Motor and Functional Recovery Post Radical Thyroidectomy: A Comparative Study of Two Types of Physical Exercises

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Abstract

Bakeground: Thyroidectomy is one of the standard surgical procedures worldwide. Although The mortality and morbidity of thyroidectomy are low, some long-term complications continue to represent significant health and social problem. Early physical exercises for these patients are effective in enhancing the neck and shoulder motor function and improving quality of life. **Aim**: Assess the efficacy of early exercise programs (self rang of motion and active rang of motion exercises) on radical thyroidectomy patients' motor and functional abilities. **Design:** the researchers used a a comparative design. **setting:**The researcher conducted the study at the Head and Neck Surgery Unit in Alexandria Main University Hospital, Egypt. **Sample**:50 radical thyroidectomy patients were included, and each patient was randomly selected to be allocated to one of the two groups, 25 patients

each. **Tools:** Four tools were used: Socio-demographic and clinical data structured interview schedule, "The disabilities of the arm, shoulder and hand" outcome questionnaire, shoulder recovery outcome and neck recovery outcome. **Methods:** The researchers used four tools for data collection. The exercise programs were applied one week before the operation and continued for two months postoperative. The researchers developed verbal and written instruction and gave it preoperatively, and patients were re-assessed by utilizing tools II, III, and IV after applying the program for each group. **Results:** 88% of self exercises patients were holding against maximal resistance of muscles strength after two months postoperatively compared to 48% of active exercises patients were holding against gravity elimination. Arm circumference measurements were not statistically significant differences between the two groups, neither preoperatively nor postoperatively. In contrast, range of motion of shoulders, shoulder pain, Disailities of Arm,Shoulder and Hand score, ability to lift objects, ability to do work, and overall activity were significantly improved among self-exercise patients than active exercise patients. **Conclusion:** Significant improvement of the self exercises group concerning functional and motor activity of the shoulder, arm, and neck. Modification of the disabilities of the arm, shoulder, and hand score of self exercises patients. Statistically significant differences between self and active exercise group regarding Neck Dissection Impairment Index after two months postoperative. **Recommendations:**
Patients and their families must be involved in early rehabilitation to prevent complications and improve their daily living activity.

Key Words: Functional recovery, Motor, Physical exercises, Radical thyroidectomy.

Introduction

The thyroid is an essential endocrine gland that plays a primary role in almost all metabolic processes. Thyroid cancer is one of the most common endocrine neoplasia. The incidence of thyroid cancer is higher in women than in men. However, men usually go to the physician in a more advanced stage, presenting extra-thyroidal extension that leads to a more reserved prognosis on the disease's survival and recurrence rate (Piciu, 2012). (American Cancer Society, 2019) (Piciu and Irimie, 2007).

Thyroidectomy is one of the standard surgical procedures worldwide, and its complication rates are mainly dependent on the surgeon's skill, experience, and the extent of surgery (Khanzada, Samad, Memon and Kumar, 2010). The mortality and morbidity of thyroidectomy are low, but some long-term postoperative complications continue to represent significant health and social problem (Sudarshan Babu and Lakshmi, 2013). Significant neck and shoulder disability may be due to complaints such as neck and shoulder pain, discomfort, stiffness, or a restricted range of motion (ROM) of the neck and shoulder. These complaints could result in limitations in daily life activities and social participation restrictions (Davies and Welch, 2014).

Thyroid cancer Survivors'Association (Thy Ca, 2018) reported a complex system in head and neck consisting of superficial and deep cervical lymph nodes and its' pathways that interconnect. Removal of lymph nodes, vessels, or compromised lymph collectors due to radiotherapy damage can cause lymphedema. Besides, recurrent cellulitis of neck vessels can lead to further scarring and damage to the lymphatic system (Cooper and White, 2009).

