

Original Article

Redo Thyroidectomy Modified Technique to Eliminate Complications: A Cohort Study

Hiwa O. Baba^{1,2}, Aso S. Muhialdeen^{1,2}, Abdulwahid M. Salih^{1,3}, Yadgar A. Saeed¹, Ismaeil Y. Abdullah⁴, Aras J. Qaradakh⁵, Karzan M. Salih¹, Soran H. Tahir³, Fahmi H. Kakamad^{1,2,3*}, Hiwa O. Abdullah^{1,2}, Berun A. Abdalla⁶, Shvan H. Mohammed²

1. Smart Health Tower, Madam Mitterrand Street, Sulaimani, Kurdistan, Iraq
2. Kscien Organization, Hamdi Street, Azadi Mall, Sulaimani, Kurdistan, Iraq
3. College of Medicine, University of Sulaimani, Madam Mitterrand Street, Sulaimani, Kurdistan, Iraq
4. Kalar General Hospital, Kalar, Sulaimani, Kurdistan, Iraq
5. Department of Radiology, Shorsh Teaching Hospital, Sulaimani, Kurdistan, Iraq
6. Department of Biology, College of Education, University of Sulaimani, Sulaimani, Kurdistan, Iraq

* **Corresponding author:** fahmi.hussein@univsul.edu.iq (F.H. Kakamad). Doctor City, Building 11, Apartment 50, Zip code: 46001, Sulaimani, Iraq



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Abstract

Introduction

Reoperation is the most challenging task in thyroid surgery because of the high risk of complications. This study aims to demonstrate the efficacy of a modified thyroidectomy technique in decreasing associated complications to almost zero in recurrent thyroidectomy.

Methods

This single-group cohort study enrolled consecutive patients who had a recurrent thyroidectomy. The procedures were done by high-volume surgeons using a modified thyroidectomy technique, which included the following steps: 1) Preserving parathyroid glands before searching for the recurrent laryngeal nerve; 2) Expecting the recurrent laryngeal nerve in any area of the neck until it is found; 3) Initiating dissection in the suprasternal notch and moving to the tracheoesophageal groove; 4) If the nerve was not found in the suprasternal notch, the search would continue at the nerve's expected entrance to the cricoid cartilage.

Results

In total, 195 cases with redo thyroidectomy were enrolled in this study. Female patients (173, 88.7%) were predominant compared to males (22, 11.3%). The most common ultrasonographic finding was multinodular goiter in 138 cases (70.7%). Most of the cases underwent total thyroidectomy (160, 82%), and thyroid lobectomy was performed in 35 cases (18%). In all the cases that underwent total thyroidectomy, both recurrent laryngeal nerves were explored, and the concerned lateral recurrent laryngeal nerve was seen during the thyroid lobectomies. There was no injury to recurrent laryngeal nerves, and only 15% of the cases suffered from temporary hypocalcemia.

Conclusion

Recurrent thyroidectomy without significant complications is possible when conducted by high-volume surgeons, and a modified technique is used.

1. Introduction

Thyroidectomy, either partial or total, is one of the major surgeries performed in the management of thyroid diseases [1].

It is the primary option in most cases; however, it is not free from critical risks, and several complications can be associated with this surgery [2]. The selected type of thyroidectomy usually relies on the lesion characteristics, the nodules' size, and the gland's total affected area [3]. Recurrent thyroidectomy is usually performed in cases with recurrent thyrotoxicosis, recurrent unimodular or Multinodular goiter (MNG), especially in the presence of compression and malignancy suspicion [4]. This surgery is challenging and associated with significant morbidity. Complications mostly occur at the time of dissecting scar tissue around the recurrent laryngeal nerve (RLN) and the vascular pedicle of the parathyroid glands (PTGs) [5]. The major complications include RLN injury, hypocalcemia, and hypoparathyroidism [6,7]. Hypocalcemia is the most common postoperative complication due to damage to the PTGs [2,8]. The RLN injury can significantly affect the quality of life, such as voice changes and airway obstruction [7,9]. Thereby, reoperation is the most challenging aspect of thyroid surgery because of the high risk of complications [7,10]. There is still no consensus on a technique to prevent intraoperative RLN injury [11].

