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Research Article

The Effect of Using Some Physical Therapy and Rehabilitation Exercises on the Functional and Physical Condition after One Month and a Week of Open Heart Surgery (ECR)

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Abstract

The aim of this study is to begin to see how the application of (WF) only affects the pain and speed of healing, improving the physical and functional condition of the muscles affected by the operation, as well as the efficiency and strength of the heart muscle. A month and a week after open heart surgery. ECR the improvement of the physical and functional condition of the muscles affected by the operation, as well as the efficiency and strength of the heart muscle after 1 month and a week of open heart surgery. For the study 5 individuals a trial group mm They had an open-heart surgery operation and the number of persons excluded from the sample was 1, and this sample represented the members of the control group in the previous experiment. The total sample size at the beginning of the study was 100 individuals who had open heart surgery. The total number of the sample was 14 individuals, 9 of whom were experimental groups and 5 were control groups, where the rehabilitation program (ECR) was applied, Only 9 members of the pilot group. And the control group was unable to apply physical and functional measurements (T-ECR) to its members because of the lack of healing of the Sternum as well as the absence of pain, which prompted the researcher to complete the study and re-application of the rehabilitation program (ECR) to members of the control group. This group was divided into three experimental groups to achieve the objectives of the study. The researcher used the experimental method to suit the nature and purpose of the study. Any misdemeanour The improvement in the strength of the heart muscle and the efficiency of the respiratory system, as well as the physical and functional condition of the muscles affected by the surgical operation in the first experimental group, as well as the complete healing of the Sternum and the disappearance of pain, improves the strength of the heart muscle and improves the physical and functional condition of the affected muscles Of the operation, improved respiratory efficiency and the ability to exchange the inhalation and exhalation well in the experimental group II and III after the application of the rehabilitation program (ECR). The researcher recommended that the use of natural therapy (WF) after open heart surgery. (WF) for the best results, not only the application of physical therapy (WF), the need to use exercise resistance and weight training after open heart surgery, the commitment to the abbreviations contained in the preparatory program (ECR) And use in diagnosis as well as during rehabilitation after open heart surgery.

Keywords: *Rehabilitation After Open Heart Surgery; Cardiac Rehabilitation; Physiotherapy; Physical and Motor Rehabilitation; ECR; WF; T-ECR; CR; Tens; Ultrasound Therapy; Laser Therapy*

Introduction

Rehabilitation of the patient is a way for people who have had a heart attack or have a heart catheter, have surgery, valve replacement, heart transplantation or other heart disease to return to normal. Reducing the risk of future heart problems.

Alireza Shoul and Farkhondeh Sharif (2012) reported that cardiac rehabilitation programs help prevent depression and anxiety among patients, reduce health care costs and increase patient quality of life [1].

Margareta Möller and Elisabeth (2010) noted that the key rationale for physical therapy after heart surgery is prevention and treatment of postoperative complications, improved lung function. Promote physical activity in general. And one or two physiotherapy sessions are offered within days of the surgery, in which shoulder movements are given taking into account precautions for the safety of the shear bone and noted that physiotherapy is necessary after heart surgery [2].

Figure 1: *Sternum precautions after open heart surgery.*

John Wallis (2009) reported that Sternum fusion was three months after non-invasive low-intensity ultrasound therapy and after 11 months of aortic valve replacement surgery. As well as the disappearance of pain after 13 months of valve replacement surgery [3].

As Gordon Waddington and Roger Adams (2007) note that after a six-week training program targeted the muscles of the chest wall of the front and abdomen, in light of the instability of the Sternum after heart surgery results showed a reduction of 6 mm in the distance between the sides to cut the shear bone [4].

Lawrence Cahalin and Tanya Kinney (2011) reported that during the first five days of surgery, the patient receives 1 - 6 sessions daily by a physiotherapist. The usual physical therapy for patients is breathing and vibration exercises for the chest wall, cough, blowing techniques, relaxation techniques, Massage, performing breathing exercises on a regular basis after surgery. And it is advisable to practice breathing exercises for six months after surgery, avoid weight loading up to 18 weeks after surgery. And the weights allowed ranging from 1 to 5 kg, during the physical therapy training the patient to sit on the bed and then trained to sit on the chair and was mobilized to walk in the room and then in the corridor, and gave exercises to the upper part of the body as well as the lower end. And the therapists declared that they consider physiotherapy necessary after open heart surgery [5].

Figure 2: *Effects Open heart surgery.*

The (CR) stages are divided into the first stage of cardiac rehabilitation, which begins at the hospital after a heart attack or heart surgery. The patient receives some advice and guidance on the risk factors for heart disease, diet, medication, sexual activity, Exercise and daily activities.

And then the second stage of cardiac rehabilitation, which begins in outpatient clinics after discharge from the hospital, about 2 - 6 weeks. Where the patient is referred to the doctor to assess the condition of the heart before starting the rehabilitation program, this stage aims to strengthen the heart, and build physical endurance and strength, and work to reduce the risk of heart disease. This phase lasts for 8 - 12 weeks.

The third phase is the continuation of participation in the rehabilitation program and include individuals who have heart problems, which does not work the second phase to solve. This stage aims to provide a program of continuous exercise and provide all the necessary support for lifestyle changes. During this stage, the heart rate, blood pressure is measured before exercise [6].

William A Baumgartner and Duke E Cameron (2009) also recruits rehabilitation after open-heart surgery to acute rehabilitation, in which the rehabilitation is performed on a daily and intensive basis, in which the patient needs more than three hours a day of rehabilitation. The doctor, physiotherapist, nursing, and psychologists, as well as sub-acute rehabilitation, which is less intensive than acute rehabilitation, in which the patient requires three hours of rehabilitation a day. The physiotherapist, social worker and nursing are involved.

While the cardiac rehabilitation program begins for patients who are discharged from open heart surgery a few weeks after surgery. After the heart surgeon authorized it [7].

Lawrence Cahalin and Tanya Kinney (2011) note that to date there is no direct evidence linking the level of activity or arm movement and the increased risk of complications of shear bone after open heart surgery and often restrictions on activity assuming that this will reduce the risk of bone instability Shear (chest incision) [5].

This has been the case for cardiac rehabilitation in the past, but Waleed Fahmy (2017) reported in rehabilitation after open heart surgery (ECR) that some physical therapy (WF) may be used as a component of the rehabilitation program after open heart surgery as well as rehabilitation exercises and use In pain relief and help to accelerate the healing of the shear bone and muscles affected by surgery within three weeks of surgery and once out of intensive care, in addition to the use of weight training within the content of the rehabilitation program [8].

Figure 3: *Application (ECR) in hospital after exit from intensive care.*

Figure 4: *Weight training at an advanced stage of application (ECR).*

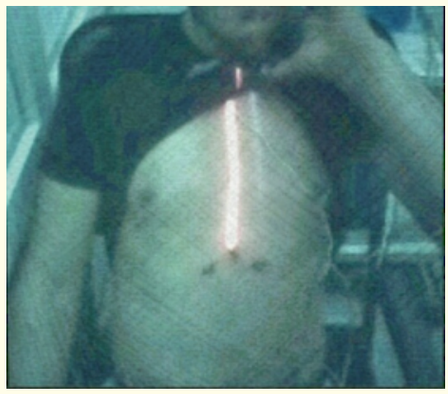


Figure 5: *Laser therapy application in rehabilitation after open heart surgery (ECR).*

Research Importance

To determine the effect of the use of certain physical therapy (WF) and rehabilitation exercises as a component of the rehabilitation program (ECR) after one month of open heart surgery on the muscles affected by surgery, both physically and functionally, as well as on the disappearance of pain and complete healing of the shear bone. (ECR) (2014) on the experimental group of the research sample, which was applied immediately after exit from intensive care and for a month, which led to the disappearance of pain and complete healing of the sternum during the first three weeks And the improvement of physical and functional condition within a month of open-heart surgery immediately after intensive care, unless the control sample that we were unable to apply functional and physical measurements (T-ECR). The disappearance of pain during the duration of application of the program on the experimental sample, which prompted the researcher to complete the study in this research to achieve the following objectives.

Research Goals

1. To begin to know how the application of natural remedies (WF) affects only the pain and the speed of healing. After a month and a week of open heart surgery.
2. To begin to know just how effective the application of physical therapy (WF) is to improve the physical and functional condition of the muscles affected by the operation. After a month and a week of open heart surgery.
3. To begin to know the effect of the application of natural therapy (WF) only on the efficiency and strength of the heart muscle, and after one month and a week of open heart surgery.
4. Start to know the impact of the application of the rehabilitation program (ECR) on the degree of pain and the speed of healing, after a month of open heart surgery.
5. To begin to know the impact of the application of the rehabilitation program (ECR) on improving the physical and functional condition of the muscles affected by surgery, one month after open heart surgery.
6. Start to know the impact of the application of the rehabilitation program (ECR) on the efficiency and strength of the heart muscle., After one month of open heart surgery.

Search questions

1. How effective is the application of (WF) only to the degree of pain and the speed of healing after 1 month of open heart surgery?
2. How effective is the introduction of (WF) only to improve the physical and functional condition of the muscles affected by the operation? After one month of open heart surgery?
3. How effective is the application of (WF) only to the efficiency and strength of the heart muscle, after one month of open heart surgery?
4. How effective is the application of the (ECR) program on the degree of pain and speed of healing after one month of open heart surgery?
5. How effective is the application of the (ECR) program to improve the physical and functional condition of the muscles affected by the operation after one month of open heart surgery?

6. How effective is the application of the (ECR) program on the efficiency and strength of the heart muscle, after one month of open heart surgery?

Search terms

- (CR): Cardiac rehabilitation Cardiac rehabilitation is a rehabilitation program that depends on breathing exercises and aerobic exercises only.
- (WF): (Waleed Fahmy) means the total of ultrasound therapy (tens current-laser therapy) used in the content of the ECR program, compared to the first used in rehabilitation after open heart surgery [9].
- (ECR): (Egypt cardiac rehabilitation), which is a rehabilitation program that contains some physical therapy. (WF) as well as training exercises in addition to weight training and resistance exercises used within the content of the rehabilitation program, which was implemented after open heart surgery, as defined (2014) Waleed Fahmy, which was applied immediately after departure from intensive care [9].
- (T-ECR): TESTS Egypt Cardiac Rehabilitation is a set of measurements used for patients in the rehabilitation program after open heart surgery (ECR), as defined by 2017 (Waleed Fahmy) [8,9].
- (DCT): Data collection tools.
- (RE): Rehabilitation equipment.

Search procedures

Research Methodology

The experimental approach was chosen to suit the nature and purpose of the study.

Research fields

The human sample: The sample was selected from patients who underwent open heart surgery, after taking the approval of the Ethics Committee at the Faculty of Medicine – Zag Fazig University and taking the written approval of each patient without specifying a specific category or age stage. Was excluded from diabetics, and those who use industrial organizations.

Time domain: The study was conducted during the period from 7/1/2014 to 7/2/2014.

Geographical area: Cardiology and chest surgery hospital, Faculty of Medicine, Department of Cardio-Thoracic Surgery, Outpatient Clinic, Faculty of Medicine Department of Rheumatism and Rehabilitation Zagazig University.

The research samples

The total sample size was 5 members of the experimental group who underwent open heart surgery. The total number of excluded individuals was 1 person. This sample was representative of the control group in the previous experiment. The total sample size at the beginning of the study was 100 individuals who underwent heart surgery and 86 individuals were excluded from the sample, as they were not regular in the sessions, for a number of reasons mentioned in the previous experiment, bringing the total number of the sample to 14 individuals including 9 experimental group and 5 control group. Where the qualifying program (ECR) was applied to the 9 members of the pilot group. And the control group was unable to apply physical and functional measurements (T-ECR) to its members because of the lack of healing of the shear bone as well as the absence of pain, which prompted the researcher to complete the study and re-application of the rehabilitation program (ECR) to members of the control group. This group is divided into three experimental groups and distributed as follows: To achieve the research objectives and questions.

- The initial experimental group of 2 individuals and the application of natural therapy (WF) only (ultrasound therapy -tens current - laser therapy) after one month and a week of open heart surgery.
- The second experimental group and the number of its members 1 person and this group has been fully implemented the program (ECR) for a month.
- The third experimental group and the number of members of 1 individual and this group has been fully implemented the program (ECR) but for only three weeks. In order to inform the patient of his intention not to complete the remaining period of the program and estimated a month as a result of his sense of improvement of his condition.