The World Health Organization [WHO] (2000) has urged that rehabilitation interventions for patients with chronic diseases should be cost-effective, evidence-based, and encourage patient empowerment. A wide range of shoulder mobility creates this joint vulnerable to injury of the bone, muscle, tendon, ligament, and bursa from extreme movement (Hess, 2000). One form of rehabilitation at home is performing early physical exercises for total thyroidectomy patients as soon as possible after surgery (Mc Neely et al., 2008). In self ROM, Shoulder stabilization exercises are designed to fix the shoulder to the chest cavity in a neutral position via the collaboration of the muscles that construct the shoulder by supporting the affected arm with another arm. Hence self ROM is very effective in enhancing the function of postural control.

Significance of the study:

Some long-term postoperative complications of thyroidectomy continue to represent significant health and social problems and reduce the health-related quality of life. Several studies identified that rehabilitation programs could reduce the complications. One method of rehabilitation is performing early physical exercises. Therefore, the current study will assess the effect of both early exercise programs (self ROM and active ROM exercises) on radical thyroidectomy patients' motor and functional abilities.

Patients and Method:

Study aim:

Assess the efficacy of both early exercise programs (self ROM and active ROM exercises) on radical thyroidectomy patients' motor and functional abilities.

- To compare self-ROM and active ROM exercises on patients' muscle strength, Arm circumference measurement, Shoulder ranges of motions, and Neck Dissection Impairment Index (NDII).

Operational definition

Self ROM exercises:

Study Hypotheses:

Hypotheses: Patients who perform self-ROM exercises exhibit improved motor and functional abilities than those who perform active ROM exercises.

Null Hypotheses: Patients who perform self-ROM exercises exhibit same improved motor and functional abilities like those who perform active ROM exercises.

Objective:

- To assess the effect of self ROM on The disabilities of the arm, shoulder, and hand (DASH) outcome.
- To assess the effect of active ROM exercises on The disabilities of the arm, shoulder, and hand (DASH) outcome.

Self-ROM exercises are used when the affected limb cannot complete ROM exercises independently. The patient used the unaffected one to support the affected limb to perform the sweeping motion. Assistance provided by manual supporting of the affected limb by the patient himself/herself using another arm as the prime mover muscles cannot complete the movement.

Active ROM exercise:

It means movement produced on a segment upon active contraction of the muscles crossing the joint within an unrestricted range of motion.

Active range of motion is the movement of a joint provided entirely by the individual performing the exercise, and there is no outside force aiding in the activity. The motion is imparted to a part by voluntary contraction and relaxation of its controlling muscles.

Research design:

The researchers used comparative design.

Setting:

The researcher conducted the study at the Head and Neck Surgery Unit in Alexandria Main University Hospital, Egypt. The researcher met the identified patients at the pre-admission and postoperative unit and followed up at the outpatient clinic.

Written approval:

After an explanation of the study aim, written approval to carry out the study was obtained from the hospital administrators and head of the department at the Main University Hospital.

Sampling and sample size:

Sample size: Based on Epi-info 7 program, Sample size calculation as follow: the population size; 50 patients for 3 months, expected frequency = 50%, acceptable error = 10% and confidence co-efficient = 95%, the minimum sample size = 45 patients.

A purposive sample of 50 adult patients with thyroid cancer scheduled for radical thyroidectomy was recruited according to the inclusion criteria. The researchers randomly selected each patient using a computer-generated randomized table to be allocated to one of the two groups, 25 patients each.

Group (I): subjects were trained and followed an active range of motion exercises.

Group (II): subjects were trained and followed self-range of motion exercises.

The researcher at the pre-admission clinic interviewed the identified patients. The researchers introduced themselves, explained the study's purpose, and assured the patient that they would maintain his / her privacy and confidentiality. Then the researchers obtained written consent.

The inclusion criteria:

Patients with thyroid cancer (stages II-IV), 18-60 years old, planned radical thyroidectomy.

Patients can read and understand the instructions of the exercise programs.

The exclusion criteria:

patients with recurrence of cancer.

Tools of the study: Four tools were used.

