The Effect of Head-Neck Stretching Exercises After Thyroidectomy on Postoperative Pain Level and Wound Healing- Randomised Controlled Trial

NCT number: 2018/1763

Document date: December 14, 2020

Abstract

Background: Thyroid diseases are one of the most common health problems all over the world. After thyroidectomy, patients often experience discomfort such as neck pain, shoulder stiffness, shoulder movement difficulty, choking or pressing feeling. Head-neck stretching exercises provide neuromuscular coordination and flexibility in patients by reducing pain and muscle weakness.

Methods: This research was carried out as a pre-test / post-test control group experimental design study in 82 patients in the general surgery clinic of a university hospital in Istanbul

Results: 79.2% of the patients participating in the study were women. 67.07% of them had no chronic disease. The diagnosis of 62.19% was multinodular goiter. 70.73% of them had undergone total thyroidectomy surgery. The average of the Visual Analogue Scale (VAS) of patients in experimental group on 1st postoperative day was 2.20± 2.22, it was 3.00 ± 2.10 in control group. There was no significant difference between patients in experimental and control groups in discomfort and pain in the neck after 1 week and 1 month of surgery. However, a significant difference within the groups in neck pain and discomfort at 1st week and 1st month was observed ($p < 0.05$). The difference between the scores given by the participant in the experimental and control groups regarding the healing of their wounds 1 day and 1 week after surgery was significant ($p < 0.05$), but there was no significant difference between the scores given by the evaluator.

Conclusion: It was found that the head-neck stretching exercise was an effective nursing intervention in reducing neck pain and disability in the patients, but no difference detected between the 2 groups. It was found that it had no positive or negative effect on wound healing.

Introduction

Thyroid hormones are responsible for many metabolic activities in human physiology. It increases the basal metabolic rate, affects protein synthesis and helps growth of long bones. However, when thyroid functions change in the human body, the individual can be negatively affected and some individuals may require surgical intervention (Takamura et al. 2005). Thyroid surgery is a prominent treatment for goiter, hyperthyroidism, thyroid nodules or thyroid carcinoma (Cooper et al. 2009).

It has been reported that the most important complications after thyroidectomy are laryngeal nerve damage and hypoparathyroidism (Bellantone 2002). Therefore, patients generally suffer from uncomfortable symptoms such as neck pain, shoulder stiffness, difficulty moving shoulders, choking or pressing feeling. In addition, it is indicated that in the early postoperative period, patients experience limitation in neck movement and have a robotic walking style in order to prevent possible neck pain and protect the incision area. It is emphasized that these symptoms persist for a while after the operation and negatively affect the daily life of the patient (Takamura et al.2005).

Neck stretching exercises which include basic movements of the neck are simple and effective exercises. Stretching exercises provide neuromuscular coordination and flexibility in patients by reducing pain and muscle weakness (Nakamura, Kodama, and Mukaino 2014). For this reason, neck stretching exercises should be performed in early postoperative period and a nurse should teach the patient the head-neck stretching exercises and ensure the patient's comfort after thyroidectomy.

1. Materials and Methods

1.1. Study Design and Setting

This study was planned and conducted as an experimental study with a pre-test and post-test control group in order to determine the effect of post-thyroidectomy head-neck stretching exercises on postoperative pain level and wound healing.

The research was conducted between January 2019 and August 2020 in a university hospital in Istanbul, with institutional permission (10/01 / 2019-7470) and ethics committee permissions (2018/1763).

1.2. Selection Criteria

Patients who consent verbally and written to participate in the study after being informed about the study, who were 18 years of age and over, who could understand the information given, who could read, write and speak in Turkish, who have not any problem preventing verbal communication were included in the study. Patients who suffers from cervical problems before surgery were excluded from the study.

1.3. Assessment and Management Policy

Routine nursing care (use of analgesics, IV fluid therapy and wound care) was applied to patients in experimental group after thyroidectomy. A brochure was developed in line with the literature on head-neck stretching exercises. Since the patients came to the clinic on surgery day, the exercises developed by the researchers in line with the literature were examined by the patient on the first postoperative day. The exercises were performed synchronously with the researcher and the patient. The application took approximately 10-15 minutes. The patient was asked to perform the exercises 3 times a day, in the morning, noon and evening for a month, provided that each movement was 5 times. Then, the "Patient and Observer Scar Rating Scale (POSAS) " was applied.