This study aims to demonstrate the efficacy of a modified thyroidectomy technique in decreasing associated complications to almost zero in patients with recurrent thyroidectomy.

2. Methods

2.1. Study design

A single-group cohort study was conducted over two years (2020–2022) to enroll consecutive patients who underwent recurrent thyroidectomy. The patient's medical and clinical records were extracted from the database at the center.

2.2. Inclusion criteria

All patients who underwent recurrent thyroidectomy (thyroid lobectomy or total thyroidectomy), regardless of the reason, were included in this study.

2.3. Exclusion criteria

The exclusion criteria included patients with preoperative vocal cord paralysis, isthmectomy, or an abnormal calcium level.

2.4. Preoperative assessment

A detailed physical examination was performed for the patients. Then, they underwent a neck ultrasound (US). Several related laboratory tests, including measurement of thyroxine, thyroglobulin, tri-iodothyronine, thyroid antibody, and calcium, were conducted. In Fifty-three cases, fine needle aspiration cytology (FNAC) was performed. Several otolaryngologists examined the patients for vocal cord motility.

2.5. Surgical intervention

The procedures were done by high-volume surgeons using a modified thyroidectomy technique, which included the following steps: 1) Finding and preserving PTGs with their blood supply intraoperatively before searching for the RLN,

immediate parathyroid gland reimplantation if detached inadvertently during the procedure. 2) Care was taken not to transect any substantial structures or tissues in the area until the RLN was confidently identified; 3) Starting the dissection in the suprasternal notch to find the RLN in the tracheoesophageal groove, fine dissection of tissues with the wise use of manual pressure, small ties, and bipolar forceps is encouraged, as this area contains tiny vessels that can bleed and obscure the operative field; 4) If the nerve was not found in the suprasternal notch, the search would continue at the nerve's expected entrance to the cricoid cartilage.

2.6. Statistical analysis

The data were recorded and organized using Microsoft Excel (2019). The dataset was then transferred to SPSS version 25 for encoding and descriptive analysis.

3. Results

A total of 213 cases with redo thyroid surgery due to various reasons were assessed against the inclusion and exclusion criteria. Eighteen cases were excluded (three cases had abnormal calcium levels and fifteen cases had preoperative vocal cord paralysis). In total, 195 cases of recurrent thyroidectomy were enrolled in this study. Female patients (173, 88.7%) were predominant compared to males (22, 11.3%). The patient's age ranged from 16 to 79 years old, with a mean age of 53 years. The most common symptom was neck swelling (45%), followed by generalized malaise (31%) and dyspnea (20%). On the general examination, neck swelling was commonly classified as G2 (43.5%) and G1 (19%). Thyroid function tests revealed hyperthyroidism in 113 patients (57.9%) and hypothyroidism in 52 cases (26.7%). The remaining cases (30, 15.4%) were euthyroid patients. The most common ultrasonographic finding was MNG in 138 cases (70.7%), followed by the retrosternal extension (28.7%) and thyroid nodule (20.5%). Fine needle aspiration cytology (FNAC) was conducted for 63 cases, and the most common finding was follicular neoplasm (45.2%). The major indications for surgery were MNG (55.4%) and hyperthyroidism (36.9%) (Table 1).

Most of the cases underwent total thyroidectomy (160, 82%), and 103 thyroid lobectomy was performed in 35 cases (18%). In all the cases that underwent total thyroidectomy, both RLNs were explored and preserved, and a lateral RLN was seen and preserved during the thyroid lobectomies. No intraoperative neuromonitoring was performed during surgery, and postoperative voice examinations were performed 6 months after surgery based on postoperative voice change. The preservation of PTGs was bilateral in 160 cases (82%) and unilateral in 35 cases (18%). There was no vocal cord paralysis, and only 15% of the cases suffered from temporary hypocalcemia.

