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Recurrent Laryngeal Nerve Injury In Total Thyroidectomy With Intraoperative Nerve Monitoring And Harmonic Sealing Instrument: A Retrospective Analysis and Treatment Results

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ABSTRACT

The aim of the current study was to reveal the incidence of RLNI in our patients with total thyroidectomy and to evaluate their clinical outcomes.

Charts of 260 patients who underwent total thyroidectomy between 2014 and 2018 were interrogated retrospectively. Standard IONM and harmonic seal were used in all. Patients with suspect of RLNI were further evaluated. Demographics, etiologic disease and the overall treatment results were presented.

A total of 12 patients with RLNI (4.6 %) were presented. Nine (75 %) were women and 3 (25 %) were men. Mean age was 51 years (range, 32-67). RLNI was unilateral in 8 patients (3 %; 50 % in right RLN and 50 % in left RLN) and bilateral in four (1.5 %). All were started corticosteroid and follow-up period was 26 months (range, 9-52). Mean hospital stay was 4 days (range, 2-14). Histopathological evaluations revealed papillary carcinoma (n=7, 58 %), multinodular goitre with thyroiditis (n=4, 34 %) and multinodular goitre with parathyroid adenoma (n=1, 8 %). In a patient with bilateral RLNI (0.3 %), tracheostomy was done on postoperative day 2, and closed on postoperative month 4. Thyroplasty and suture lateralization were applied to other bilateral RLNI cases. In 5 patients with unilateral RLNI and one with bilateral palsy, vocal cords became normal in first 6 months (transient palsy, 2.3 %).

Careful surgical dissection with harmonic and IONM employed in total thyroidectomy are both reliable methods. In case of inevitable RLNI, a close follow-up and cooperation are mandatory to have optimal results.

Key Words: Total thyroidectomy, recurrent laryngeal nerve (RLN), injury, palsy, intraoperative nerve monitoring (IONM), harmonic seal

Introduction

Total thyroidectomy procedure is currently the choice of most experienced endocrine surgeons, as it has a complication rate similar to those seen in subtotal thyroidectomies and it provides the best palliation in both benign and malign thyroid diseases where recurrence is in question. Since the best way of treatment in progressing ophthalmopathy that is commonly seen in thyrotoxicosis is total thyroidectomy and L-thyroxine hormone replacement is relatively easy and can be achieved by just monitoring serum thyroid hormones, a repeat or completion surgery which increases the risk of damaging to recurrent laryngeal nerve (RLN) and parathyroid glands will not be necessary. Increased reports stating microcarcinomas incidentally found in thyroidectomy specimens reaches 10 to 15 % is an another advantage of total thyroidectomy, as the patient needs no additional treatment (1). As a result, total thyroidectomy has become the surgical procedure of choice in most high-volume reference clinics to treat thyroid cancer and benign diseases such as Graves disease and multinodular goitre.

The most feared complication of total thyroidectomy is recurrent laryngeal nerve injury (RLNI). Even there are reported series with high complication rates after total thyroidectomy, many other recent studies have showed permanent hypoparathyroidism and RLN palsy as low as 0.7 and 2.2 %, respectively (2, 3).

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Table 1. The outcome of our patients with RLNI

Patients (n)	Etiology (B/M)	RLNI (R/L/R+L)	Clinical outcome (Transient/Permanent/Surgical intervention)
1	M	R+L	Tracheostomy closed at po 4.mo, spontaneous relief of L RLN, limited movement on RRLN
2	B	R+L	Transient
3	M	R+L	Stridor, L thyroplasty at po 1.mo
4	M	R+L	Fixed cords in the middle allowing air passage, suture lateralization procedure at po 6.mo
5	M	L	Transient
6	M	R	Transient
7	M	L	Adipose tissue injection at po 12.mo, improved Voice quality
8	B	R	Intubation crush injury, arythenoid reduction Surgery at po 12.mo, improved voice quality
9	M	L	Transient
10	B	L	Transient
11	B	R	Transient
12	B	R	Permanent, on follow-up

M: malign, B: benign, R: right, L: left, po: postoperative, mo: month

However, in case of repeat surgery for recurrent disease and when the operation was done by surgeons not specialized in endocrine surgery, the complication rates reaches to 20-25 % (3). The best known technique to avoid injury to RLN is meticulous dissection of the nerve throughout its anatomic pathway, especially close to the thyroid. Several technological advances such as the introduction of intraoperative nerve monitoring (IONM) and instrument-based sealing haemostasis were supposed to help surgeons decrease RLNI incidence. Meticulous hemostasis can be achieved with harmonic sealing instrument without prolonging operation time, since improper hemostasis is known to increase the risk of RLNI (4). A shorter operation time and a decrease in RLNI incidence can also be expected in total thyroidectomy cases with use of IONM. However, most studies have failed to demonstrate a statistically significant difference (5).

