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ORIGINAL ARTICLE

Assessment of recurrent laryngeal nerve injury due to thyroid surgery in Gorgan medical centers

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Abstract

Introduction: Thyroid surgery is one of the most common surgeries performed on the neck. There is a possibility of nerve injury and vocal cord paralysis due to the close anatomical relationship between recurrent laryngeal nerve and thyroid. Considering the importance of this study, it was performed to determine nerve damage during thyroid surgery.

Methods: This cross-sectional descriptive study was conducted on patients undergoing thyroidectomy at Gorgan University of Medical Sciences, Goelstan Province, Iran, from 2016-2017. After providing a list of patients, their files were obtained and the demographic data relating to the type of surgery, type of pathology, and condition of the larynx after surgery were recorded. The patients were asked for a re-examination (if necessary) and the current condition of their larynx was determined. The collected data were recorded and analyzed in SPSS software (version 16).

Results: The statistical population of this study consisted of 195 patients, among which 12.3% were male (24 cases) and 87.7% were female (171 patients). The type of surgery in 65.6% (n=128), 28.7% (n=56), and 5.6% (n=11) cases was thyroidectomy, hemithyroidectomy, and subtotal thyroidectomy, respectively. It was revealed that the most common pathology was papillary carcinoma. In terms of complications, there were two cases of laryngeal nerve injury which persisted in only one case of unilateral paralysis. The type of surgery in both cases was total thyroidectomy.

Conclusions: Although recurrent laryngeal nerve injury is not common, in cases of total thyroidectomy greater care should be taken to preserve the nerve.

Key words: Laryngeal, Recurrent laryngeal nerve, Thyroid

Introduction

The thyroid is located in the anterior part of the larynx. The larynx, which is made up of cartilage, membranes, and internal and external muscles, houses the vocal cords. The larynx is innervated by superior and recurrent laryngeal nerves which are the branches of the vagus nerve. Their role is to provide a sense in the inner mucosa of the larynx and movement in vocal cords. The recurrent laryngeal nerve travels through the groove between the esophagus and the trachea and enters the larynx at the periphery of the lower branch of the thyroid cartilage and above the cricoid, where it is also close to the lower thyroid artery (1).

The thyroid gland, which is located close to the larynx, may develop various diseases requiring surgery. Regarding this, thyroidectomy is a common type of surgery involving the removal of all or a part of the thyroid (2).Since the recurrent

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laryngeal nerve is closely intervened in the thyroid surgery environment, it can be damaged during surgery and paralyzed unilaterally or bilaterally, causing some problems. In cases the paralysis is unilateral, one of the main symptoms would be dysphonia, while in bilateral paralysis, shortness of breath and stridor would be the signs (3, 4).

Recurrent nerve paralysis has been reported in various studies and it has been estimated to be 0.3-3% permanent and 5-8% temporary (5). Although other complications may occur after thyroid surgery, such as hypocalcemia, hematoma, tracheomalacia, and hemorrhage, bilateral paralysis of the nerves leads to severe postoperative distress, deserving to receive significant attention. Therefore, surgeons make every effort during the surgery to preserve the nerve and perform direct laryngoscopy to assess the patient's postoperative laryngeal condition. Moreover, re-intubation or tracheostomy may be required after the surgery. (6-8). Tracheomalacia can also occur due to chronic pressure from a tumor, which presents as respiratory distress after surgery and often improves over time (9).

Considering the importance of preserving recurrent laryngeal nerve in airway management and the possibility of damage to that nerve in thyroid surgery, this study aimed to determine recurrent laryngeal nerve injuries in patients undergoing thyroid surgery in Gorgan educational and medical centers within 2016-2017.

Methods

This cross-sectional study was performed on patients who underwent thyroid surgery during 2016-2017 in Gorgan educational and medical centers, including 5Azar and Sayad Shirazi hospitals. By referring to the Medical Statistics and Records Unit, the patients'names, file numbers, age, gender, telephone number, and address were collected from archives. Other information, including the course of the disease, surgery report, observations at the time of admission, and laryngoscopic findings after the surgery was also obtained. Accordingly, the type of operation (i.e., total thyroidectomy, subtotal thyroidectomy, and hemithyroidectomy), complications during hospitalization (e.g., hematoma, bleeding, respiratory distress, and change in sound), the condition of the vocal cords, re-hospitalization, and the patient's final condition before discharge were recorded. In case the patients experienced complications during hospitalization, they were invited and re-examined. Patients' pathology was analyzed and recorded after the surgery.