Tool I: Socio-demographic and clinical data structured interview schedule

The researchers developed this tool after reviewing related literature. It included: Patient's age, educational level, marital status, occupation, and residence area, name of the operation, chief complaints, diagnostic studies, laboratory values, stage of thyroid cancer, number of neck lymph nodes removal and size of cancer, current medications, medical and surgical history.

Tool II: The disabilities of the arm, shoulder, and hand (DASH) outcome questionnaire

It was adopted by the researchers from the "DASH" scale, which was developed by Hudak, Amadio and Bombardier,1996 (. It is a self-reported questionnaire that patients can rate the difficulty and interferences with daily life on the Five-point Likert scale "(1) No Difficulty to (5) Unable". DASH consisted mainly of 30 items. Twenty-one items to assess the degree of difficulty in performing different physical activities. Five items to assess the severity of each symptom of pain, activity-related pain, tingling, weakness, and stiffness. Four items to assess the impact of the problem on social functioning, work, sleep, and self-image. The scores are then calculated according to the following equation: "DASH disability/ symptoms score = ([(sum of n responses/n)-1x25, where n is the number of completed responses)". It ranged from (0 = no disability to 100 = most severe disability. A higher score reflects greater disability. If less than 10% of the items are left blank by the respondent, then the mean value of the responses to the completed items is substituted

for each missing item (Gummesson, Atroshi and Olsen; 2014).

Tool III: Shoulder recovery outcome

The researcher developed this tool after reviewing the related literature, and it consisted of 3 parts.

Part one: Assessment of the muscle's strength

This part was adopted from the "Medical Research Council (MRC)" (2019) scale for muscle strength to assess muscle weakness as a result of nerve affection during lymph node dissection and to assess the motor ability of patients. It includes assessing the following muscles: sternocleidomastoid, trapezius, deltoid, biceps, triceps, wrist, finger. MRC scale is a six-point scale ranging from (0-5) as follows: "muscle contracts against full resistance =5, strength reduced, but contraction can still move joint against resistance = 4, strength further reduced such that joint can be moved only against gravity with examiner's resistance completely removed =3, the muscle can only move if the resistance of gravity is removed =2, evidence of slight contractility =1, no movement = 0". (O'Neill, Jaszczak, Steffensen and Debrabant; 2017) (Riddoch et al., 2018).

Part two: Arm circumference measurement

This tool has been validated in a few studies, including Megens et al., 2001; Sander et al., 2002; Karges et al., 2003; Taylor et al., 2006. Arm measurements were assessed at the marked point of four points. First: metacarpal phalangeal joint, second: the wrist, third: ten centimeters distal to and fourth: fifteen centimeters proximal to lateral epicondyles. It was measured by tape. The researchers assessed each patient at each visit (Saeed et al., 2015).

Part three: Shoulder ranges of motions

A universal "full-circle manual goniometer" was used to measure the range of complete passive shoulder abduction (Benryman and William, 2017).

Tool IV: Neck recovery outcome

The researcher developed the tool after a review of the related literature. It consisted of three parts:

Part I: Numerical rating scale of pain distress

This scale numbered from 0 to 10 at equal intervals. With the left end of the line, "0" had verbal anchors of "no distress," and the right end, "10" had verbal anchors of "most distress imaginable." The reliability coefficients of the numerical rating scales for pain sensation (r = 0.72, p< 0.01) and pain distress (r = 0.75, p < 0.01) were satisfactory (Chu, Reddy, Lee and Patt, 1999).

Part II: Neck mobility assessment

The extent of head rotation at the neck was measured in degrees with "a universal full-circle manual goniometer" (Frank-Stromborg and Olsen, 2004).

Part III: Neck Dissection Impairment Index (NDII):

This tool was developed by Taylor, Chepeha and Chepeha (2019); they used it to assess the long-term effects of neck dissection on quality of life-related to shoulder dysfunction. It is a self-administered questionnaire and consists of 10 items. Every patient was required to express response for each item on a 5-point response option ranging from1 to 5, with higher responses representing the better "quality of life."