In the present study, we aimed to reveal the incidence of RLNI in our patients with total thyroidectomy where we used both IONM and harmonic sealing instruments. We also evaluated the clinical outcomes of the patients with uni or bilateral RLNI, and discussed the treatment options.

Materials and Methods

The research protocol was approved by our institution's Ethics Committee (21/11/2018, B.10.1.TKH.4.34.H.GP.0.01/135). The charts of 260 patients who underwent total thyroidectomy by the same surgeon between May 2014 and January 2018, for benign and malignant thyroid diseases (toxic nodular goitre, a nodule ≥ 4 cm with benign cytology, papillary thyroid carcinoma, etc.) were interrogated retrospectively. Demographics, the etiologic disease, surgical outcomes and the overall treatment results were presented. Data were recorded at Excel file, and results were expressed as the number (n) and the percentage (%).

A standard transverse cervical incision 2 cm above the sternal notch and just below cricoid cartilage was used to explore thyroid gland and all parathyroid glands in all patients. Standard IONM (nim response 3. version, Medtronic, USA) and harmonic focus shears instrument (Ethicon, USA) were used in all cases. Standard total thyroidectomy was performed after identification and electrical stimulation of RLN bilaterally (Figures 1 and 2).

Patients with suspect of RLNI were evaluated by an experienced Ear-Nose-Throat (ENT) staff surgeon. RLNI was defined as hoarseness associated with vocal cord paralysis at laryngoscopy within 6 months postoperatively, and after 6 months, RLNI was considered as permanent palsy. All patients were started L-thyroxine sodium (Abdi İbrahim İlaç San A.Ş., İstanbul, Türkiye), and intravenous glucocorticoid shots (100 mg dose, twice Daily). Patients were discharged home with hormone replacement, steroid and vitamin B12 tablets.