The pain level of the patient on postoperative day 1 was evaluated using VAS. For further evaluations, the patient was called by phone at the 1st week and 1st month. Neck pain and discomfort status was evaluated with the “Neck Pain and Disability Scale” (NPDS), and then the scar appearances with the “Patient and Observer Scar Assessment Scale” by requesting neck photographs at the 1st week and 1st month.

Routine nursing care (use of analgesics, IV fluid therapy and wound care) was applied to the control group after thyroidectomy. Follow-up of the patients with the scales applied in the experimental group were also performed to the control group at the same intervals. After thyroidectomy, patients were called by phone in the 1st week and 1st month. “Neck pain and discomfort scale” and “Patient and Observer Scar Rating Scale” were applied again in both phone calls. Photographs of the scar appearance at the 1st week and the 1st month were requested from the patients.

Neck Pain and Disability Scale (NPDS): Evaluation of pain intensity, Turkish Validity and Reliability were conducted with using the Neck Pain and Disability Scale by Biçer et al. (2004). The scale consists of 15 items. Each item measures the severity of pain, and evaluates the interaction of professional, social and functional aspects of life, and the presence and extent of emotional factors. Each item has a 10 cm visual analog scale. It is divided into 6 sections at equal intervals by vertical bars. Each item is between 0-5 points. It is stated that the Neck Pain and Discomfort Scale is not suitable to be used on the first postoperative day, it is more correct to use from 1st week. Therefore, postoperative pain was evaluated with VAS in the study. In the analysis, Cronbach's alpha coefficient of the Neck Pain and Discomfort Scale was 0.952, and the test-retest reliability coefficient was 0.929.

Patient and Observer Scar Rating Scale (POSAS): In the evaluation of the wound site, the Patient and Observer Scar Assessment Scale, which was made by Yalılı (2014), was used. The scale consists of 7 items, 6 of them are for evaluating the scar (pain, itching, color, elasticity, thickness and irregularity assessment) and 1 evaluating the general opinion about the scar. Each item has a Likert-type score ranges from 1 to 10. 1 indicates normal skin, 10 indicates worst scar assessment. The lowest score in scale, which is 6, demonstrates normal skin, the highest score 60 demonstrates the worst possible scar. The scale score is calculated over the first 6 items. In the analysis, the Cronbach's alpha coefficient of the scale was 0.914 for PSAS, 0.724 for the OSAS, and the test-retest reliability coefficient was 0.756 for PSAS and 0.580 for the OSAS.

1.4. Sample Size and Statistical Analysis

G*Power Version 3.1.9.2 was used in the sample size calculation of the study. Sample size was calculated with repeated measures ANOVA test statistics. In the line with the results obtained by Ayhan et al. (2016), in order to find a significant difference between experimental and control groups in pain level and wound healing with head-neck stretching exercises, within the 95% confidence interval ($\alpha = 0.05$), the sample size to be reached for the medium effect size of $f = 0.25$ Cohen at 0.80 power was calculated as 82 patients. Patients meeting the research criteria were divided into experimental and control groups by using a computerized randomization program (https://www.randomizer.org/).

The data obtained from the research was evaluated by using 2013 version of IBM SPSS Statistics 21 program "*(IBM SPSS- Statistical PackagefortheSocialSciencesfor Windows, Version 22.00, Armork, NY).*" In evaluation of study data, besides descriptive statistical methods (mean, standard deviation, median, frequency, ratios, minimums, and maximum); Student t-Test were used in order to evaluate the qualitative values for the two-group comparisons of the data with normal distribution; Mann Whitney U test and Kruskal-Wallis H test were used for the two-group comparisons of the data without normal distribution. Pearson Correlation Analysis and Spearman's Correlation Analysis were used to evaluate the relationships between parameters. The results were evaluated at the significance level of $p < 0.01$ and p 0.05 and at 95% confidence intervals.

2. Results

2.1. Distribution of Introductory Features

Specific characteristics (age, gender, marital status, educational status, job status, economic status) of the patients in the experimental and control groups were homogeneous ($p > 0.05$) (Table 1).