Content validity: All tools were submitted to a jury member, five experts (Academic Faculty with Ph.D.) in the field of head and neck surgery, and two medical-surgical nursing. A critical appraisal sheet was provided to each expert to rate each item on the questionnaire for relevance, clarity, and essentiality. Relevancy scale: A 4-point Likert scale was used and was interpreted as follows: 1 = not relevant, 2 = somewhat relevant, 3=quite relevant, and 4 = very relevant. Any item rated either 1 or 2 was considered content invalid, while ratings of 3 and 4 were deemed content valid. Clarity scale: Scores were interpreted as follows: 1 = not clear at all, 2 = clear yet needs revision, and 3 = very clear. Essentiality: Scores were interpreted as follows: 1 = not essential; 2 = useful, but not essential, and 3 = essential. Accordingly, the Content validity index (CVI) =0.906, suggesting excellent content

Validity and reliability:

validity. Recommendations from the experts were used to revise the questionnaire and the necessary modifications were carried out accordingly.

Reliability testing: Reliability testing was tested by using Cronbach's alpha reliability test. The reliability coefficient for tool II was (0.090), tool III was (0.43), and tool IV was (0.32), which means all tools were reliable.

Pilot Study: A Pilot study was initially carried out on five patients to test the tools' applicability and feasibility.

Booklet developments:

The researchers developed two Arabic illustrated booklets; booklet one was for the active ROM exercises group and booklet two for the self ROM exercises group. It was distributed to each patient in the implementation phase.

Booklets illustrated and used clear statements to demonstrate step by step of each exercise to help patients to use it at home during exercise program to achieve a higher level of motor and functional abilities and reduce the severity post thyroidectomy complications as well as Perform activities of daily living independently.

Method:

All recruited patients received the intervention, educational sessions and assessed among three phases as follows:

Phase I: Assessment phase: every patient who met the inclusion criteria was assessed immediately using the four tools to collect baseline data.

Phase II: Implementation of patient exercise programs: The exercise program was carried out one week before the radical thyroidectomy operation. The researchers met each patient preoperatively to give him/her verbal and written instructions based on the type of exercise program using simple language. Postoperatively and on discharge, The researchers interviewed every patient to ensure that the patient understands the exercise program and to clarify any concerns.

Phase III: Evaluation: This phase was carried out after one month postoperatively and continued for two months. The researchers arranged the follow-up appointments with the patient by telephone. The patient was interviewed in the hospital waiting room to evaluate the patients by utilizing tools II, III, and IV to determine the program's effectiveness on patients' motor and functional outcomes. **Group I**: **Active range of motion** is the movement of a neck and shoulder joints, the patient was performing ROM exercise of neck and shoulder joints, and there is no outside force aiding in the activity immediately after drains was removed.as shown in figure (1).

Group II : The patient used the unaffected arm to support the affected limb to perform the sweeping motion. **Self Neck range of motion exercises**: Once any drains are removed, gentle exercises will help to improve movement and reduce swelling, pain and stiffness; by supporting his/ her neck by hands to complete ROM of neck as shown in figure (2). **Self shoulder exercises:** These exercises will help keep patients` muscles strong and mobile, and joints flexible by doing each exercises slowly within patient tolerance and supporting affected arm with healthy arm to keep shoulder stabilization in natural position as shown in figure (3).