Tools and devices used in data collection (DCT)

- Tape centimeter.
- Balls (Rsfllo).
- Adhesive tape.
- Ultrasound device for the heart. Echocardiography.
- Antiseptic disinfectant.
- Check bed.
- Iron bar.
- Various weight weights.

Equipment and devices used in rehabilitation (RE)

- Ultrasound-therapy device.
- Tennis machine tens current.
- Laser therapy.
- Check bed.
- Iron bar.
- Various weight weights.

Functional, physical and transient measurements (T-ECR)

First Functional measurements

- Respiratory efficiency measurement
- Respiratory system (respiflo).
- Journey of inspiration and exhalation (chest circumference).
- Measurement of myocardial force: ultrasound on the heart Echocardiograph.

Figure 6: *Respufflow during suction*

Figure 7: *Rispllo during blowing.*

Figure 8: *Journey of inspiration and exhalation.*

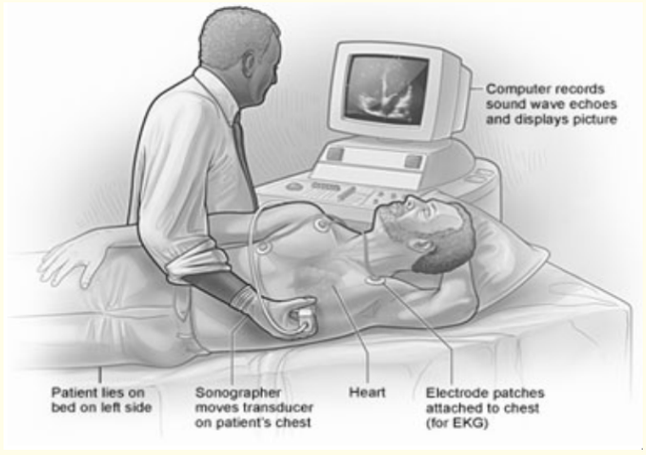


Figure 9: *Echocardiograph.*

Search procedures

- Muscle rubber measurement: Rubber gauge of the muscles: Test the rubber of the dorsal position (Figure 10).
- Rubber gauge of chest muscles: Test the rubber of the supine position (Figure 11).
- Measurement of elastic abdominal muscles: Test the torsion movement in the spine (Figure 12).
- General rubber gauge for the upper part: Measure the movement of the spine around the vertical axis (Figure 13).

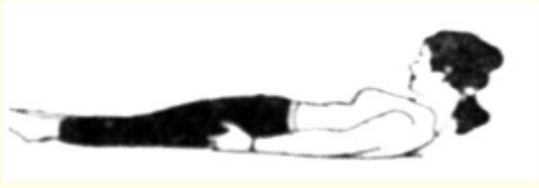


Figure 10: *Natural Rubber for Neck Muscle.*

Figure 11: *Natural Inflammation of Chest Muscle.*

Figure 12: *Natural Inflammation of Belly Muscles.*

Figure 13: *Proof of complete healing of the shear bone.*

Measurement of muscle strength

- Measure the muscle strength of the neck muscles: Test the power of the laying position.
- Measure the muscle strength of the abdominal muscles: Test the sitting of the supine position of the D-legs (Figure 14).
- Measure the muscular strength of the chest muscles: Test the strength of the stand position with the drape and extend the arms to the highest load (weight) (Figure 15).

Figure 14: *Muscle strength of the abdominal muscles.*

Figure 15: *Measure the muscular strength of the chest muscles.*

Third: Interim measurements

- Measuring the degree of pain: Through the pain regulator (Figure 16).
- Measurement of pain (clinical) (Figure 17).
- Measuring the speed of healing: (clinical) (Figure 17).

Figure 16: *Ruler pain.*

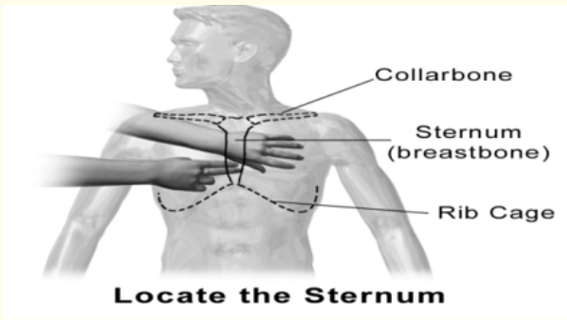


Figure 17: *Clinical examination of STERNUM.*

Eligible Program Content (ECR)

The ECR program includes rehabilitation exercises and some physiotherapists (WF). The ECR program is applied one month and three weeks after the surgery, and the (WF) is applied to the first experimental group by three Sessions weekly. A month and a week after surgery.

Statistical treatments that have been used

- Arithmetic mean
- Standard deviation.
- Differences
- As well as the percentage% for the improvement of the sample members of the tribal and titular scales of the experimental groups.
- The value of z.
- The value of sig.
- Chi-Square test.
- Variance.

Results

Differences between the measurement before and the measure after of the initial experimental group (this group applied only the natural treatment methods (WF) and duration ranging from 3 - 4 sessions, three sessions a week)

Table 1 and figure 18 and 19 the differences between the measurement before and the measure after in the (physical measurements) of the first experimental group indicate that there are no differences between the measurements at level 0.05 in all tests where the value of Z is between (-1.342 to -0.447). These values are lower than the tabular values at 0.05 and the improvement rate ranged from (-121.212 to 0.279).

	Physical measurements		Measure Before		Measure after		Difference between the two averages	Improvement rate %	Values Z	sig
N			x	± Σ	x	± Σ				
1	Measure the natural elasticity of the neck muscles degrees 10		9.500	0.707	8.500	2.121	-1.000	-	-0.447	0.655
2	Measure the natural elasticity of the chest muscles. The arms are elongated, replacing their integrity. Degree 180		179.500	0.707	180.000	0.000	0.500	0.279	-1.000	0.317
3	Measure the natural elasticity of the abdominal muscles (measuring the extent of the movement of the torso in the spine)		61.000	16.971	49.500	6.364	-11.500	-18.852	-1.342	0.180
4	Measure the dynamic movement of the spine around the vertical axis (N) from 0 to 75cm on Staging	The right part	16.500	4.950	-3.500	0.707	-20.000	-121.212	-1.342	0.180
		The left part	12.000	1.414	0.000	14.142	-12.000	-100.000	-1.342	0.180
5	Measure Muscle strength of neck muscles, as long as possible		44.500	16.263	19.000	15.556	-25.500	-57.303	-1.342	0.180
6	Measure the muscle strength of the abdominal muscles. Sit long from the dorsal position to make with a 90-degree angle torso		58.000	45.255	24.500	3.536	-33.500	-57.759	-1.342	0.180
7	Measure the muscular strength of the chest Muscles	The right part	10.000	3.536	6.500	4.950	-3.500	-35.000	-1.342	0.180
		The left part	7.500	3.536	7.250	3.889	-0.250	-3.333	-1.000	0.317

Table 1: *Differences between the measurement before and the measure after of the first experimental group in (physical measurements) n = 2.*

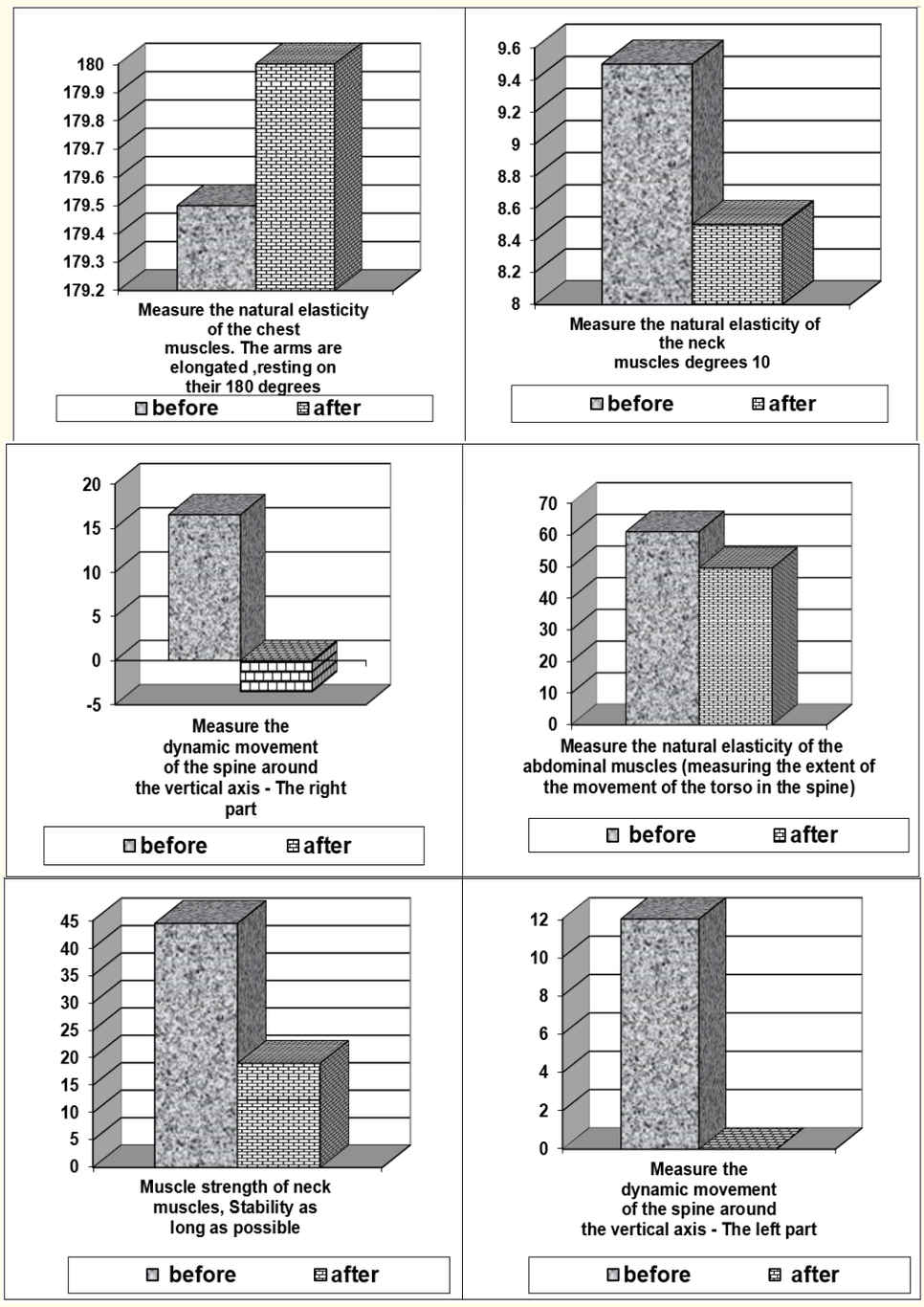


Figure 18: *The arithmetic mean of the measurement before and the measure after of the first experimental group in (physical measurements) table 1.*

Table 2 and figure 20, on the differences between the measurement before and the measure after in the physiological measurements of the first experimental group, show that there are no differences between the two measurements at level 0.05 in all tests where the value of Z is between (-1,000 to -1,000). These values are less than the value of the tables at 0.05, and the improvement rate ranged from (-40.000 to -0.418).

