rural residents.

Table (2): Demonstrates that a medium rotator cuff tear affected more than half (60%) of both groups. In terms of risk factors for rotator cuff tears, shoulder arthritis was present in the control group whereas

overuse was present in half of the study group (or 50%). While the control group had a left side rip, the more than half of the study group (60%) had a right side tear. Tear sizes ranged from 1-3 cm in more than half of the groups under study (60%, 65%).

Table (3): Shows that one quarter of study group (25%) had pain while nearly two thirds (65%) in control group and less than one quarter 20% had superficial infection and readmission to hospital. There is statistical difference between study and control group regarding regional pain syndrome with p-value (0.025*).

Table (4): Shows that more than two thirds (70%) had fair level of shoulder rating scale while the control group had two fifth (40%).There was statistically significant difference at follow up between study and control group at p value (0.022*)

Table (5): Shows negative correlation between regional pain syndrome and shoulder rating scale for study group and also there was negative correlation between readmission and shoulder rating scale for control group.

Table (6): Shows statistically significant difference at follow up between age and shoulder rating scale for study group at p value (0.025*)

Table (7): Shows statistically significant difference at follow up between risk factors, affected side and shoulder rating scale for study group and also there was highly statistically significant difference at follow up between type of rotator cuff tear, tear size and shoulder rating scale for control group.

Discussion

Rotator cuff tears are the most common upper extremity condition seen by primary care and orthopedic surgeons, with a spectrum ranging from tendinopathy to full-thickness tears with arthritic change. **(Asheesh et al., 2024)**

The aim of this study was to evaluate the effect of implementing shoulder therapeutic exercises on patients' outcomes (pain, function, active forward flexion, strength and satisfaction).for patients with rotator cuff repair

The discussion will cover the main findings as follows:

Part 1: Demographic characteristics

The present study clarified that the highest percentage of studied groups (study and control) their ages ranged between fifty to sixty five years, mean of their age were (48.84±9.22, 53.27±6.09).this finding consistent with **Georgia et al. (2020)**, who mentioned that the rate of rotator cuff retears is low in patients less than fifty years of age. The relationship between age and rotator cuff retears is linear in patients fifty to sixty nine years of age, with an increase of 5% between decades, and increases substantially in patient's ≥seventy years old.

Also, this result was supported by **Varacallo et al. (2023),** they found that people under the age of forty (5–30%) seldom get rotator cuff tears or injuries. Those between the ages of 55 and 85 make up the vast majority. About 15% of persons over 70 who experience shoulder pain also have rotator cuff problems. The prevalence rises with aging. The researcher believes that shoulder arthritis and aging may be to blame for this outcome.

Several well-conducted studies have shown that age, occupation, and anatomical characteristics including the crucial shoulder angle are frequent risk factors. There may also be a hereditary component, according to recent research. Rotation and abduction are provided by the rotator cuff, which also axially compresses the humeral head at the glenohumeral joint. Couples of forces are categorized as axial and coronal. It is believed that uneven force couples result in rotator cuff injuries **Manop et al. (2023),**

In terms of gender, the majority of both groups in this study were married women, who is in line with findings from **Marlis et al. (2021),** that showed women had smaller rotator cuff tears and were more likely than males to undergo dominant-arm surgery. According to the researcher, excessive use, particularly on the dominant hand, is the reason why rotator cuff injuries are more common in females.

These results disagreed with **saleh et al. (2022),** who mentioned that A total of 40 patients were included in this study, with 20 undergoing arthroscopic rotator cuff repair and 20 undergoing open rotator cuff repair. Patients' ages ranged from 30 to 70 years old, with the majority of them being men.

In terms of occupation, housewives made up more than half of the study groups. This outcome was consistent with the findings of **Weheida et al. (2022),** which demonstrated that housewives made up half of the study group's patients and more than two thirds of the control group's patients, or 66.7%.

Part 1I: Medical data

According to the current study, a medium rotator cuff injury affected more than half of both groups. The earlier findings were at odds with those of **Manop et al. (2023),** who reported that full-thickness tears were more closely linked to humeral migration and degenerative changes of the greater tuberosity, such as sclerosis, subcortical cysts, and osteophytes.

In terms of risk factors for rotator cuff tears, shoulder arthritis was present in the control group whereas excessive use was present in half of the research group. According to **Wang et al. (2019),** patients with rheumatoid arthritis had a higher chance than the control group of developing rotator cuff disease. The

researcher believes that the degenerative effects of arthritis are to blame for this outcome.

Additionally, this study supported the findings of **Gowan, (2023)** who revealed that shoulder pain and edema can start as soon as two years after diagnosis and that RA can cause erosion and deformity of the shoulder joints over time. Patients with RA are more likely to experience rotator cuff tears and degeneration.