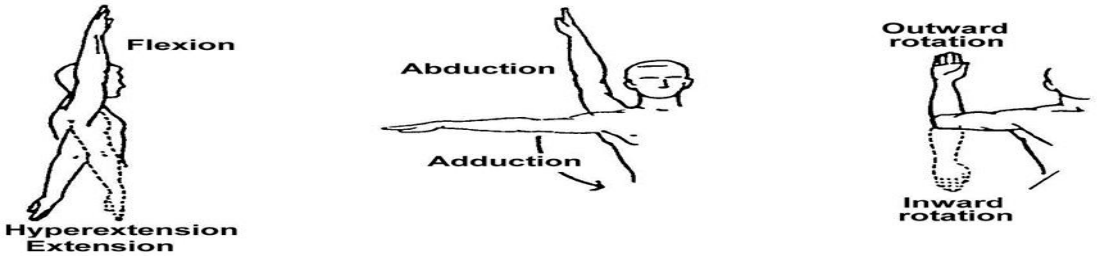

Figure 1: Active range of motion exercises of the shoulder

Figure 2: The self range of motion exercises of the neck

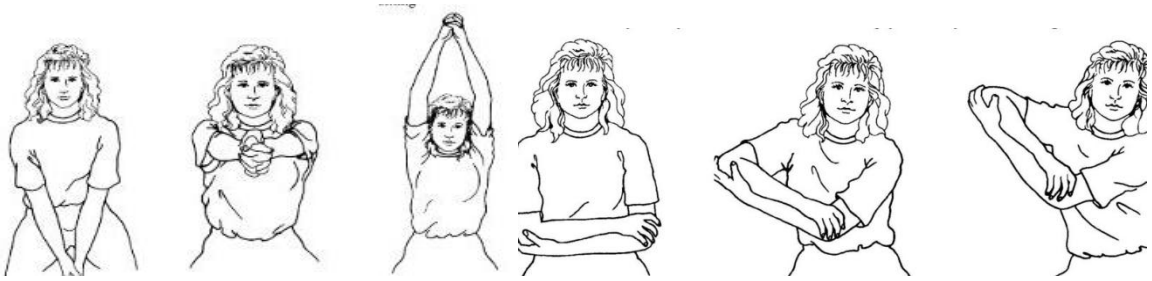

Figure 3: The self range of motion exercises of the shoulder

Data collection was carried out over seven months, from the beginning of June 2019 to the end of January 2020.

Statistical analysis:

All statistical tests were completed using the Statistical Package for Social Sciences (SPSS) version 25 for windows. A 5 % level of significance was chosen where $p \leq 0.05$ was considered significant. Frequency distribution was used to describe the demographic data. Chi-square test: For categorical variables, to compare between different groups. Fisher's Exact or Monte Carlo correction was used for chi-square when more than 20% of the cells have an expected count less than 5. Besides, a t-test was used to compare the mean between the two groups.

Results:

Table (1): reveals the bio-sociodemographic of patients in both groups. Regarding patients' age, the mean ± SD was 43.36 ± 8.65 years and 42.28± 8.84 years for the active exercise and self-exercise groups, respectively. Regarding sex, (56.0 %) and (60.0 %) for the active exercise and self-exercise groups respectively were female patients. Regarding the patient's education, the highest percentage in both groups (40.0 %) was secondary school certificates. Concerning patients' occupation, the highest percentages in both groups were housewives, 36.0 % and 44.0 % of the active exercise and self-exercise groups, respectively.

Concerning associated diseases, the active exercise group (72.0 %) and (80.0 %) in the self-exercise group had no associated disorders. However, hypertension, cardiovascular diseases, and diabetes mellitus were the related disorders among the rest of the participated patients.

There were no statistically significant differences between both groups regarding the bio-sociodemographic data ($P > 0.05$).

Table (2): shows the muscle strength in both groups. All patients in both groups were able to hold against maximal resistance preoperatively, while after one month postoperative; in the self exercises group, 96.0 % of patients were holding against maximal resistance and after two months postoperative 88.0 %. On the other hand, 48% of active exercises group (hold against gravity eliminated) after 2months.

Table (3) illustrats the physical examination of arm circumference, ROM, and neck pain. There was no statistically significant difference between arm circumference measurements in both groups preoperatively ($t= -1.457$ $p= 0.150$). Moreover, there was no statistically significant difference between the self-exercise and active exercise group in the first month postoperative and second month postoperative ($t= -1.579$ $p= 0.121$) and ($t = - 0.448$ $p= 0.656$) respectively. Regarding the range of motion measurements, There was no statistically significant difference between the range of motion measurements in both groups preoperatively ($t =- 0.153$ $p= 0.879$). Simultaneously, there was a statistically significant difference between the self-exercise and active exercise group in the first month postoperative and second month postoperative ($t = -5.238$ $p = 0.000$) and ($t = - 12.242$ $p= 0.000$) respectively.