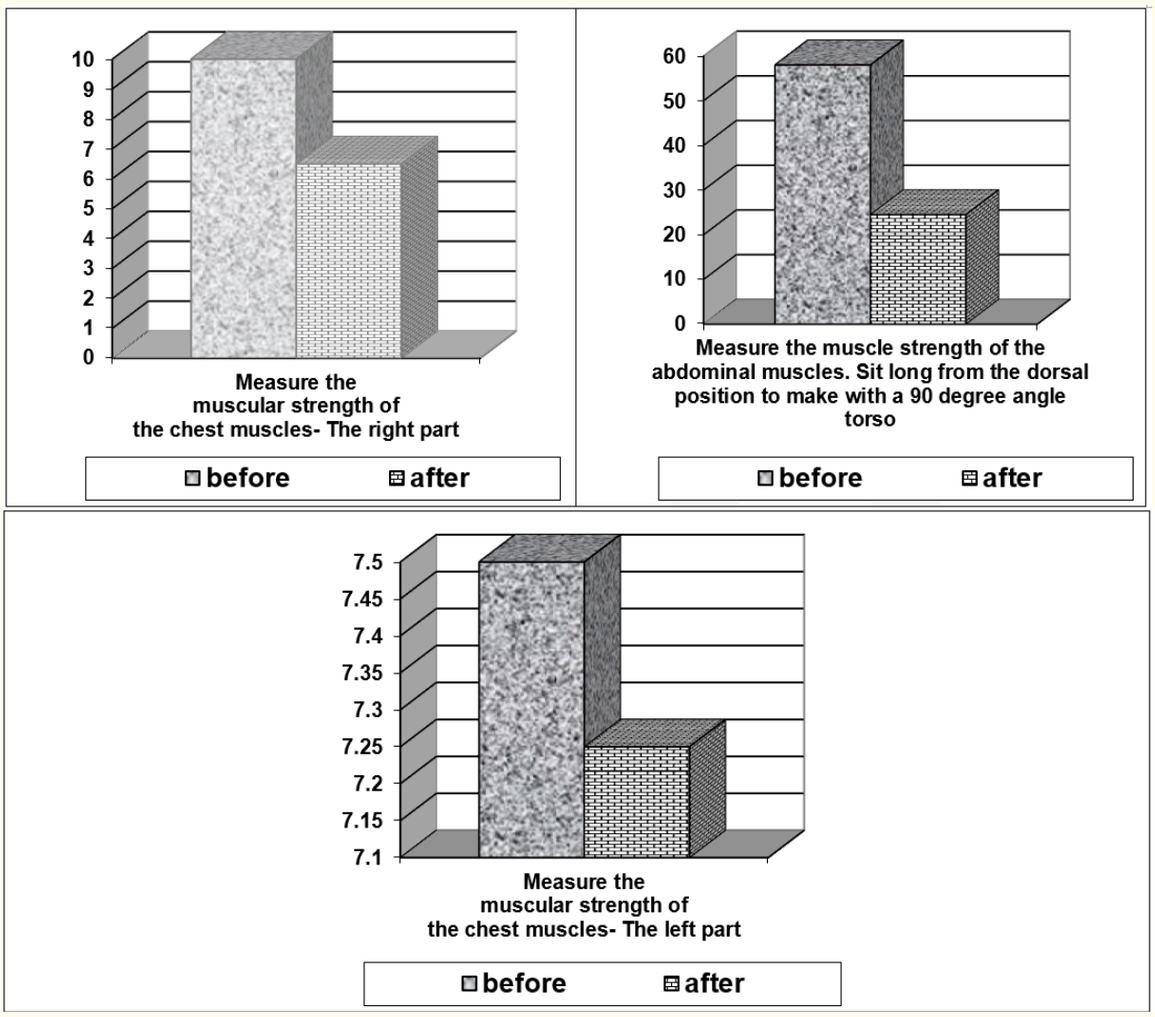


Figure 19: *The arithmetic mean of the measurement before and the measure after of the first experimental group in (physical measurements) table 1.*

N	Functional measurements		Measure before		Measure after		The difference between the two averages	Improvement rate %	Values Z	sig
			x	± Σ	x	± Σ				
1	Journey of inhalation and exhalation, the difference between maximum inhalation and maximum exhalation.		2.500	0.707	1.500	0.707	1.000-	-40.000	-1.000	0.317
2	RSPFLO device to assess the Efficiency of the respiratory system	Inhalation	1195.000	7.071	1200.000	0.00	5.000-	-0.418	-1.000	0.317
		Exhalation	1050.000	212.132	900.000	0.000	150.000	-14.286	-1.000	0.317
3	Cardiac muscle strength (ultrasound scan on the heart)		61.500	10.607	60.000	8.485	1.500	-2.439	-1.000	0.317

Table 2: *Differences between the measurement before and the measure after of the first experimental group in physiological measurements, n = 2.*

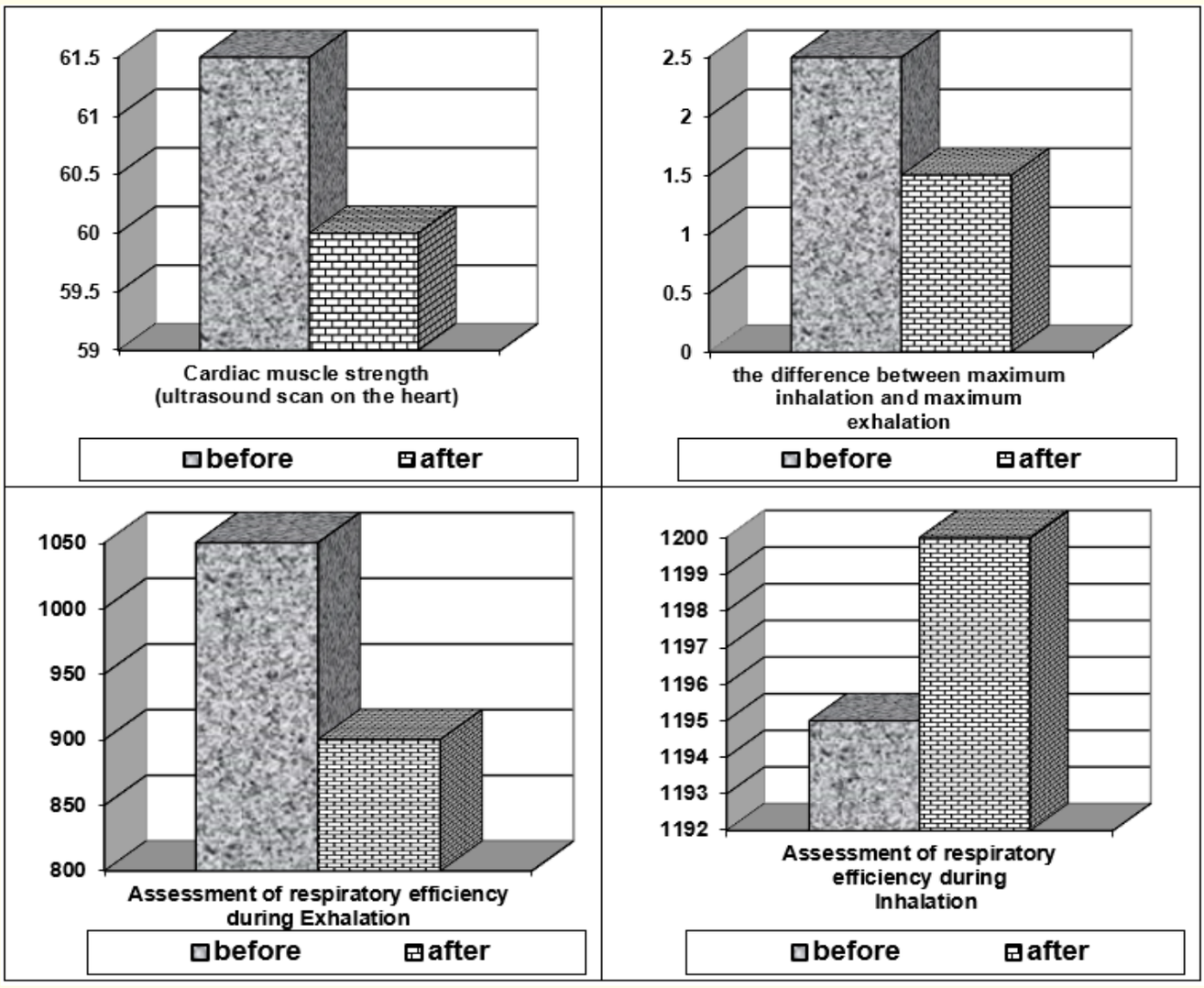


Figure 20: *The arithmetic mean of the measurement before and the measure after of the first experimental group in (physiological measurements) table 2.*

Intermediate Measures Progressive measurements after 1 month and 1 week of open heart surgery and pre-qualification immediately

Table 3 and figure 21 and the differences between the measurement before and the measure after in the Phase measurements of the first experimental group showed that there were no differences between the two measurements at level 0.05 in all tests (-48.000 to -0.425). These values are less than the value of the tables at 0.05, and the improvement rate ranged from (-100.000 to 53.846). This value is greater than the tabular values at the level of 0.05.

N	Phase measurement	Measure before		Measure after		The difference between the two averages	Improvement rate %	var(x)
		x	± Σ	x	± Σ			
1	Degree of pain	35.000	7.071	0	0	-35.000	-100.000	-0.425
2	Degree of healing	65.000	7.071	100.000	0	35.000	53.846	0.425-
3	Measure the strength of the heart muscle prior to direct rehabilitation.	60.000	8.485	60.000	8.485	0.000	0.000	-48.000

Table 3*: Differences between the measurement before and the measure after in the (Phase) Measurements of the First Pilot Group.*

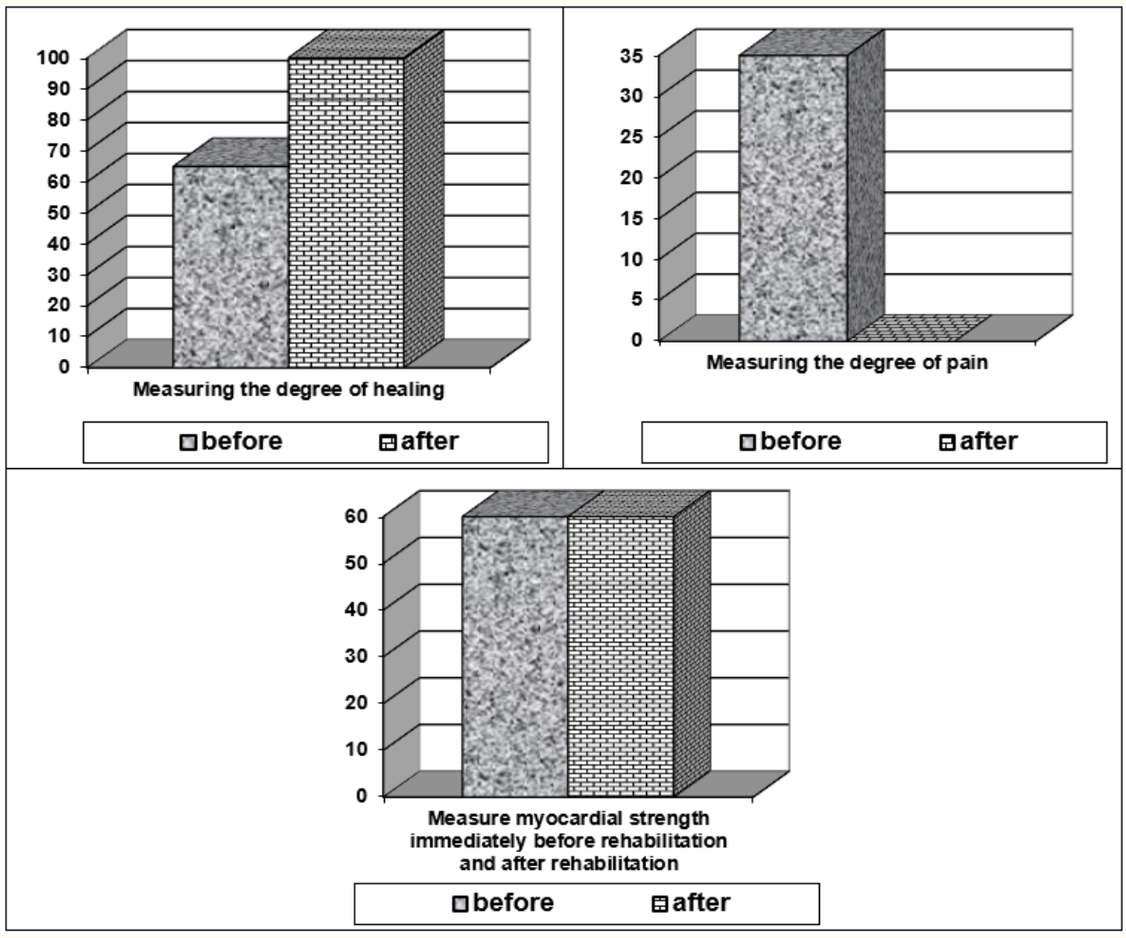
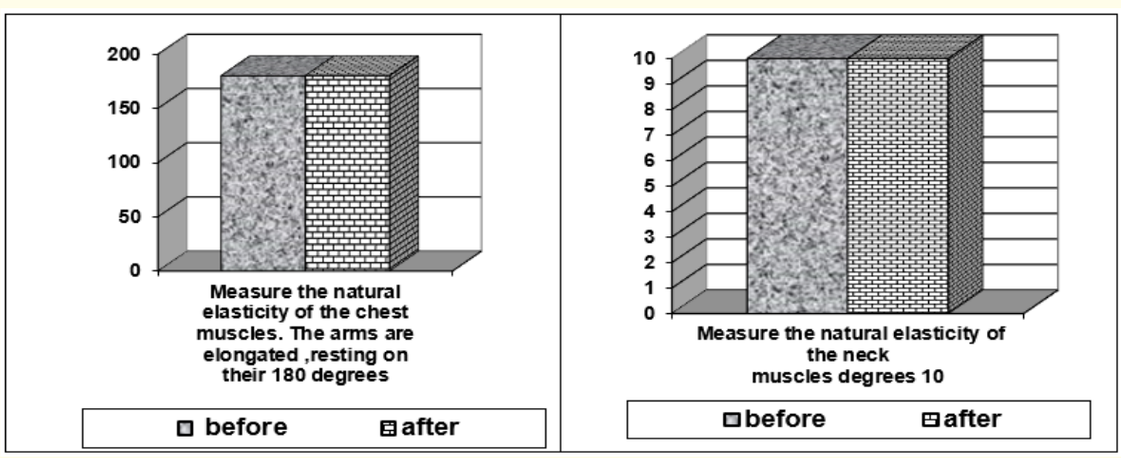