4. Discussion

Thyroid surgery is the most common surgical intervention in the field of endocrinology, and it is the primary surgery in most

cases of thyroid diseases. Secondary intervention for recurrent goiter and thyroid cancers is a risky challenge for surgeons due

Table 1. Presentations of the patients.

Symptoms	N. patients (%)
Symptoms	
Neck swelling	88 (45%)
Generalized malaise	61 (31%)
Dyspnea	39 (20%)
Neck and/or shoulder pain	28 (14.4%)
Palpitation	16 (8.2%)
Headache	10 (5.2%)
Sweating	9 (4.6%)
Tremor	6 (3.1%)
Voice change	5 (2.7%)
Eye protrusion	4 (2%)
Dry mouth	2 (1%)
Hair loss	2 (1%)
Neck Swelling Grade	
G0	6 (3.1%)
G1	37 (19%)
G2	85 (43.5%)
G3	26 (13.3%)
Not-determined	41 (21%)
Diagnostic Findings (Ultrasonography)	
Multinodular Goiter (MNG)	138 (70.7%)
Retrosternal extension	56 (28.7%)
Thyroid nodule	40 (20.5%)
Thyroiditis	14 (7.2%)
Graves' disease	3 (1.5%)
Diagnostic Findings (FNAC)	
Follicular neoplasm	24 (45.2%)
Thyroid nodule	14 (27.4%)
PTC	12 (22.6%)
Benign lymphoid cells	5 (9.4%)
Hurthle cell tumor	5 (9.4%)
Thyroiditis	3 (5.7%)
Indication	
Multinodular Goiter (MNG)	108 (55.4%)
Hyperthyroidism	72 (36.9%)
Retrosternal extension (RSE)	32 (16.4%)
Thyroid Nodule	32 (16.4%)
Pressure symptoms	24 (12.3%)
Papillary thyroid carcinoma (PTC)	19 (9.7%)
Hurthle cell carcinoma	5 (2.56%)
Graves' disease	3 (1.5%)
Shortness of breath	3 (1.5%)
Voice change	1 (0.5%)
Sebaceous cyst	1 (0.5%)

to the complications like RLN injury and hypoparathyroidism. These complications can directly influence patients' quality of life [6,7]. RLN injuries can cause vocal cord paralysis and even obstruction of the respiratory tract [12]. There are various indications for thyroid reoperations. According to the study by Gurliyek et al., the indications for redo surgery were nodular and MNG in the majority of the cases (53.1%), followed by atypia, follicular lesions (28.5%), and hyperthyroidism (8.2%) [13]. In another study, nodular disease, malignant or suspicious cytology results, and thyrotoxicosis were the indications for reoperation. In general, indications for recurrent thyroidectomy include three thyroid abnormalities: MNG, thyrotoxicosis, and malignancy [13,14]. In the current study, the most common indication for recurrent thyroidectomy was MNG (55.4%), followed by hyperthyroidism (36.9%).

Thomusch et al. mentioned secondary intervention as an independent risk factor for vocal cord paralysis in recurrent goiter [15]. An ENT examination has been suggested to assess the movement of the vocal cords pre-and postoperatively [12]. The protection of the RLN is the priority in recurrent thyroidectomy, especially when the risk of RLN injury is duplicated. Identification of the RLN during surgery is important to prevent this complication, but visualization of the nerve during the dissection of scar tissue is challenging [13]. In the present study, all of the cases underwent diagnosis of vocal cord motility to get certainty about the state of the vocal cord. The modified thyroidectomy technique used in this study guaranteed a satisfactory outcome, and we were able to successfully observe both RLNs in cases that underwent total thyroidectomy, and unilateral RLN was seen in the thyroid lobectomies.