It can also be noted that there was a statistically significant lowering of shoulder pain level in the self-exercise group than in the active exercise group after one month postoperatively ($t= 3.599$ $p= 0.001$). However, there was no statistically

significant difference between both groups after two months postoperative (t= 0.412 p=0.682).

Table (4): Concerning DASH assessment, in the preoperative period, mean± S.D. of DASH score was 815.87 ± 93.37 in the self-exercise group and 828.90 ± 76.50 in the active exercise group. In addition, there was no statistically significant difference between both group (t = 0.540 P = 0.592). Conversely, there was a statistically significant difference between both groups after one and two-month postoperative exercise (t= 14.670 p=0.000) and (t=26.529 p=0.000).

Table (5): display neck dissection impairment index. After one month postoperative, there was no statistically significant difference between self-exercise and active exercise concerning "neck or shoulder pain, stiffness, difficulty with self-care activity, ability to lift light objects, ability to lift heavy objects, ability to reach above for objects, overall activity level, ability to do leisure or recreational activities and ability to do work." On the other hand, after two months postoperative, there were statistically significant differences between self-exercise and active exercise groups regarding the ability to reach above for objects, overall activity level, and ability to do work.

Table (1): Frequency Distribution of Patients in the active exercise and self-exercise groups concerning Bio-sociodemographic Characteristics (n=25)

Items	Active exercise (n=25)		Self-exercise (n=25)		Significance test
	Number (N)	Percent (%)	Number (N)	Percent (%)	
Age					T = 0.43
Mean ± SD	43.36 ± 8.65		42.28± 8.84		P= 0.66
Sex					
Male	11	44.0	10	40.0	χ^2 = 0 .082
Female	14	56.0	15	60.0	P = 0.77
Total	25	100	25	100	
Educational Level					
Illiterate	1	4.0	1	4.0	
Read and Write	2	8.0	1	4.0	
Primary	0	0.0	2	8.0	FET = 4.37
Preparatory	3	12.0	6	24.0	P = 0.52
Secondary	10	40.0	10	40.0	
University	9	36.0	5	20.0	
Total	25	100	25	100	
Marital status					
Single	9	36.0	7	28.0	
Married	15	60.0	18	72.0	FET = 1.47
Widow	1	4.0	0	10.0	P = 0.55
Total	25	100	25	100	
Occupation					
Professional	9	36.0	6	24.0	FET = 3.12
Manual	5	20.0	8	32.0	P = 0.396
Housewife	9	36.0	11	44.0	

Items	Active exercise (n=25)		Self-exercise (n=25)		Significance test
	Number (N)	Percent (%)	Number (N)	Percent (%)	
Retired	2	8.0	0	00.0	
Total	25	100	25	100	
Associated disease No	18	72.0	20	80.0	
Hypertension	2	8.0	4	16.0	FET = 3.35 P = 0.340
Cardiovascular	1	4.0	0	0.0	
Diabetes	4	16.0	1	4.0	
Total	25	100	25	100	

Table (2): displays Muscle testing at specified assessment for patients in the self and active exercises groups

Dates	Muscle strength	Active exercise Group (n=25)		Self-exercise Group (n=25)		Test (P)
		N	%	N	%	
Preoperative	holds against maximal resistance	25	100	25	100	-
1 postoperative month	holds against maximal resistance	15	60.0	24	96.0	$\chi^2 = 9.441$ (0.002) *
	holds against moderate resistance	10	40.0	1	4.0	
	holds against gravity eliminated	0	0.0	0	0.0	
	able to move full ROM	0	0.0	0	0.0	
	no visible movement	0	0.0	0	0.0	
	no palpable muscle contraction	0	0.0	0	0.0	
2 months postoperative	holds against maximal reistance	0	0.0	22	88.0	$\chi^2 = 40.25$ (0.000) *
	holds against moderate resistance	13	52.0	3	12.0	
	holds against gravity eliminated	12	48.0	0	00.0	