Figure 21: *The arithmetic mean of the measurement before and the measure after of the first experimental group in (Phase measurements) table 3.*

Differences between the measurement before and the measure after of the second experimental group (rehabilitated for one month)

Table 4 and figure 22 and 23, on the measurement before and the measure after in the physical measurements of the second experimental group, show differences between the two measurements at the level of 0.05 in the measurements (0.000 to 48.000) Between (0.000 to 24.000). These values are greater than the value of the ka table at 0.05 and the improvement rate ranged from (0.000 to 300,000).



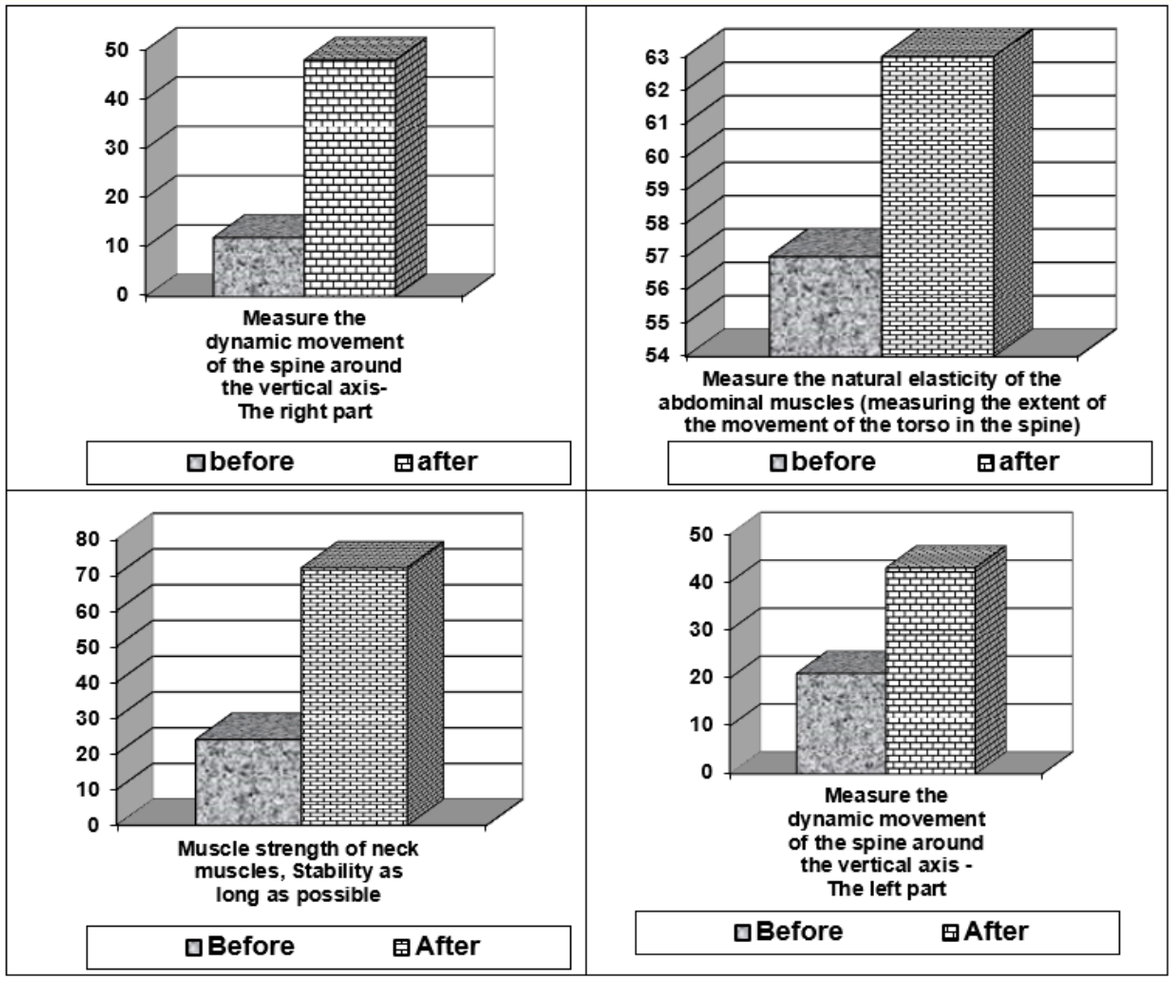
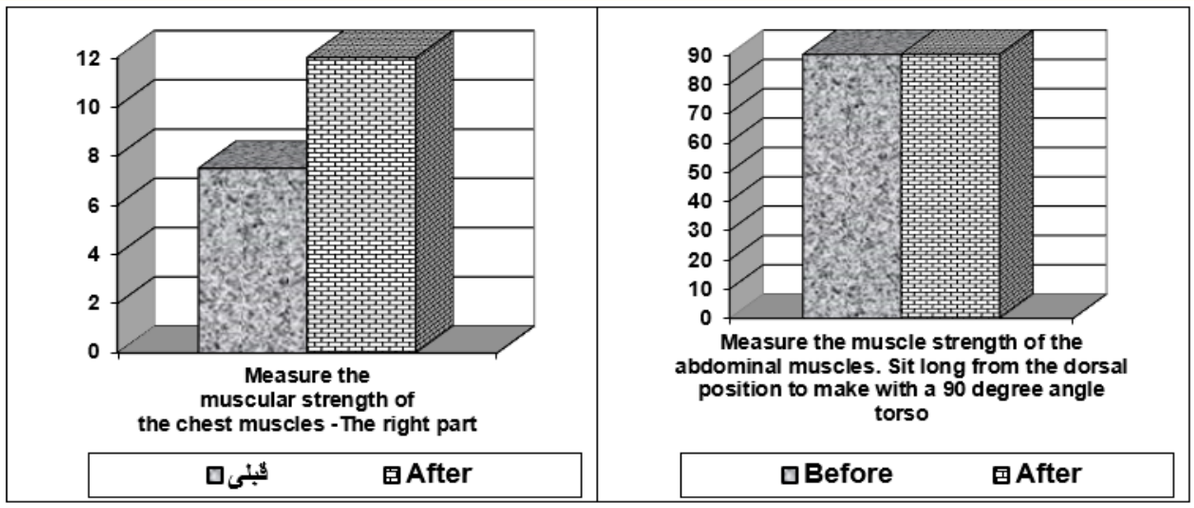


Figure 22: *The measurement before and the measure after of the second experimental group in (physical measurements) table 4.*



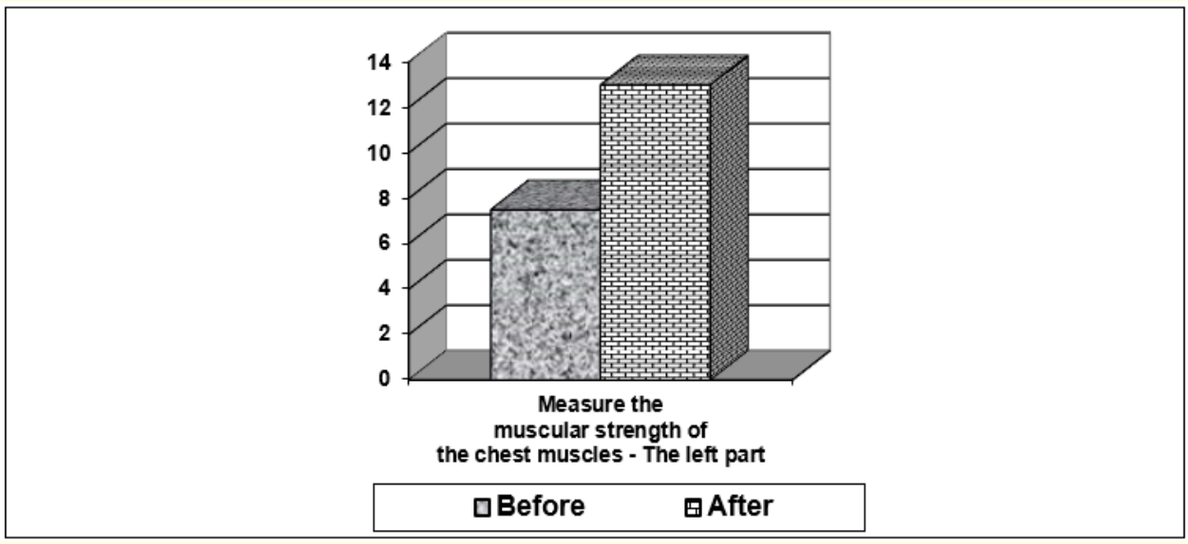


Figure 23: *The measurement before and the measure after of the second experimental group in (physical measurements) table 4.*

N	Physical measurements		Measure before	Measure after	The difference between the two measurements	Improvement rate %	χ2	(a)
1	Measure the natural elasticity of the neck muscles degrees 10		10	10	0.000	0.000	0.000	Not statistically significant
2	Measure the natural elasticity of the chest muscles. The arms are elongated, replacing their integrity. Degree 180		180	180	0.000	0.000	0.000	Not statistically significant
3	Measure the natural elasticity of the abdominal muscles (measuring the extent of the movement of the torso in the spine)		57	63	6.000	10.526	0.300	Not statistically significant
4	Measure the dynamic movement of the spine around the vertical axis from 0 to 75cm on staging.	The right part	12	48	36.000	300.000	21.600	statistically significant
		The left part	21	43	22.000	104.762	7.563	statistically significant
5	Measure Muscle strength of neck muscles, as long as possible		24	72	48.000	200.000	24.000	statistically significant
6	Measure the muscle strength of the abdominal muscles. Sit long from the dorsal position to make with a 90-degree angle torso		90	90	0.000	0.000	0.000	Not statistically significant
7	Measure the muscular strength of the chest muscles	The right part	7.5	12	4.5000	60.000	1.038	Not statistically significant
		The left part	7.5	13	5.500	73.333	1.476	Not statistically significant

Table 4*: Differences between the measurement before and the measure after of the second experimental group in (physical measurements) n = 1.*

The value of the kai tabular box is at the level of 0.05 = 3.841

Table 5 and figure 24, on the differences between the measurement before and the measure after in the physiological measurements of the second experimental group, show differences between the measurements at level 0.05 in the measurements (0.000 to 300.000) The value of the kai box was between (0.000 to 60.000). These values are greater than the value of the square ki table at 0.05 level and the improvement rate ranged from (0.000 to 50,000).

N	Functional measurements		Measure before	Measure after	The difference between the two measurements	Improvement rate %	χ2	(a)
1	Journey of inhalation and exhalation, the difference between maximum inhalation and maximum exhalation		2	2	0	0	0	Not statistically significant
2	RSPFLO device to assess the Efficiency of the respiratory system	Inhalation	900	1050	150	16.67	11.54	statistically significant
		Exhalation	600	900	300	50	60	statistically significant
3	Cardiac muscle strength (ultrasound scan on the heart)		64	70	6	9.375	0.269	Not statistically significant

Table 5: *Differences between the measurement before and the measure after of the second experimental group in physiological measurements (n = 1).*

The value of the kai tabular box is at the level of 0.05 = 3.841.