The average age of the experimental group participants who perform head-neck exercises was 46.10 ± 13.124, and the average age of the control group participants was 47.17 ± 13.670. 72.50% (n = 29) of the experimental group and 85.71% (n = 36) of the control group participants were women; 42.50% (n = 17) of the experimental group, 54.76% (n = 23) of the control group were primary school graduates; 30% (n = 12) of the experimental group participants, 33.33% (n = 14) of the control group participants were working actively and 67.50% (n = 27) of the experimental group and 83.33% (n = 35) of the control group was determined to have a medium economic level (Table 1).

Table 1. Distribution of Introductory Features (N = 82)

Individual Features		Experimental Group (n=40)		Control Group (n=42)		Total (N=82)		Test	
		Mean±SD		Mean±SD		Mean±SD		ρ	p
Age (year)		46.10±13.124		47.17±13.670		46.65±13.335		-0.360	0.720
		n	%	n	%	n	%	$^1\chi^2$	p
Gender	Female	29	72.50	36	85.71	65	79.27	2.177	0.140
	Male	11	27.50	6	14.29	17	20.73		
Marital Status	Married	35	87.50	29	69.05	64	78.05	6.295	0.098
	Single	2	5	7	16.67	9	10.97		
	Divorced	0	0	3	7.14	3	3.66		
	Widow	3	7.50	3	7.14	6	7.32		
Educational Status	Literate	7	17.50	5	11.90	12	14.63	2.408	0.492
	Primary school graduate	17	42.50	23	54.76	40	48.79		
	High school graduate	11	27.50	7	16.67	18	21.95		
	University and senior	5	12.50	7	16.67	12	14.63		
Working condition	Working	12	30	14	33.33	26	31.71	0.241	0.971
	Housewife	20	50	21	50	41	50		
	Retired	5	12.50	4	9.53	9	10.98		
	Other	3	7.50	3	7.14	6	7.31		
Economical situation	Low	11	27.50	5	11.91	16	19.51	3.235	0.198
	Middle	27	67.50	35	83.33	62	75.61		
	High	2	5	2	4.76	4	4.88		

ρ: Pearson Correlation Test, t: Independent Sample t-Test, Avg: Average, SD: Standard Deviation, $^1\chi^2$= Pearson Chi-Square Test

2.2. Distribution of Characteristics Regarding Health Status and Surgical Intervention

The health status characteristics of the patients in the experimental and control groups (diagnosis, chronic disease status, movement status, status of having neck surgery) were similar. There was no statistically significant difference between the health status characteristics of the two groups (p> 0.05) (Table 2).

The diagnosis of 62.50% (n = 25) of the experimental group and 61.90% (n = 26) of the control group was MNG. It was observed that 25% (n = 10) of the experimental group patients had chronic disease, 12.50% (n = 5) of the patients with chronic disease had heart failure and 62.50% (n = 25) were active in daily life. It was stated that 40.48% (n = 17) of the control group patients had chronic disease, 16.68% (n = 7) of the patients with chronic disease had hypertension and 69.05% (n = 29) were active in daily life (Table 2).

Total thyroidectomy was applied to 67.50% (n = 27) of the experimental group and 73.81% (n = 31) of the control group (Table 2).

Table 2. Distribution of Characteristics Regarding Health Status and Surgical Intervention (N=82)

Features		Experimental Group (n=40)		Control Group (n=42)		Total (N=82)		Test	
		n	%	n	%	n	%	$^1\chi^2$	p
Diagnosis	MNG	25	62.50	26	61.90	51	62.19	0.971	0.914
	Cancer	13	32.50	13	30.96	26	31.71		
	Hyperthyroidism	1	2.50	1	2.38	2	2.44		
	Graves disease	1	2.50	1	2.38	2	2.44		
	Planjuan goiter	0	0	1	2.38	1	1.22		
Chronic İllness Condition	Yes	10	25	17	40.48	27	32.93	2.222	0.136
	No	30	75	25	59.52	55	67.07		
Existing Chronic Diseases	Diabetes mellitus	4	10	5	11.90	9	10.98	9.308	0.97
	Hypertension	1	2.50	7	16.68	8	9.76		
	Heart failure	5	12.50	2	4.76	7	8.53		
	Asthma	0	0	1	2.38	1	1.22		
	All of	0	0	2	4.76	2	2.44		
Movement State	Active	25	62.50	29	69.05	54	65.85	0.748	0,688
	Medium moving	10	25	10	23.81	20	24.39		
	Motionless	5	12.50	3	7.14	8	9.76		
Having had neck surgery	Yes	5	12.50	5	11.90	10	12.19	0.007	0.934
	No	35	87.50	37	88.10	72	87.81		
Type of surgery	Total thyroidectomy	27	67.50	31	73.81	58	70.73	3.277	0.194
	Partial thyroidectomy	10	25	11	26.19	21	25.61		
	Lobectomy	3	7.50	0	0	3	3.66		