* Significant difference at P level ≤ 0.05

Table (3): Comparison between Arm circumference, ROM and neck pain among both groups

Physical exam	Dates	Self-exercise Group Mean ± S.D.	Active exercise Group Mean ± S.D.	t (P)
Arm circumference	Preoperative	38.56± 6.82	35.80 ± 6.57	-1.457 (0.15)
	1 month postoperative	37.04± 7.18	33.96±6.59	-1.579 (0.12)
	2 months postoperative	36.52±6.45	35.68± 6.79	-0.448 (0.65)
ROM	Preoperative	179.68±0.80	179.64±1.03	-0.153 (0.87)
	1 month postoperative	171.36±10.82	156.88±8.59	-5.238 (0.00) *

	2 months postoperative	177.80± 3.31	157.56± 7.57	-12.242 (0.00) *
shoulder pain scale	1 month postoperative	5.28±1.20	6.72±1.59	3.599 (0.00) *
	2 months postoperative	3.96±0.88	4.08±1.15	0.412 (0.68)

* Significant difference at P level ≤ 0.05

Table (4): Total score of DASH score preoperative, 1st month and 2nd month postoperative among the active exercise and self-exercise group

Dates	Self-exercise Group Mean ± S.D.	Active exercise Group Mean ± S.D.	t (P)
preoperative	815.87± 93.37	828.90± 76.50	0.540 (0.592)
1 month postoperative	1645.33± 200.461	2282.67±83.68	14.670 (0.000) *
2 months postoperative	986.93±155.407	1981.30± 104.75	26.529 (0.000) *

* Significant difference at P level ≤ 0.05

Table (5): Comparison between both groups regarding Neck Dissection Impairment Index after one month and two months postoperatively

Items	groups	1 month postoperative	2 months postoperative
"Neck pain or discomfort"	Self-exercise Active exercise	$\chi^2 = 0.08$ (1.00)	$\chi^2 = 0.99$ (0.61)
"Neck stiffness"	Self-exercise Active exercise	$\chi^2 = 0.16$ (1.00)	FET= 1.45 (0.56)
"Difficulty with self-care activities because of your neck or shoulder (For example, combing hair, dressing bathing, etc)"	Self-exercise Active exercise	FET = 0.21 (1.00)	$\chi^2 = 3.00$ (0.08)
"Ability to lift light objects because of your shoulder or neck"	Self-exercise Active exercise	$\chi^2 = 0.00$ (1.00)	FET= 9.73 (0.00) *
"Ability to lift heavy objects because of your shoulder or neck"	Self-exercise Active exercise	$\chi^2 = 1.29$ (0.39)	FET= 23.04 (0.00) *
"Ability to reach above for objects because of your shoulder or neck (for example, from shelves, tables, or counters)"	Self-exercise Active exercise	$\chi^2 = 0.00$ (1.00)	FET= 3.53 (0.305)
"overall activity level because of your shoulder or neck"	Self-exercise Active exercise	$\chi^2 = 1.299$ (0.254)	$\chi^2 = 21.12$ (0.00) *
"Participation in social activities"	Self-exercise Active exercise	$\chi^2 = 0.00$ (1.00)	FET= 3.53 (0.30)
"Ability to do leisure or recreational activities because of your neck and shoulder?"	Self-exercise Active exercise	$\chi^2 = 0.00$ (1.00)	FET= 1.004 (1.00)
"Ability to do work (including work at home) because of your neck or shoulder"	Self-exercise Active exercise	$\chi^2 = 2.00$ (0.15)	$\chi^2 = 10.47$ (0.00) *