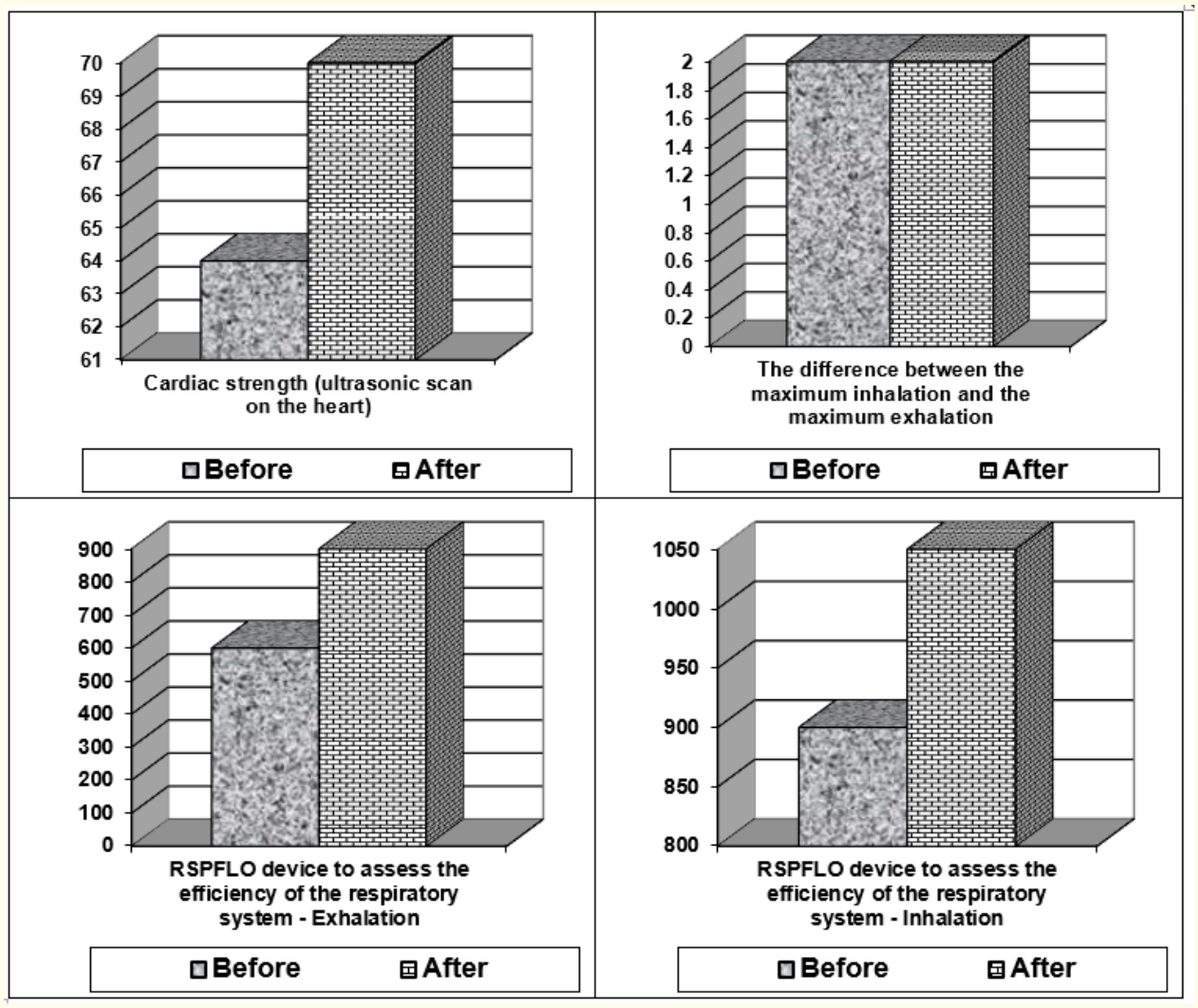


Figure 24: *The measurement before and the measure after of the second experimental group in (physiological measurements) table 5.*

Intermediate Measures Progressive measurements within a month and a week of surgery prior to direct rehabilitation

Table 6 and figure 25 and the differences between the measurement before and the measure after in the Phase measurements of the second experimental group show differences between the measurements at level 0.05 in measurements Between (-70,000 and 70,000). The value of the square was between (0.485 to 70.000). These values are greater than the value of the square table cubic meter at 0.05. The improvement rate ranged from (-100.000 to 233.333).

N	Phase measurement	Measure before	Measure after	The difference between the two measurements	Improvement rate %	χ^2	(a)
1	Degree of pain	70	0	-70.000	-100.000	70.000	Statistically Significant
2	Degree of healing	30	100	70.000	233.333	37.693	Statistically Significant
3	Measure the strength of the heart muscle prior to direct rehabilitation.	62	70	8.000	12.903	0.485	Not statistically significant

Table 6: *Differences between the measurement before and the measure after of the second experimental group In (Phase measurements) n = 1.*

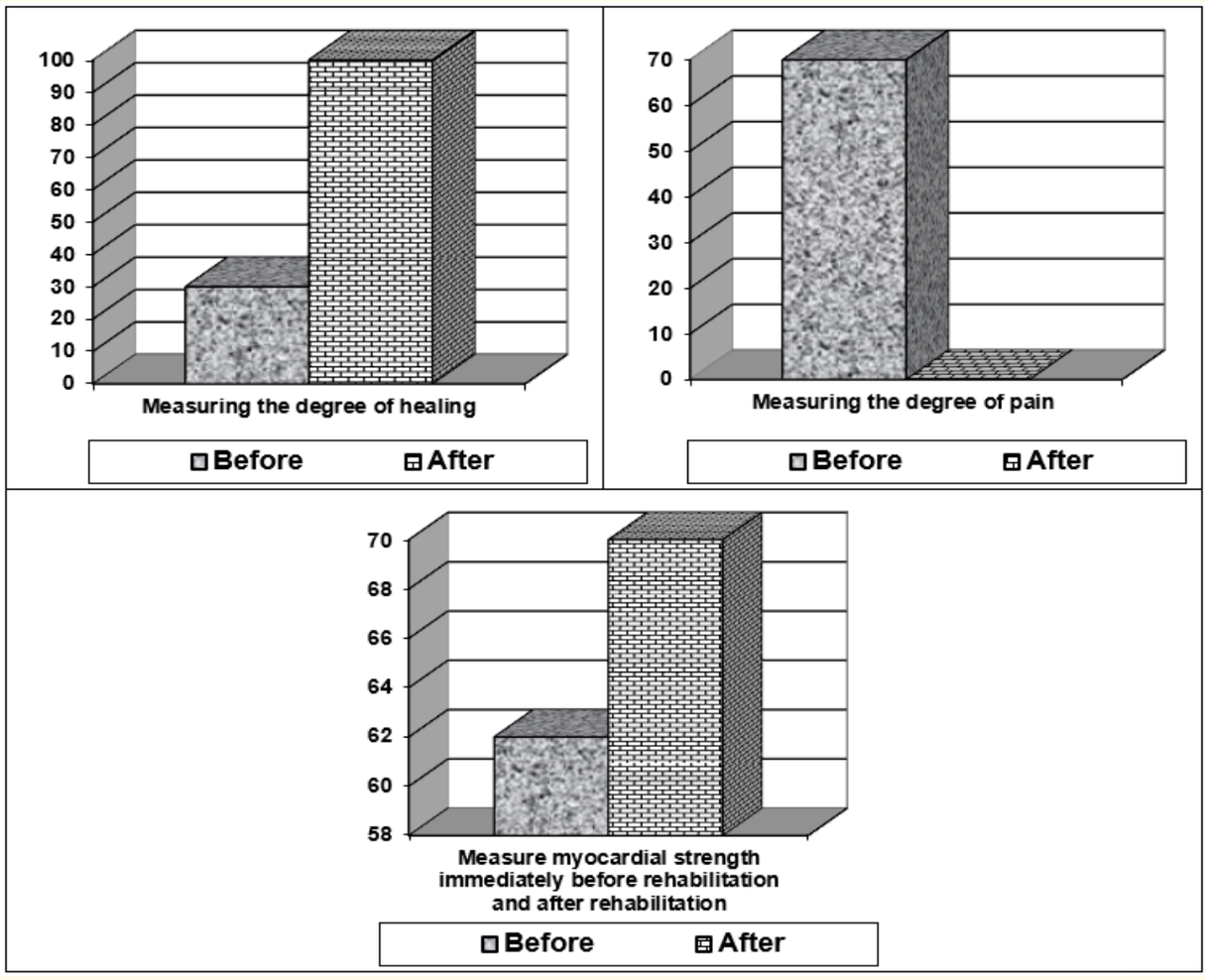


Figure 25: *The measurement before and the measure after of the second experimental group in (interim measurements) table 6.*

Differences between the measurement before and the measure after of the third experimental group

Table 7 and figure 26 and 27 on the differences between the measurement before and the measure after in the physical measurements of the third experimental group, show differences between the measurements at level 0.05 in the measurements (0.000 to 229.000), between (0.000 to 141.350). These values are greater than the value of the square kai box at the level of 0.05 and the improvement rate ranged from (0.000 to 322.535).