MNG: Multinodüler goither, $^1\chi^2$= Pearson Chi-Square Test

2.3. Evaluation of the VAS and NPDS Score Average After Surgery

The average VAS of the experimental group and control group was 2.20 ± 2.22 and 3.00 ± 2.10, respectively and there was no statistically significant difference (p>0.05) (Table 3).

There was no statistically significant difference between the mean neck pain and disability scores of the patients in the experimental and control groups at 1 week and 1 month after surgery (p = 0.316>0.05) (p = 0.104>0.05) (Table 3). However, analysis (Wilcoxon signed-rank test) was conducted to examine whether there was a difference between 1 week and 1 month after surgery in the patients of experimental and control group in terms of neck pain. The p value of the experimental and control groups was found to be 0.000. In conclusion, there was a statistically significant difference between the mean scores of neck pain and disability 1 week after surgery and 1 month after surgery in the experimental and control groups (p <0.05). While the mean neck pain score of the experimental group patients 1 week after surgery was 28.5 ± 20.18, the mean neck pain score 1 month after surgery was

11.35 ± 16.66. The mean neck pain score of the control group patients 1 week after surgery was 32.78 ± 19.89, while the mean neck pain score 1 month after surgery was 14.00 ± 13.84. (Table 3).

Table 3. Evaluation of the VAS and NPDS Score Average After Surgery (N=82)

Evaluation of VAS (0-10) Average Score	**Experimental Group (n=40)**	**Control Group (n=42)**	**t**	**p**
	Mean±SD	**Mean±SD**		
VAS score averages on the 1st postoperative day	2.20±2.22	3.00±2.10	-1.674	0.099
Neck Pain and Discomfort Assessment	**Experimental Group (n=40)**	**Control Group (n=42)**	**Z**	**p**
	Mean±SD	**Mean±SD**		
NPDS- One week after surgery	28.50±20.18	32.78±19.89	-1.002	0.316
POSAS (2)- One month after surgery	11.35±16.66	14.00±13.84	-1.627	0.104
[1]t	**-4.65**	**-4.80**		
p	**0.000**	**0.000**		

SD: Standart Deviation, t: Independent Samples Test, [1]t: Wilcoxon Signed Ranks Test, Z: Mann-Whitney U Test

2.4. Comparison of Postoperative POSAS Score Average

The difference between the scores given by the participants of experimental and control groups regarding the healing of wounds 1 day after surgery and 1 week after surgery was significant ($p < 0.05$). However, it was found that there was no statistically significant difference between the scores given by the researcher for healing of the wounds of the patients in the experimental and control groups (Table 4).

Table 4. Comparison of Postoperative POSAS Score Average

Patient and Observer Scar Assessment	**Experimental Group (n=40)**	**Control Group (n=42)**	**Z**	**p**
	Mean±SD	**Mean±SD**		
Patient monitoring				
PSAS- One day after surgery	33.70±6.71	29.73±6.63	**-2.844**	**0.004**
			[1]t	**p**
PSAS (2)- One week after surgery	26.55±6.35	23.14±7.43	**2.225**	**0.029**
PSAS (3)- One month after surgery	16.22±7.13	17.61±7.65	-0.852	0.397
Analysis of repeated measurements within the group				
χ^2	**69.354**	**58.072**		

p	**0.000**	**0.000**		
Observer monitoring			**[1]t**	**p**
OSAS- One day after surgery	15.12±6.26	15.38±5.53	-0.196	0.845
			Z	**p**
OSAS (2)- One week after surgery	21.35±4.71	19.50±5.72	-1.526	0.127
			[1]t	**p**
OSAS (3)- One month after surgery	26.57±6.11	24.02±6.68	1.80	0.076
Analysis of repeated measurements within the group				
χ^2	**48.962**	**36.454**		
p	**0.000**	**0.000**		