Additionally, according to **Yoon et al. (2020),** the primary causes of rotator cuff dysfunction in younger individuals include overuse, moderate instability, and muscle imbalance. Deterioration and chronic shoulder pain are common in the elderly.

The present study's findings are consistent with those of **Jinlong et al. (2023),** who reported that osteoarthritic change was a separate risk factor for the beginning of rotator cuff tears and that the existence of pain during motion was a separate risk factor for the advancement of RCT within the following five years.

According to the current study, a left side tear was present in the control group, while a right side rip affected over half of the study group. Our findings are comparable to those of **Geraldine et al. (2022),** who found that a high work level and early tear involvement of more than 47.5% enhanced the likelihood of tear advancement. The researcher believes that this is the effect of using the dominant right hand excessively.

Part III: Complications

According to the current study, 25% of the study group experienced pain, compared to over 50% in the control group and less than 25% experienced a superficial infection and a hospital readmission. **Saragaglia et al. (2021)** corroborated the study findings by observing that the immobilization group saw a 20.9% incidence of pain syndrome, whereas the immediate passive motion groups experienced an 8.2% incidence.

The study's findings, which support those of **Longo et al. (2021),** show that male sex and open or miniopen surgical approaches are important risk factors for infection following rotator cuff surgery. According to the study, some patients weren't adhering to the recommended clothing and rehabilitative activities.

Part IV: shoulder rating scale before operation and at follow up for studied patients

According to the current study, the control group had two fifths of the shoulder rating scale, whereas more than two thirds had a decent level. Between the study and control groups, there was a statistically significant difference at follow-up.

Tsuyoshi et al. (2023) provided support for this study by demonstrating that motor control exercise programs considerably decreased impairment over the short and medium terms in comparison to non-specific exercise programs. Exercise regimens focused on motor control were likely marginally better than general exercise regimens for persons undergoing rotator cuff surgery.

This study is comparable to that of **Elnour et al. (2023),** who found that in terms of enhancing shoulder proprioception, neuromuscular training outperformed conventional strength training.

Olimpio et al. (2023) , corroborated the results of this study by showing that all muscular strength tests showed higher rates of improvement between pre and post measurements. This suggests that the scientifically grounded muscular strength exercises included in the rehabilitation exercise program have a beneficial impact on the development of balanced muscular strength of the working (motor) and opposing (opposite) muscles in the close vicinity of the injured shoulder joint of dolphin swimmers.

According to **Weheida et al. (2022),** the results of the current study corroborate this finding. They reported that patients who participate in a nursing rehabilitation program experience improvements in their functional abilities and shoulder joint range of motion following rotator cuff surgery. The researcher believes that this outcome is the result of some dedication to therapeutic workouts.

Part V: Correlation Co-efficient between shoulder rating scale with complication at Follow up 6 month

The present study showed that negative correlation between pain and shoulder rating scale for study group. Also, negative correlation between readmission shoulder rating scales in control group. This outcome was consistent with **Yu-Chieh et al. (2023),**there were no statistically significant differences between the younger and older groups in terms of re-tear rate, muscle power, shoulder range of motion, or Constant score improvement. The researcher believes that as regional pain and readmission rise, the shoulder rating scale falls.

Part VI: Relation between shoulder rating scale and demographic data

There was statistically significant difference at follow up between age and shoulder rating scale for study group

This outcome is consistent with the findings of **Jay et al. (2023),** who noted that a higher Constant score was associated with older age and poorer postoperative integrity and functional recovery. Additionally, **Ahmed (2023)** found that younger and **Philip et al. (2021),** noted that the risk of retears following rotator cuff repair is associated with increased age and doubles between the ages of 50 and 70 years. These elderly patients, in good health and with no significant comorbidities, benefit equally

from rotator cuff repair. According to the study, both younger and older people's shoulder rating scales increase after engaging in therapeutic exercises.

Part VII: Relation between shoulder rating scale and medical data

The current study demonstrated that there was statistically significant difference at follow up between risk factors, affected side and shoulder rating scale for study group and also there was highly statistically significant difference at follow up between type of rotator cuff tear, tear size and shoulder rating scale for control group. This result contradicted a research by **Davies (2022)** that found that patients with rheumatoid arthritis who underwent surgical intervention for a rotator cuff tear had improved shoulder functional outcome similar to that of matched patients without rheumatoid arthritis.

Asheesh et al. (2024) corroborated these results by demonstrating that patients with initial tear size had superior shoulder function and muscle strength compared to those with increased tear size after six months. Despite statistical differences, results don't seem to be significant enough to provide clinically meaningful distinctions.

Conclusion

After application of shoulder therapeutic exercises, more than two thirds of patients had fair level of shoulder rating scale in study group. There was statistically significant difference at follow up between study and control group.

Recommendations

Apply the study on huge probability sampling

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