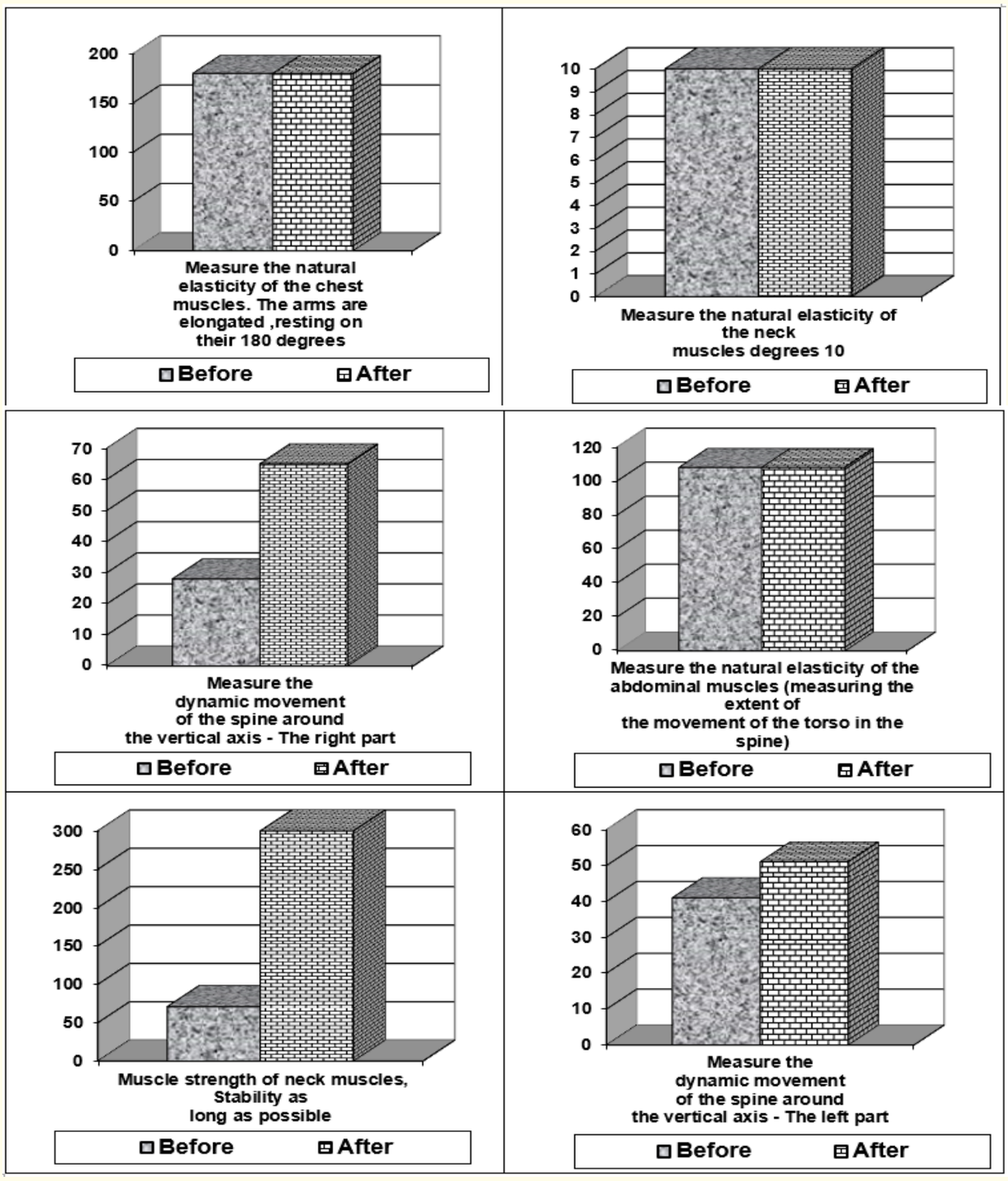
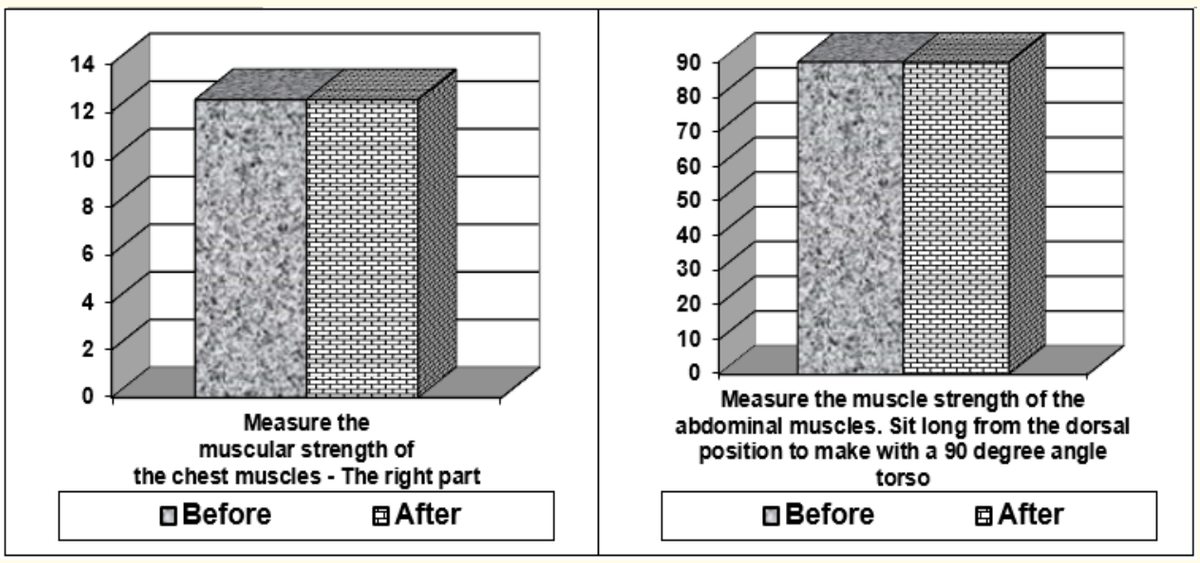


Figure 26: *The measurement before and the measure after of the three experimental group in (physical measurements) table 7.*

N	Physical measurements		Measure before	Measure after	The difference between the two measurements	Improvement rate %	χ^2	(a)
1	Measure the natural elasticity of the neck muscles degrees 10		10	10	0	0	0	Not statistically significant
2	Measure the natural elasticity of the chest muscles. The arms are elongated, replacing their integrity. Degree 180		180	180	0	0	0	Not statistically significant
3	Measure the natural elasticity of the abdominal muscles (measuring the extent of the movement of the torso in the spine)		108	108	0	0	0	Not statistically significant
4	Measure the dynamic movement of the spine around the vertical axis from 0 to 75cm on staging.	The right part	28	65	37	132.143	14.72	statistically significant
		The left part	41	51	10	24.39	1.087	Not statistically significant
5	Measure Muscle strength of neck muscles, as long as possible		71	300	229	322.535	141.35	statistically significant
6	Measure the muscle strength of the abdominal muscles. Sit long from the dorsal position to make with a 90 Degree angle torso		90	90	0	0	0	Not statistically significant
7	Measure the muscular strength of the chest muscles	The right part	12.5	12.5	0	0	0	Not statistically significant
		The left part	10	10	0	0	0	Not statistically significant

Table 7: *Differences between the measurement before and the measure after of the third experimental group in (physical measurements) n = 1.*

The value of the kai tabular box is at the level of 0.05 = 3.841.



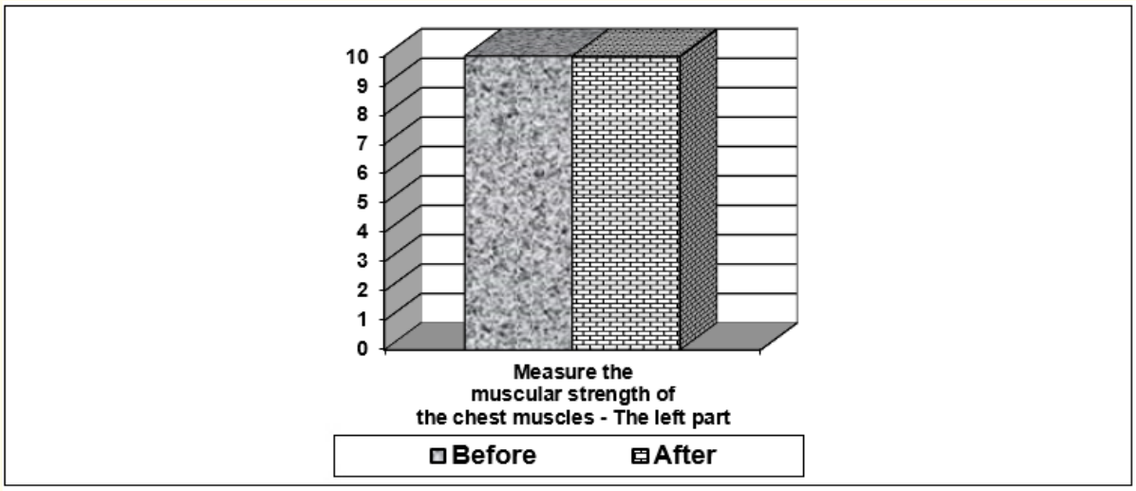


Figure 27: *The measurement before and the measure after of the three experimental group in (physical measurements) table 7.*

Table 8 and figure 28 and the difference between the measurement before and the measure after in the physiological measurements of the third experimental group showed differences between the measurements at level 0.05 in measurements (-3.000 to 50.000), between (0.000 to 1.351). These values are greater than the value of the square cupping table at 0.05 and the improvement rate ranged between (-4.762 to 5.566).

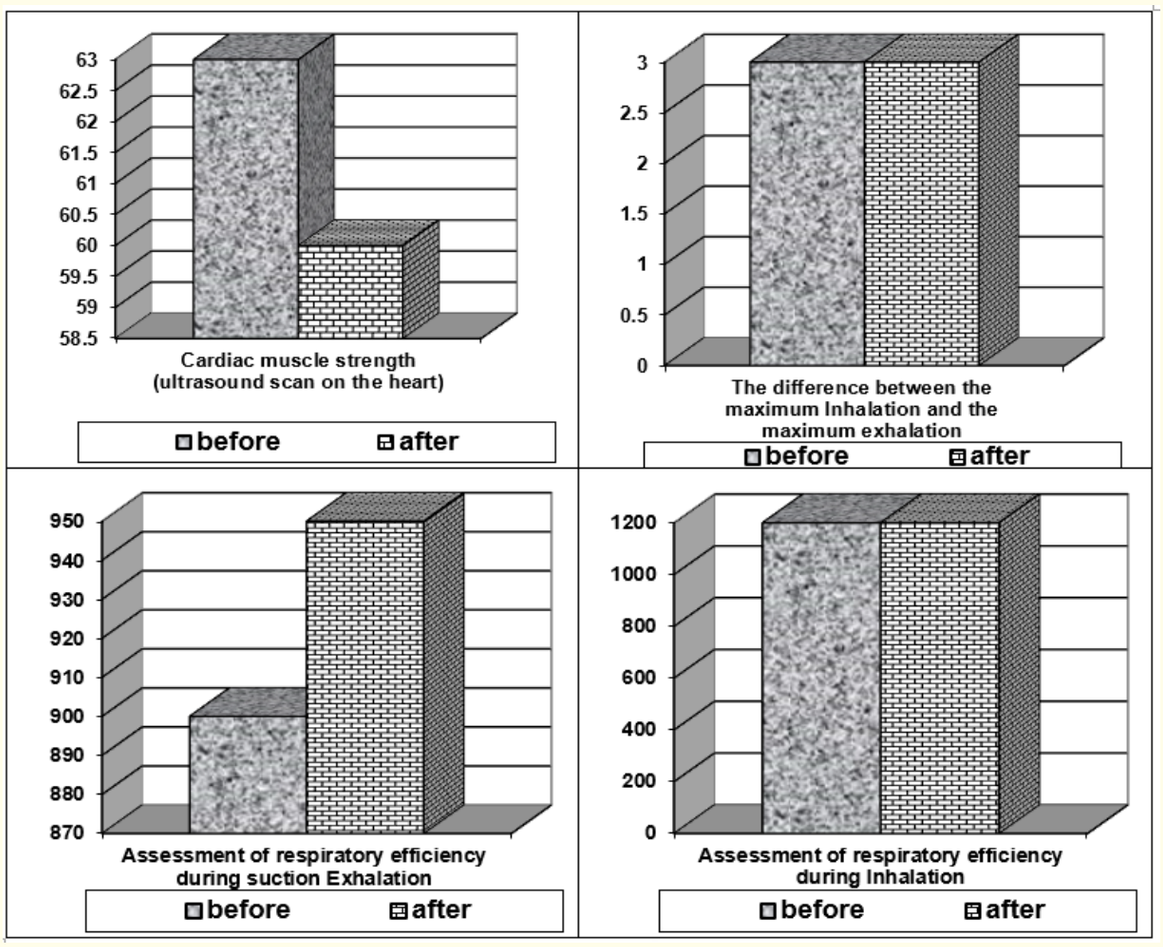


Figure 28: *The measurement before and the measure after of the third experimental group in (physiological measurements) table 8.*

N	Functional measurements		Measure before	Measure after	The difference between the two measurements	Improvement rate %	χ^2	(a)
1	Journey of inhalation and exhalation, the difference between maximum inhalation and maximum exhalation		3	3	0.000	0.000	0.000	Not statistically significant
2	RSPFLO device to assess the Efficiency of the respiratory system	Inhalation	1200	1200	0.000	0.000	0.000	Not statistically significant
		Exhalation	900	950	50.000	5.556	1.351	Not statistically significant
3	Cardiac muscle strength (ultrasound scan on the heart)		63	60	-3.000	-4.762	0.073	Not statistically significant

Table 8: *Differences between the measurement before and the measure after of the third experimental group In physiological measurements (n = 1).*

The value of the kai tabular box is at the level of 0.05 = 3.841.

Intermediate Measures Progressive measurements within a month and a week of surgery prior to direct rehabilitation

Table 9 and figure 29 and the differences between the measurement before and the measure after in the Phase measurements of the third experimental group show differences between the measurements at level 0.05 in measurements (-90,000 to 90,000), where the value of the square between (0.034 to 90.000) and these values are greater than the value of the square ki table scale at the level of 0.05 and the improvement rate ranged between (-100.000 to 900.000).