SD: Standart Deviation, [1]t: Wilcoxon Signed Ranks Test, χ^2: Friedman test, Z: Mann-Whitney U Test

Discussion

Thyroid disease is one of the most common health problems in Turkey and all over the world. Gender is one of the unchangeable risk factors in thyroid diseases. Studies have reported that women experience more thyroid-related problems and neck pain than men (Takamura et al. 2005 Chung et al. 2007; Worni et al. 2008; Çağlayan and Çelik 2010; Haunch et al. 2014; Jang et al. 2014; Lang et al. 2015; Li et al. 2018; Ha et al. 2018; Al Qubaisi and Haigh 2019; Genç et al. 2019). The result obtained in this study was similar to the studies performed.

Thyroidectomy is the most commonly used surgery method in the treatment of diseases related to thyroid gland (Delbridge 2003). As in present study, previous studies also stated that total thyroidectomy is mostly performed surgical intervention in thyroid diseases (Sosa 2006; Chung et al. 2007; Worni et al. 2008; Brown, de Souza and Cohen 2011; Spanheimer et al. 2011; Haunch et al. 2014; Lang et al. 2015; Ha et al. 2018; Al Qubaisi and Haigh 2019).

Post-thyroidectomy neck pain is one of the most important problems seen in the first 36 hours after surgery. Patients usually recover quickly after surgery, but may feel uncomfortable due to this problem. Similar to this study, in other studies it was observed that the neck pain level experienced by the patients on the first day after surgery was below 5 points (Ryu et al. 2013; Chai et al. 2016; Ha et al. 2018; Miccoli et al. 2010; Atasayar 2016; Barua et al. 2016).

During thyroidectomy surgery, due to hyperextension applied to the neck, nociceptive stimuli originating from anatomical structures in the cervical region may cause neck pain. In this study, we did not find a significant difference in terms of pain and disability between the groups in which we did and did not exercise head-neck stretching, but the average pain and disability scores of the group who did not exercise were higher. When the literature is reviewed, it is stated that head-neck stretching exercises increase the flexibility of the neck and reduce neck pain (Nakamura, Kodama and Mukaino 2014). In other studies, it was stated that patients who underwent thyroidectomy experienced neck pain and disability after surgery and this pain negatively affected their daily life (Takamura et al. 2005; Roerink et al. 2017; Rodríguez - Torres et al. 2019).Takamura et al. (2005) stated that there was a significant relationship between the neck pain levels of the patients who exercised in the postoperative 1st week and the 1st month, and the neck pain of the patients decreased significantly in the 1st

month. Ayhan et al. (2016) found that the rate of neck pain and disability at 1 week and 1 month after thyroidectomy was less in the group of patients who performed stretching exercises; Jang et al. (2014) reported that in the first 3 months after surgery, the stretching group experienced less neck pain and disability than those who did not.

In the present study, we could not find any positive or negative effects of head-neck stretching exercises performed on patients in the experimental group on wound healing. Studies have reported that head-neck stretching exercises increase the movement function of the neck, but their effects on wound healing are controversial (Takamura et al. 2005; Chan, Lui and So 2010; McNeely et al. 2010; Ayhan et al. 2016).

Conclusion

In the study, which was planned to determine the effect of post-thyroidectomy head-neck stretching exercises on postoperative pain level and wound healing, head-neck stretching exercises decreased the average neck pain and disability scores of the patients after thyroidectomy, although there was no significant difference between the group who did and did not exercise. At the same time, it was observed that head-neck stretching exercises did not affect wound healing positively or negatively after thyroidectomy. We think that studies in larger groups investigating the effect of post-thyroidectomy head-neck stretching exercises on pain and disability can be found statistically effective.

GRediT Authorship Contribution Statement

Acelya Türkmen: Conceptualization, Data curation, Methodology, Investigation, Formal analysis, Writing-original draft, Editing. **Ikbal Cavdar:** Methodology, Editing, Writing-review, Resources. **Nihat Aksakal:** Data curation, Writing-review, methodology, Analysis.

Declaration of Competing Interest

None

Acknowledgements

We would like to thank all who contributed materially to our study as participating investigators.

Funding Sources

None to be disclosed by the aouthors.

Funding

None.

Ethical Approval

Before starting the study, permission from the institution (10/01/2019-7470) and ethics committee permissions (2018/1763) were obtained.

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