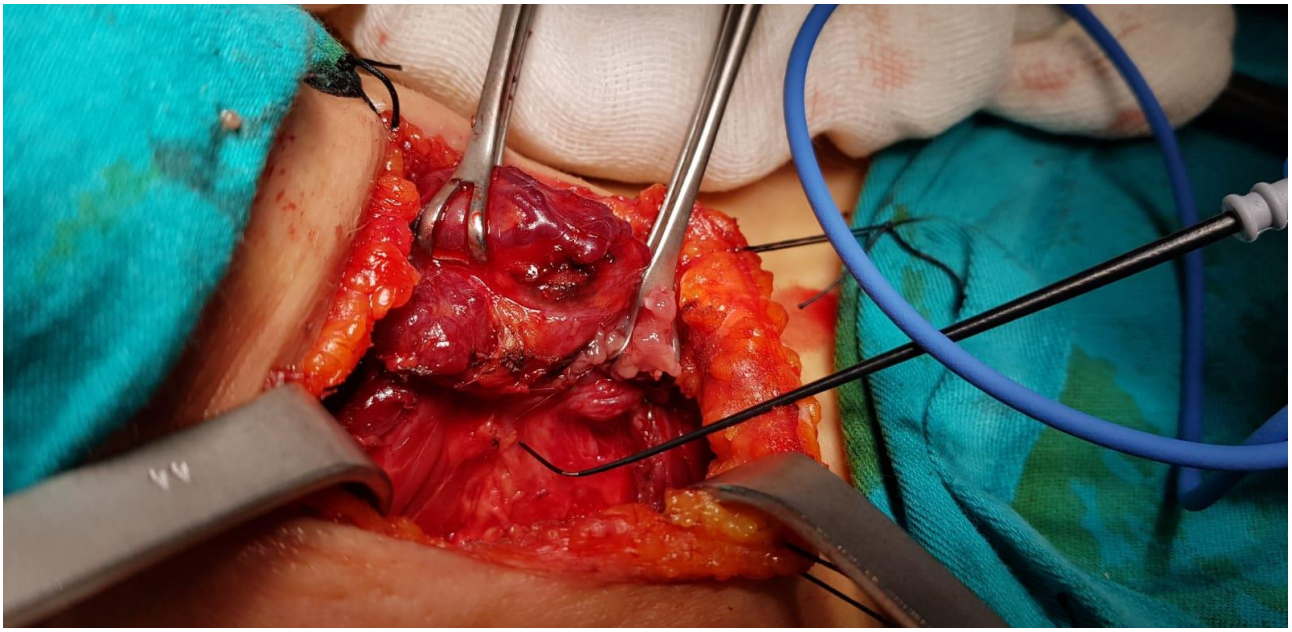

Fig. 1. IONM of right RLN

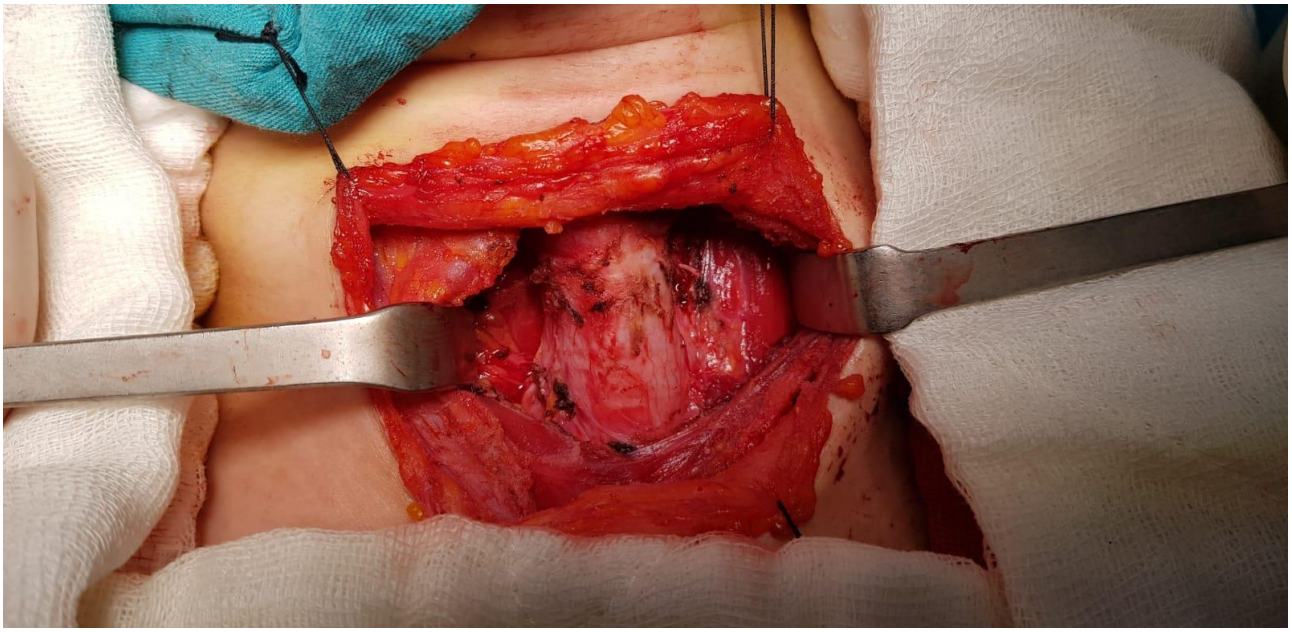

Fig. 2. Operative field after total thyroidectomy

Results

A total of 12 patients (4.6 %) with respiratory distress and/or impaired voice quality were diagnosed as vocal cord paralysis, with ENT consultation. Nine of these patients (75 %) were women and 3 (25 %) were men, and the mean age was 51 years (range, 32-67).

RLNI was unilateral in 8 patients (n=8, 3 %; 50 % in right RLN and 50 % in left RLN) and bilateral in the remaining 4 (n=4, 1.5 %). Mean follow-up period was 26 months (range, 9-52). Their mean hospital stay was 4 days (range, 2-14). Histopathological evaluations revealed papillary thyroid carcinoma (n=7, 58 %), multinodular goitre with thyroiditis ground (n=4, 34 %) and multinodular goitre with coexistant parathyroid adenoma (n=1, 8 %).