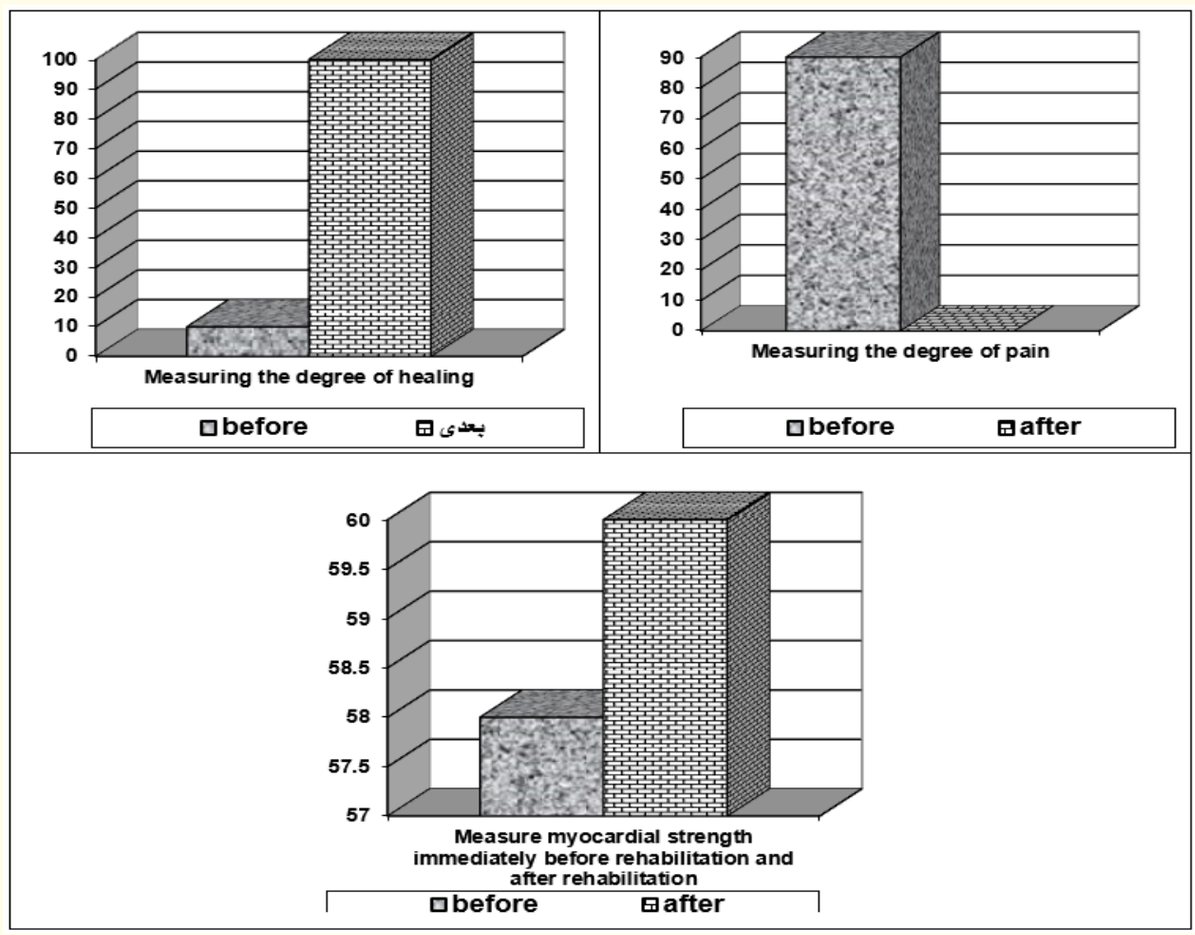


Figure 29: *The measurement before and the measure after of the third experimental group in (interim measurements) table 9.*

N	Phase measurement	Measure before	Measure after	The difference between the two measurements	Improvement rate %	χ2	(a)
1	Degree of pain	90	0	-90.000	-100.000	90.000	Statistically significant
2	Degree of healing	10	100	-90.000	-100.000	90.000	Statistically significant
3	Measure the strength of the heart muscle prior to direct rehabilitation.	58	60	2.000	3.448	0.034	Not statistically significant

Table 9: *Differences between the measurement before and the measure after of the third experimental group in (Phase measurements) n = 1.*

The value of the kai tabular box is at the level of 0.05 = 3.841.

Discussion

Table 1 shows that there are no statistically significant differences between the pre-test and the first experimental group. The value of z in measurement (1) for measuring the natural elasticity of neck muscles was -0.447 with an improvement rate of -10.526%.

The value of z in measurement (2) for measuring the natural elasticity of the chest muscle was -1,000, an improvement of 0.279%. And the value of z in measurement (3) for measuring the natural elasticity of the abdominal muscles was -1.342 at an improvement rate of -18.852%.

The results in the measurement of the dynamic movement of the spine around the vertical axis showed that the value of z for the right side of the chest was -1.342 with an improvement of -121.212% and the z value of the left side of the chest was -1.342 at an improvement of -100.000%.

The measurement of the muscle strength of the neck muscles shows that the value of z -1.342 increased by -57.303%, and the z value in measurement (6) for measuring the muscle strength of the abdominal muscles was -1.342 with an improvement rate of -57.759%. And the results showed also in measurement No. 7 of the measurement of muscle strength of the chest muscles that the value of z for the right section of the chest -1.342 by an improvement of -35.000%. The value of z for the left side of the chest for the same measurement -1,000 by an improvement of -3.333%.

As shown in table 1 in table 2 of the measurement of the journey of inspiration and exhalation, the value of z - 1,000 by an improvement of -40.000%. And the value of z in measurement (2) in table 2 for the measurement of respiratory efficiency using the risper floor during suction -1,000 was improved by - 0.418%. And the value of z during blowing for the same measurement was -1.000 with an improvement of -14.286%.

And the value of z in measurement No. (3) in table 2 for measuring the strength of the heart muscle -1,000 by an improvement of -2.439%.

The researcher finds that there is no positive improvement of the physical and functional measurements between the measurement before and the encroachment of the members of the first experimental group compared to measurement before. And attributed the researcher to the failure to apply rehabilitation exercises on the members of the first experimental group. Because of the complete relaxation of muscles resulting from the nature of the surgical opening and drugs for the extension of muscles given to patients before surgery. Also subject to the group to apply some methods of physical therapy only (ultrasound therapy -tens current - laser therapy). And not to fully implement the program. And the researcher finds that the use of these methods helped to fully heal the shear bone and the disappearance of the pain of bone, shear and muscles affected by the operation. And the results of the Phase measurements in table 3 show the difference in the percentage of healing and the degree of pain in the measurement before and the ablution at -0.425, where the rate of improvement in the measurement of pain -100.000% which means that the pain reached the zero phase and the complete disappearance of pain. The results of the measurement (2) in table 3 for the degree of healing showed that the improvement rate reached 53.846%. This confirms the effectiveness of the use of natural treatment methods (WF) in the complete healing of the shear bone. And measurement (2) in table 6 for the interim measurements of the second experimental group where it reached (1) to -100.000%, with a value of about 70.000 square meters, which has a statistical variability. The percentage of improvement in the measurement of healing in the number (2) to 233.333% The value of the square was 37,693, which is also statistically significant. The measurement (1) and the measurement

(2) in table 9 for the Phase measurements of the third experimental group also confirmed the improvement in pain in measurement (1) to -100.000%, where the value of the box of Kai 90.000, which has a statistical leakage and the rate of improvement to the degree of healing in the measurement number (2) to 900.000%, where the value of square Ka 73,366, which has a relativity statistic.

Waleed Fahmy (2017) has stated that for physiotherapy (ultrasound therapy-tens current-laser therapy) has a major effect on the healing of the shear bone and the disappearance of pain within the first three weeks immediately after surgery [8].

Osama Reyad and Imam elnagmy (1999) agree that the application of post-operative physiotherapy aids in faster healing of injuries as it speeds up the blood flow to the infection site, thus facilitating the feeding of infected tissues. To get rid of muscle contraction Leading to muscle relaxation, pain relief, and high level of metabolic reactions that assist in the healing of infected tissues [10].

The results of measurement (3) in table 3 for the preliminary measures of the heart muscle strength in the experimental group showed that the improvement in heart muscle strength was 0.000%, i.e. there was no difference in the improvement rates for the heart muscle strength (3) in table 2 for the measurement of the strength of the heart muscle in the initial experimental group. The researcher attributed this to the lack of use of training exercises and the exclusive use of means Physical therapy only, as confirmed by the measurement No. (3) in table 6 To measure your heart muscle strength in the interim measurements I have a second experimental group where The percentage of improvement was 12.903%, as was the measurement (3) in table 9 for measuring the strength of the heart muscle in the Phase measurements in the third experimental group where the improvement rate was 3.448%. The researcher attributed this to the application of the rehabilitation exercises in addition to applying the physiotherapy means for the second and third experimental groups, in contrast to the initial experimental group, which was applied only physiotherapy to their members without the exercise of rehabilitation.

And this is confirmed by Christian K Roberts and Frank W Booth., et al. (2012) that historical evidence has shown that non-exercise of physical activity harms health and functional abilities and leads to reduced Cardiorespiratory fitness [11].

Mellion (1988) states that joint mobility is reduced when an area of the body is exposed to injury or surgery where pain causes muscle dysfunction, which reduces the ability of the joints to move, and that the lack of movement leads to stiffness of the joints as well as shortening muscles and ligaments [12].

And the researcher points out that if the muscle strength is not stimulated muscle gradually become smaller and weaker and can become muscular dystrophy the rate may vary Weakness from one individual to another.

Bente K Pedersen and Mark A Febbraio (2012) suggest that physical inactivity and muscle neglect lead to impaired meokin response and poor resistance to myrcene effects, which increases the risk of a complete network of diseases including cardiovascular disease, and osteoporosis [13].

This is confirmed by Enrique G Artero, and Duck-chul Lee., *et al.* (2013) Physical fitness is one of the strongest predictors of a person's future health status, as it is linked to health and is capable of performing daily activities without fatigue and is associated with reducing the risk of developing chronic diseases and premature death along with respiratory cardiac fitness. Bone and Muscle is one of its main ingredients [14].

As shown in Measurement (1) for measuring the natural elasticity of the neck muscles, and measurement (2) for measuring the natural elasticity of the muscles of the chest. And measurement (6) for measuring the muscle strength of the muscles of the abdomen. In table 4 and measurement (1) in table 5 for the measurement of the journey of inspiration and exhalation. The absence of any significant differences with statistical significance between the measurement before and the encoder in the second experimental group in these measurements, With a 0.000% improvement. The researcher attributed this to the congruence between the tribal and infallible standards, where the patient obtained the highest assessment in the measurement after and also obtained the same evaluation in the measurement before and this indicates the extent of the program rehabilitation to restore natural rubber to the muscles of the neck and chest in an excellent manner as in the first and second measurements as well as his ability To restore the muscle strength of the abdominal muscles in an excellent manner as in the number (6) to match exactly with the patient's ability before surgery as well as the congruence between the tribal and the measure in the measurement No. (1) in table 5.

As shown in the measurement (3) for the measurement of the natural elasticity of the abdominal muscles in table 4 there are significant differences between the measurement of tribal and barbed for the benefit of measurement after, where the value of the box Kai 0.300 improvement rate 10.526% Which is the result of the success of the rehabilitation program and its ability to increase the natural elasticity of the muscles of the abdomen after rehabilitation before surgery, as it is one of the muscles affected by the operation.

As shown by measurement (4) for the measurement of the dynamic movement of the spine around the vertical axis in table 4 there are significant differences of statistical significance between the measurement of tribal and barbed for the benefit of the dimension measurement where the value of the square of the right section of the chest of 21.600 improvement rate of 300.000% Kai for the left shoulder of the chest 7.563 with an improvement of 104.762%.

The researcher believes This indicates the increase of natural elasticity of the chest muscle in the second experimental group after the application of the rehabilitation program and training exercises. This measurement is one of the strong evidence of the complete healing of the sternum.

In this regard, some studies suggest that when using stretching exercises for several weeks, this leads to a permanent increase in the elasticity of the muscle group involved in the movement [15].

As shown by the measurement No. (5) of the measurement of muscle strength of the neck muscles in table 4. There are significant differences of statistical significance between the measurement of tribal and barricade in the second experimental group for the benefit of remote measurement, where the box Ka 24,000 with an improvement of 200,000%.

The researcher attributed this to the ability of patients to maintain a longer period in measurement after than in measurement before. This indicates the effectiveness of the rehabilitation program and its ability to raise the efficiency of muscle strength of the neck muscles by a very large difference from the measurement before of the second experimental group where the rehabilitation program contains some special exercises Neck muscles, which are interested in constipation and sequential succession, as well as in advanced stages of the program was performed the patient neck exercises against the resistance of the hand of the processor and this in turn led to reach this result and the high rate of improvement from measurement before.