In order to comply with ethical and professional principles, the names of surgeons, patients, and surgical assistants remain completely confidential and will not be disclosed in publications. Moreover, patients who needed to be invited for reexamination were informed that they were involved in research work and no costs were imposed on them. Additionally, the subjects completed the questionnaire after necessary instructions for their treatment were provided to them. The patients' information was entered into a computer and analyzed in SPSS software (version 16) using percentage, mean, and standard deviation tables. This study is extracted from a general doctoral dissertation with an ethics code and registration number in Gorgan Medical School, Golestan University of Medical Sciences, Golestan Province, Iran (IR. GOUMS.ac.1397.246).

Results

This study (n=195) was performed on 24 males and 171 females, among which 98 patients were younger than 45 years old and the rest were older. Furthermore, the mean age of the patients was obtained as 45.23±14.45 years. The type of surgery in 65.6% (n=128) and 28.7% (n=56) cases was total thyroidectomy and hemithyroidectomy, respectively, and only 5.6% (n=11) of the subjects had subtotal thyroidectomy (Table 1).

Based on the patients' pathology results, 113 and 82 cases were respectively malignant and benign. Malignant lesions in 63 cases were

Table 1: Frequency distribution of airway complications in patients undergoing thyroidectomy

Malignant	Number	Percentage	Benign	Number	Percentage
Papillary carcinoma	63	32.21	Multinodular goiter	36	18.48
Follicular carcinoma	48	24.62	Colloid nodule	27	13.85
Anaplastic	1	0.51	Thyroid cyst	11	5.64
			Grave's disease	3	1.53
Hurthle cell carcinoma	1	0.51	Hashimato's disease	3	1.53
			Mediastinal goiter	2	1.02
Sum	113	57.85	Sum	82	42.05

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Table 2: Frequency distribution of pathology findings in patients undergoing thyroidectomy

Type of Complication	Number	Percentage	Pathology		Final condition		Percentage
			Malignant	Benign	Permanent	Transient	
Tracheomalacia	4	2.05	4	0	0	4	0
Hematoma	2	1.02	2	0	0	2	0
Recurrent laryngeal nerve paralysis	2	1.02	2	0	1	1	0
Sum	8	4.1	8	0	0.51%	0.51%	1.02%

papillary carcinoma, which is the most common malignant tumor. On the other hand, the most common benign tumor, found in 36 cases, was a multinodular goiter. Table 2 presents the frequency distribution of pathology findings in patients undergoing thyroidectomy.

The average length of hospital stay was 4 days with the maximum and minimum of 19 and 2 days, respectively. After the surgery and extubation, four cases developed respiratory distress despite the fine movement of the vocal cords; therefore, they were re-intubated and transferred to the intensive care unit (ICU). Respiratory distress could occur due to tracheomalacia. Among the mentioned patients, three cases were female, adjust one of the cases aged over 45 years. The type of surgery in these patients was total thyroidectomy, and all of them were malignant and their type was papillary, follicular, and anaplastic carcinoma. All of these patients were discharged from ICU after a while in good general condition without the need for endotrachealtubeor tracheostomy.

Vocal cord paralysis was present in two cases after surgery, which was determined by laryngoscopy. Both patients experienced a change in their voice, without respiratory distress, though, and in both cases, paralysis was unilateral. After 3 months, one case improved spontaneously; however, in one case paralysis persisted. The type of surgery in both cases with recurrent laryngeal nerve injury was total thyroidectomy, which its pathology was papillary thyroid carcinoma. The patients were female and under the age of 45 years.

In this study, two cases experienced postoperative hematoma, both of whom were under the age of 45. Additionally, their pathology was anaplastic and papillary thyroid cancer, while in neither of these patients vocal cord paralysis occurred.

Discussion

This study (n=195) was performed on 24 (12.3%) males and 171 (87.7%) females undergoing thyroidectomy. In a study performed by Khatami et al. on 259 patients undergoing thyroid surgery, 197and 62 of cases were female and male, respectively (10). In another study, Porseyedi et al. examined 566 patients, among which 78% of the subjects were female and 21% of them were male (6) . Chahardahmasumi et al. reported that women (81.9%) underwent thyroid surgery than men (11). Comparing our study with other studies in this field, it can be concluded that thyroid surgery is more common in women than men.

In our study, 50.25% of patient's aged under 45 years and 49.7% were over it. The results of research carried out by Khatami et al. revealed that the mean age of patients was 35.4±4.1 years (9).The mean age scores in the studies conducted by Pourseyedi et al. (2) Chahardahmasumi et al. were obtained as 40.2 and 41.2 years, respectively (11). Regarding these findings, it seems that thyroid surgery is mainly performed in middle age.