In a 57 year-old woman with bilateral RLNI (n=1, 0.3 %), emergent tracheostomy was done on postoperative day 2, upon rapid development of stridor. She had multicentric papillary carcinoma. Her left RLN became normal on postoperative month 4, and after closure of tracheostomy, she was referred to radioactive iodine therapy. Left thyroplasty and suture lateralization techniques were applied to the other patients with bilateral RLNI on postoperative months 1 and 6, respectively. All are doing well now.

In 5 patients with unilateral RLNI and one with bilateral palsy, vocal cords became normal in the first

6 months postoperatively (transient palsy, n=6, 2.3 %) (Table 1). Adipose tissue injection and reduction surgery were applied to the patients with permanent left RLNI and right arythenoid subluxation (intubation crush injury), respectively. Their voice quality improved significantly.

Discussion

Total thyroidectomy is currently the preferred surgical treatment modality for both thyroid carcinomas and benign disorders such as Graves disease and multinodular goitre, since it minimizes the risk of recurrence and eliminates the complication risks of repeat or completion surgery. Unignorable ratios of false negative results obtained from fine needle aspiration biopsies and the high rates of incidental carcinomas reaching 10 percent also approves total thyroidectomy as the procedure of choice in most reference centers all over the world (1-3). The prompt relief of symptoms and the best alleviation obtained in case of endocrine ophthalmopathy are also worth to be counted among its advantages. Although life-long thyroxine replacement treatment should be applied to patients following total thyroidectomy, the complication ratio seem to be almost equal with those seen in nontotal procedures (4, 5). Furthemore, in case of repeat surgery for recurrent disease, especially when the operation is performed by an inexperienced surgeon, the complication rates reach up to 20-25 % (3). We also prefer total thyroidectomy in both benign and malign thyroidal disorders in our patients who require surgical resection.

Vocal cord paralysis due to injury to RLN is the most dreaded complication of total thyroidectomy. The reported incidence of temporary RLNI varies between 0 and 12 %, while the incidence of permanent RLNI has been reported to be much lower (0-3.5 %) (6-8). In case of bilateral RLNI, respiratory distress and aspiration can develop rapidly and may cause result in mortality. Therefore, all precautions including close monitoring and tracheostomy should be undertaken without any delay. The best known technique to avoid injury to RLN is meticulous dissection of the nerve throughout its anatomic pathway. However, functional impairment of RLN is not visible macroscopically and IONM has been developed to monitor the nerve to avoid unnecessary dissection (9, 10). Meticulous hemostasis can be achieved with harmonic sealing instrument, since improper hemostasis is known to increase the risk of RLNI (4). Despite the lack of evidence to support an advantage of IONM over the standard anatomic dissection of RLN, surgeons have adopted it in increasing ratios (5, 11, 12).

In our study, both IONM and harmonic sealing instruments were used in all cases, and a standard total thyoidectomy was performed after visual identification and electrical stimulation of RLN bilaterally. The incidence of RLNI was 4.6 %, but permanent RLNI occurred in only 2.3 % of patients. We think that these ratios are consistent with the rates presented in the English-written literature. Furthermore, since the great majority of our patients had either papillary carcinoma (58 %) or a benign disease with thyroiditis causing adherence to the surrounding tissues (34 %), these results can be considered successful. In our opinion, routine use of both IONM and harmonic sealing device helped us in both meticulous hemostasis and identification of the nerve throughout the operation. Tracheostomy was created in only one patient with multicentric papillary carcinoma (0.3 %), and it stayed open just for 4 months. Close follow-up of all cases with RLNI and cooperation with ENT specialists afforded our patients an opportunity to improve the quality of their life with additional small mini-invasive surgical procedures such as adipose tissue injection, thyroplasty and suture lateralizations. Most are doing well at the moment.

In conclusion, total thyroidectomy can be undertaken safely with a low complication rate. An immediate and permanent cure with a minimum risk of disease recurrence or repeat surgeries can be achievable. Surgical dissection with minimal bleeding using harmonic sealing instrument and IONM employed in total thyroidectomy are both reliable methods to decrease postoperative morbidities. However, in case of inevitable RLNI, a close follow-up of the patient and cooperation are mandatory to have optimal results.

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