It has been reported that the rate of postoperative RLN palsy was six times higher in redo surgery. Furthermore, the risk of RLN paralysis has been estimated to be between 2% and 30% in revision surgery [12,16]. In a study by Elkhateeb et al., on fifty cases of recurrent MNG that underwent reoperation, the RLN injury occurred intraoperatively in four cases [12]. In another study, RLN palsy was reported in a total of 7 cases (3.4%) [4]. The rate of transient and permanent vocal cord paralysis in recurrent thyroid surgery has also been reported to be 12.5% and 3.8%, respectively [17]. Hypoparathyroidism is another postoperative complication of thyroidectomy. Permanent hypoparathyroidism may occur when fewer than three PTGs are found intraoperatively [18]. Miccoli et al., claimed that temporary and permanent hypoparathyroidisms were 37.7% and 7.2%, respectively [19]. Another study reported that permanent hypoparathyroidism was 3 to 8 times higher in secondary thyroid surgery compared to primary surgery [20]. In this cohort study, in 82% of the cases, preservation of bilateral PTGs was achieved, and at least two PTGs were protected in the remaining cases (18%). In contrast to most of the previous studies, there were no complications like RLN injury and permanent hypoparathyroidism as a consequence of the operations. The only complication encountered in this study was temporary hypocalcemia in 15% of the cases.

The high risk of complications in the redo operation can be related to the scar formation and anatomical disturbance that occurred in the primary surgery, and this factor makes the RLN

vulnerable to injury. Hence, proper knowledge of anatomical disturbances owing to the previous surgery can minimize the complications during the redo operation [13]. Many risk factors for the development of RLN paralysis have been identified, including secondary intervention, surgery extension, non-identification of RLN during surgery, female gender, age, thyrotoxicosis, an inexperienced surgeon, and a low-volume hospital [17]. Elkhateeb et al. reported that the rate of RLN injury could significantly decrease when the surgery is conducted by experienced neck surgeons. It has also been shown that the total rate of permanent vocal cord paralysis and hypoparathyroidism was respectively equal to 0.6% and 1.5% when the procedures were conducted by high-volume surgeons [21]. Despite the modified technique, another reason for achieving the ideal outcome in our study is that all of the procedures were performed by high-volume and skillful surgeons. This is significantly in agreement with the recommendations of the mentioned literature. Even though the literature mentioned the female gender as a risk factor for RLN paralysis, in this study, most of the cases were females (88.7%), and there was no incidence of RLN paralysis.

Ayhun et al., demonstrated that using lateral approach thyroidectomy and adequate identification of the RLN with the aid of a neuro-intraoperative monitoring probe can significantly increase the chance of RLN preservation in a redo operation. They successfully identified RLNs in all the cases using a lateral approach, but the total rate of permanent hypoparathyroidism was 2.3% [17]. In contrast to Ayhun et al., a study claimed that neuro intraoperative monitoring was unable to reduce the RLN palsy in thyroid reoperations [7]. Simon's triangle is an area formed by three structures: the esophagus, the carotid artery, and the inferior thyroid artery. This area can be used as a point to identify the RLN during surgery. About 0.5 cm below the cornu of the thyroid cartilage can also be used to identify the nerve and reduce the possibility of RLNs blood supply defects [12,22, 23]. In this study, the first step was to find and preserve PTGs before starting any further intervention. Then we tried to find RLNs either in the tracheoesophageal groove through dissection of the suprasternal notch or in the nerve's expected entrance to the cricoid cartilage.

5. Conclusion

Although it is a risky operation, recurrent thyroidectomy without significant complications is possible when conducted by a high-volume surgeon and using a modified technique.

Declarations

Conflicts of interest: The author(s) have no conflicts of interest to disclose.

Ethical approval: This study was approved by the scientific research and ethical committee of college of medicine, University of Sulaimani and all procedures were performed regarding the relevant scientific guidelines and regulations.

Patient consent (participation and publication): Written informed consent was obtained from all participants of this study.

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Authors' contributions: AMS was a major contributor to the conception of the study, as well as in the literature search for related studies. HOA, BAA and FHK were involved in the literature review, in the writing of the manuscript, and in the examination and interpretation of the patient's data. HOB, ASM, YAS, IYA, KMS and SHM were involved in the literature review, the design of the study, the critical revision of the manuscript. FHK and SHM confirm the authenticity of all the raw data. AJQ and SHT were the radiologists who performed the assessment of the case. All authors have read and approved the final manuscript.

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