The type of surgery in 56% of cases in our study was total thyroidectomy. Moreover, Khatami et al. (10) and Porseyedi et al. (6) reported that 76% and 67% of the patients had a total thyroidectomy, respectively. Consequently, total thyroidectomy is the most common type of surgery for thyroid tumor removal.

In the current study, 57% of tumors were malignant and 42.5% of them were benign. The most common malignant tumor was papillary thyroid carcinoma and the most common benign tumor was a multinodular goiter. These results are in line with those of a study performed by Porseyedi et al. (6), in which the most common malignant tumor was reported papillary thyroid carcinoma (17.8%), and the most prevalent benign tumor was found multinodular goiter (39.4%).

In the present study, the average length of hospital stay was 4 days, with a maximum and minimum of 19 and 2 days, respectively. Khatami et al. revealed that the average hospital stay was 6.65 day (10). Considering these results, it seems that our hospitalization time (2.05 days) was in an acceptable range.

However, the length of hospitalization was extended in four cases (three females and one male) (2.05 days). Despite having normal vocal cords after surgery and direct laryngoscopy, these patients developed respiratory distress. Therefore,

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they were re-intubated and transferred to the ICU. They all underwent total thyroidectomy for malignant tumors. The cause of respiratory distress in these patients was due to the prolongation of the disease, pressure on the trachea, and tracheomalacia. However, after the surgery, the trachea obtained the adequate strength for normal breathing. Although tracheomalacia can be accurately diagnosed by pathological examinations and tests, the softness of the tracheal wall can also be indicative of clinical judgment. In a study conducted by Ayandipo et al., tracheomalacia was reported in 5.03% of thyroid surgery cases (8).

In our study, there were two cases (1.02%) of vocal cord paralysis during the surgery, which were diagnosed by direct laryngoscopy after the surgery. Both cases developed changes in voice after surgery; nevertheless, none had respiratory distress. Moreover, both cases were female experiencing unilateral paralysis. Both had thyroid papillary carcinoma and underwent total thyroidectomy. Although one of these cases recovered after 3 months, the other one experienced persistent paralysis, in which after stroboscopy, vocal cords seemed to be in an intermediate condition.

Khatami et al. reported unilateral nerve paralysis in 0.8% of cases (10). The results of a study carried out by Porseyedi et al. (6) were indicative of recurrent nerve paralysis in 1.1% of patients undergoing thyroidectomy. Moreover, Zakaria et al. performed research on 340 patients who underwent thyroidectomy, among which 3.2% of cases experienced unilateral vocal cord damage, with 0.3% of them suffering from permanent damage. Bilateral vocal cord damage was reported in 0.58% (n=2) of cases which was transient (12). The results of these studies are nearly similar to our study; however, Chahardahmasumi et al. reported 8.2% of cases of permanent hoarseness (11).

Based on the findings of a study performed by Haque et al., 4% and 1% of cases had unilateral paralysis of recurrent laryngeal nerve and bilateral paralysis, respectively (2). In addition, Siddique et al. reported 5.46% of cases with recurrent laryngeal nerve injury (13). Kerimoglu et al. indicated permanent paralysis of vocal cords in 3.4% of cases (14). These results are higher than those found in our study. In a study carried out by Sajid et al., damage to the recurrent laryngeal nerve in 2.8% of the patients was reported, which was more prevalent in subtotal than total thyroidectomy (15). In our study, there were two cases of nerve paralysis, both undergoing total thyroidectomy.

In this study, two cases (1.02%) experienced hematoma in the surgery site, had malignancy, and underwent total thyroidectomy and hemi thyroidectomy. However, none of the patients experienced any form of paralysis. Khatami et al. reported 1.54% of cases of hematoma (10) that is similar to our findings; nevertheless, according to the findings of a study conducted by Chahardahmasumi et al., this rate increased to5.6% (11), which is higher compared to our results. Ayandipo et al. reported 0.8% of hematoma cases, which was lower than that in our study (7).

Limitations

Due to the incomplete record of findings and information during surgery in patients' files, it was not possible to determine the stage of the disease. The other limitation was related to the small size of the sample.

Conclusions

The results of this study indicated that although the risk of recurrent laryngeal nerve injury was low, more caution must be taken in case of malignancy incidence to prevent any form of damage to that nerve. Considering the significance of this study, it is recommended to conduct a study with a larger statistical population.

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Conflict of Interest

The authors declare that they have no conflict of interest regarding the publication of the current article.

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