* Significant difference at P level ≤ 0.05

Discussion:

Thyroid surgery complications such as bleeding, hypoparathyroidism, and Recurrent Laryngeal Nerve Injury (RLNI) represent nearly half of all complications of thyroid surgery (Zakaria et al., 2011). One of the frequent problems after surgery is shoulder pain that is caused by trapezius dysfunction from nerve damage or removal during neck dissection (Mitchell, 2012). The results of the current study showed that all patients in both groups were adults. In this context, Albalawi (2017) stated that thyroid gland disorders are common in adults, occurring in 3% to 5% of the population, and are the second most prevalent endocrine disease.

The present study revealed that the females comprised a higher population than males. This finding is congruent with Kilfoy et al. (2009), who stated that "thyroid cancer is accounting for approximately 1-5% of all cancers in females and <2% in males".

There was statistically significant improvement regarding postoperative muscle strength testing on the part of the self exercises group patients than the active exercise group patients. The self exercises group patients had 88% normal muscle strength testing. In this context, Stone et al. (2012) reported that self-exercise sessions had significantly improved maximal muscle strength.

There were highly significant differences elicited between patients in self exercises and active exercises group regarding shoulder abduction. In line with Aoilfe et al. (2015), this result pointed out that early intensive physiotherapy for accessory nerve shoulder dysfunction had a significant increase in shoulder abduction among the intervention group than the control group.

In the postoperative period, shoulder pain assessment during patients` activities between the self exercises and active exercises group was statistically significant. These results are in line with Roy et al. (2009), who stated that subjects showed significant improvement and disappearance of a painful motion in flexion and abduction in addition to an increase in isometric peak torque in lateral rotation and abduction.

Reaching an excellent upper extremity function need all joints must be anatomically passable, effective motor control, and sufficient range of movement for stabilizing the shoulder and precisely position the arm to reach a good upper extremity function. DASH assessment showed a statistically significant difference between both groups after one month and two months of postoperative exercise. Maning et al. (2014); stated a difference in mean change in DASH scores between the group, which was significant at 12weeks, even following sensitivity analyses after education and self-management of upper extremity exercise training in people with rheumatoid arthritis.

There were statistically significant differences between the self-exercise and active exercise groups regarding Neck Dissection Impairment Index after two months postoperative. These results are in line with Cleland et al. (2005), who investigate the effectiveness of manual physical therapy on cervical abilities. The study reveald that patients (91%) demonstrated a clinically meaningful improvement in pain and function following physical therapy visits and a 6-month follow-up.

All the studied patients had complied with the nursing program's rehabilitation regarding; the simplicity of the information and overall improvement following compliance of the exercises. Thus, the results could match the first hypothesis that patients who perform self-ROM exercises exhibit improved motor and functional abilities than those who perform active ROM exercises. These results are in line with McNeely et al. (2012), who concluded that excellent adherence to exercise was achieved in the trial despite high morbidity associated with HNC treatment. The high adherence achieved was likely due to the select and highly motivated sample of thyroid cancer survivors as well as to factors related to trial design, such as the support offered to participants.

Conclusion:

The current study showed improvement in .self-exercise group patients more than the active exercise group regarding the shoulder and neck's functional and motor activity. Additionally, muscle strength, shoulder abduction, shoulder pain, and improvement of DASH score than active ROM; Furthermore, after two months postoperative, there

were statistically significant differences between self-exercise and active exercise groups regarding Neck Dissection Impairment Index. This type of self-exercise program prevents complications of post-radical thyroidectomy, including shoulder pain and muscle strength. This type of self-exercise program improves the quality of life for patients undergoing radical thyroidectomy.

Recommendations:

Thyroidectomy patients and their families must be involved in an early rehabilitation program to prevent complications and improve their daily living activity. The nurses should be involved in educational training programs for patients undergoing thyroidectomy. Further researchs can be applied, including study the effect of slf-exercise on long tem effect, Daily Living Activities and lymphedema size.

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