Zakia Ahmed Fathi., *et al.* (2000) note that when comparing the great force resulting from constant muscular contractions with those of the movable muscular contraction, we observe the superiority of the fixed force on the motor. If increased resistance increases the number of muscle fibers involved in contractions and therefore the constant force is always accompanied by the involvement of a larger number of muscle fibers. And organized sports training increases the efficiency of the muscular system [16].

Sean R McMahon and Philip A Ades., *et al.* (2017) that the use of rehabilitation exercises for patients with heart disease increases the ability to endurance and maintain physical activity for long periods of time, as well as improve cardio-pulmonary fitness [17].

Byunghun So, a and Hee-Jae Kim (2014) notes that regular physical activity and exercise result in muscle and skeletal regeneration, and also prevent chronic diseases such as cardiovascular disease, metabolic diseases, and of the multiplier benefits on the whole body [18].

Is evident from the measurement (7) for the measurement of muscular strength of the chest muscle in table (4) There are statistically significant differences between the pre-measurement and the threshold for the benefit of remote measurement in the second experimental group where the value of the square of the right section of the chest 1.038 improved by 60.000% For the left side of the chest 1,476, an improvement of 73.333% This indicates the increase of muscle strength of the muscles of the chest in the second experimental group after the application of the rehabilitation program before the surgery.

And attributed the researcher to the use of the first-time weight training after open heart surgery at an advanced stage of the program in addition to start the work of muscle contractions of the muscles of the chest, as well as start the process of inspiration and exhalation gradually.

The researcher also attributes minor differences in measurement and improvement rates between the right and left sides of the chest in favour of the left side to the severity of the weakness resulting from the operation and the extent of the patient's injuries.

Recalls mark A Williams., *et al.* (2007) That weight training increases muscle strength and endurance, and the ability to perform a wide range of activities. It reduces disability and enhances the quality of life. It also works to increase bone mineral density and lean body mass [19].

Explains Mikel Izquierdo and Keijo Häkkinen., *et al.* (2005) reported that low frequency resistance and endurance training increases the maximum dynamic force in the leg and arms muscles, as well as cardiovascular fitness if resistance is exercised only once a week [20].

As shown in the measurement No. (2) of the measurement of respiratory efficiency in table 5 there are significant differences of statistical significance between the measurement of tribal and barber in the second experimental group for the benefit of remote measurement during the suction, where the value of the box 11.538 Kaif improvement rate of 16.667%. While the value of the Kaie box during blowing up was 60.000 with an improvement rate of 50.000%.

And attributed the researcher to the patient's ability to exchange inspiration and exhalation well during the application of the program. As well as physical pregnancy on the respiratory system as a result of weight training.

Mohamed Sobhy Hassanein (2004) states that the vital capacity reflects the safety of the body's respirators and is largely related to the skills that require periodic circulatory skin and reflects physiological efficiency. Individuals with significant vitality can become high-level and make significant progress [21].

According to Hazaa Mohammed Hazza (1992), the primary function of the lungs lies in the supply of oxygen to the blood and the elimination of carbon dioxide. It is accomplished through the mechanical breathing process of respiratory muscle contraction [22].

Ferid Oueslati and Ahmed Berriri., *et al.* (1996) asserts that fatigue of the respiratory muscles leads to a reduction in exercise, thus affecting the absorption of the maximum oxygen ($\dot{V}O_2$ max) [23].

As noted by Jan Müller and Peter Ewert., *et al*. (2018) that limitations on vital capacity impair the ability to exercise, and reduced ability to exercise leads to lower lung function in patients with congenital heart disease [24].

And Anna Caroline Marques Braga and Anabela Pinto., *et al.* (2018) emphasized that muscle fibers to increase their size and even become stronger must maintain their endurance through constant activity of strong and short mechanical loads, which lead to increased oxygen transport, and improve the functions of heart, lung and blood vessels, which protect against hypoxia in tissues [25].

Explains by the measurement No. (3) in table 5 showed that there was no significant difference between the pre and post measurement in the second experimental group in favor of the dimension measurement. The value of the kai box was 0.269 with an improvement rate of 9.375%.

Mahmoud Ezzat Mahmoud Kashef (1990) states that the practice of different types of exercise and sports is one of the most effective and effective means of training the heart muscle. Physical exercise is an appropriate way for all internal organs, especially heart function. The heart muscle during physical work is growing stronger [26].

Abdul Razek Yousef Ibrahim (2009) points out that sports training has a positive effect on physical fitness and has a clear effect on increased cardiomyopathy and cardiac momentum [27].

And many researchers agree that regular physical activity and participation in sports training programs lead to changes in the heart muscle and include anatomical changes in heart size and weight.

Gabriel Somarriba and Jason Exstein (2008) note that cardiovascular rehabilitation programs have been successful in improving heart function and overall physical activity, and the quality of life of adults with congestive heart failure [28].

Patrick O'Shea (2004) emphasizes that bodybuilding promotes musculoskeletal, cardiovascular, and physical fitness. And cardiovascular improvement is associated with choice of exercise, intensity training, and duration of rest periods between exercise groups [29].

And Michael A Pollock and Barry A Franklin., *et al.* (2000) agree that moderate resistance training is an effective way to improve muscular strength and endurance. Resistance training reduces the demands of the heart muscle during daily activities (Improves the efficiency of the heart muscle) [30].

Raminshabani., *et al*. (2010) note that rehabilitation improves the ability to exercise and provide oxygen to the heart muscle [31].

Larry R Gettman and Michael L Pollock (2016) further affirms that weight training can improve cardiovascular function, improves body composition and muscle strength, and can maintain physical fitness. The pneumatic maximum capacity for oxygen absorption [32].

Is shown by measurement no. (1) for measuring the natural elasticity of the neck muscles. Measurement (2) for measuring the natural elasticity of the chest muscles, and measurement (3) for measuring the natural elasticity of the abdominal muscles. Measurement (6) for the measurement of muscle strength of the abdominal muscles, and measurement (7) for the measurement of muscle strength of the muscles of the chest in table 7, and measurement (1) of measuring the journey of inspiration and exhalation in table 8 There were significant statistical significance differences between the tribal and algebraic measurements in the third experimental group in these measurements. The value of the kai box was 0.000 with an improvement rate of 0.000%.

And attributed the researcher to the match between the tribal and barricade standards and this indicates the ability of the rehabilitation program and the importance of training exercises in the restoration of natural rubber muscles neck, chest and abdomen as in the first, second and third. As well as the ability of rehabilitation exercises and rehabilitation program to restore the muscle strength of abdominal muscles as excellent as in the measurement No. (6) in table 7 to match exactly with the patient's ability before surgery.

Osama Reyad (1999) points out that the use of therapeutic exercises prevents the adhesion of soft tissues, as well as prevents joint stiffness and accelerates the return of elastic muscle tissue, flexibility and ability to contract fully, which has the decisive effect in preventing complications in the site of surgery and the return of the patient to exercise early [10].

As shown in by the measurement (7) in table 7, the return of the muscular strength of the chest before surgery in the right and left sides of the chest. And attributed the researcher to the use of exercise resistance and weight training.

American heart association (2007) suggests that weight training increases health and fitness [33].

As the results showed in the measurement No. (1) In table 8, the correlation between the measurement before and the vertebrae is attributed to the return of the patient to the normal state he had before the surgery, as confirmed by the measurement number (1) in table 5.

And from the measurement No. (4) Measuring the dynamic movement of the spine around the vertical axis In table 7, there were significant differences with statistical significance between the tribal and the test in the third experimental group in the right side of the chest for the benefit of the dimension measurement, where the value of box Ka 14.720 with an improvement of 132.143%.

And the results showed that there were statistically significant differences between the measurement of the tribal and the test in the third experimental group in the left side of the chest for the benefit of measurement after the value of the Kaie 1.087 was up 24.390%.

And that this shows that the increase of natural elasticity of the muscles of the chest in the third experimental group after the application of the program from the normal before surgery for the left and right sides of the right side to the extent of muscle tissue after the surgery and the ability to respond to training exercises.

As shown in the measurement (5) of the measurement of muscle strength of the neck muscles in table 7 There are significant differences of statistical significance between the measurement of tribal and barber in the third experimental group, where the value of the box of 141,350 Ka improvement rate of 322.535%.

And attributed to the researcher to the contraction and progressive expansion of neck muscles sequentially during the application of the rehabilitation program and in advanced stages of the program performs the patient neck exercises against the resistance of the hand of the processor and this in turn led to the achievement of this result and the high rate of improvement from measurement before.

Rogeradams., *et al*. (2007) reported that exercise improves the function of muscles in contrast to the common that it must avoid movement to avoid pain [4].

Is shown by measurement (2) for measurement of respiratory efficiency In table 8 there were no statistically significant differences between the tribal and the tertiary measurements in the third experimental group of the tribal and infrastructural measurements during suction, where the value of the kai box reached 0.000 with an improvement rate of 0.000%.

The results also showed that there were statistically significant differences between the pre-test and the third experimental group during the blowing for the benefit of the dimension measurement. The value of the box of 1.351 kai rose by 5.556%.

The researcher attributed this to the congruence between the tribal and the occult during the suction to return the efficiency of the respiratory system to its nature before surgery, the highest percentage that can be obtained by the patient on the device Ravello during the evaluation, where the value in the measurement before and dimension 1200 on the scale of the device.

And the researcher attributed the rate of improvement during the blowing to the ability of members of the group to exchange the inspiration and exhalation well and the use of breathing exercises within the content of the rehabilitation program. As well as physical pregnancy on the respiratory system as a result of weight training.

The researcher also attributes the decrease in the percentage during blowing during the suction to the fact that the nature of the device is designed for suction training and to withdraw the maximum amount of inhalation on the device, but the researcher can use it in an innovative way to allow it to be used during the blowing process and remove the maximum exhalation after turning the device down, Resistance The device needs a larger force and larger volume of air to move the balls on the staging and thus increase the degree of difficulty during performance.

Abdul Moneim Badir Al-Qusair (2008) indicates that the respiratory system is one of the most important devices that can accurately control the intensity of physical exertion on the individual. The relationship is related to the high intensity of the breathing process with the increase in the intensity of the physical effort [34].

Is shown by measurement no. (3) for measuring the strength of the heart muscle In table 8 there were statistically significant differences between the pre-test and the pre-test in the third experimental group in favour of the measurement before. The value of the kai box was 0.073 with an improvement rate of -4.762%, and the researcher believes that this is due to the decline of strength of the heart muscle after surgery directly from the value before surgery and then begin to increase gradually with the application of the rehabilitation program may be a large or average decline. And this is confirmed by the interim measurement.

Ahmed Nasr El Din (2003) states that heart muscle such as skeletal muscle grows and Increasing by training. He also noted that increased muscle contractions and myocardial infarction under physical exertion cause a morphological change in myocardium leading to increased size [35].

Conclusions

1. The application of natural treatment methods (WF) only led to the complete healing of the shear bone in the first experimental group.
2. The application of natural treatment methods (WF) only led to the complete disappearance of pain and the severity of the shear and muscles affected by surgery in the first experimental group.
3. There is no difference in the rates of improvement of the strength of the heart muscle in the first experimental group, because of the lack of application of training exercises and limit the application of natural treatment methods (WF) only.
4. There is no difference in the rates of improvement after open heart surgery for the physical and functional condition of the muscles affected by the operation. I have the first experimental group. So as to limit the application of natural remedies (WF) only.
5. Complete healing of the shear bone and the disappearance of pain in the second and third experimental group after the application of the rehabilitation program (ECR).
6. Improve the strength of the heart muscle in the second and third experimental group, because of the use of training exercises, especially exercises resistance and weight training, and not only the use of physical therapy only.
7. Improve the physical and functional condition of the muscles affected by the surgery in the experimental group II and III. After applying the qualifying program (ECR).
8. Improve the efficiency of the respiratory system and the ability to exchange inspiration and exhalation well. After the application of the rehabilitation program (ECR).

Recommendations

1. The need for the use of physical therapy (WF) after open heart surgery.
2. The need to apply Rehabilitation exercises with physical therapy methods (WF) to get the best results.
3. Not only to apply the methods of physical therapy (WF) only.
4. The need to use resistance exercises and weight training after open heart surgery.
5. Adherence to the abbreviations contained in the rehabilitation program (ECR) and use in diagnosis as well as during rehabilitation after open heart surgery.

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Volume 5 Issue 7 July 2018