

## Risk of Recurrent laryngeal Nerve Injury in Complete Resection OF Recurrent Multi-nodular Goiter: Cross Sectional study

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### Abstract

**Background:** Anatomic and functional preservation of the recurrent laryngeal nerve (RLN) is the gold standard in thyroid and various neck surgery.

**Aim of the work:** To assess incidence and risk factors for (RLN) injury which may be just palsy or permanent injury postoperative after thyroid surgery in patient with recurrent multiple nodular goiter (MNG) and observe the timing of recovery.

**Methods:** This prospective cross-sectional study was done on fifty patients with recurrent MNG. The study was done from December 2018 to October 2019. Patients with voice changes, RLN injury from previous operation and other type of cancer thyroid were excluded from the study. Results: Identification of the RLN was succeeded in 45 patients and failed in 5, due to sever fibrosis from pervious surgery. Intra-operative identification of both RLN done in 34 patients, we identify Right RLN in 8 while left RLN identified in 3. During dissection, intra-operative injury of RLN happen in 4 patients on one side only. Seven patients developed hoarseness of voice which was transient and voice returned after Speech therapy from three weeks to two months. Postoperative indirect laryngoscopy done, only four patients suffered from immobile vocal cord on one side.

**Conclusion:** Previous history of thyroid surgery is not significant and intraoperative RLN injury is significant so incidence of re-operation related transient vocal cord paresis was rare in our study four patients only. The median recovery time for transient RLN injuries was 8 weeks after operation.

**Keywords:** laryngeal Nerve; Goiter; Resection.

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### INTRODUCTION

Anatomic and functional preservation of the recurrent laryngeal nerve (RLN) is the gold standard in thyroid and various neck surgery. Visual identification of RLN has decreased the rates of permanent RLN palsy during thyroid and parathyroid operations. However, unexpected RLN palsy still occurs after thyroid and parathyroid surgery. In addition, most nerve injuries are not recognized intraoperatively and visualization of the nerve is insufficient to assess nerve damage.<sup>1</sup>

Injury of RLN is generally unilateral and transient, but occasionally it can be bilateral and permanent and it may be either accidental. The permanent lesion of damaged RLN often manifests as an irreversible dysfunction of phonation and is the most common complication following surgery. Permanent injuries to the recurrent laryngeal nerve are best avoided by identifying and carefully tracing the path of the recurrent nerve. Surgeon's

experience, histopathologic diagnosis, previous surgery, surgical technique and anatomic variations are important factors affecting this complication.<sup>2</sup>

Due to the lack of common language between the surgeons regarding the extent of thyroid resection in treating MNG, the recurrence rate varies widely. An inadequate surgical removal of the thyroid gland, lack of substitution therapy and pathological stimulation of the thyroid growth can all promote the recurrence<sup>3</sup>, the rate of recurrence after partial resection of the thyroid gland in the literature varies between 2.2% and 49%.<sup>4</sup>

Bilateral subtotal thyroidectomy is one of the surgical options in MNG. It was established to avoid complications like hypoparathyroidism and recurrent laryngeal nerve palsy which are associated with total and near total thyroidectomy.<sup>5</sup> The 2012 Scandinavian quality register was based on the findings of approximately 2000 thyroidectomies

performed within 1 year in 31 endocrine surgical units from Sweden and Denmark. A temporary rate of 3.02 % ( $\leq 6$  weeks) and permanent rate of 1 % ( $\geq 6$  months) was reported. However, postoperative routine laryngoscopy was performed in only 52 % of patients.<sup>6</sup> Reported risk for nerve injury if the RLN is not identified intra-operatively is 1.41 times higher according to a large multi-centre German study<sup>7</sup> and 3–4 times higher as demonstrated by Mountain et al. whom that the rate of RLN injury following nerve identification has been reported to be as low as 0.5 % at specialized centers.

Patients undergoing revision surgery are at increased risk of RLN injury, although wide ranges of palsy rates are reported. It is estimated that the risk of RLN paralysis is between 2 and 30 % in revision surgery. The British Association of Endocrine and Thyroid Surgeons (BAETS) audit showed that the incidence of a postoperative palsy was six times higher in revision surgery.<sup>8</sup>

The incidence of injuries to the recurrent laryngeal nerve has been reported between 1% to 2% from different thyroid surgery centers when surgeries performed by experienced neck surgeons. This incidence is higher when thyroidectomy is performed by a less experienced surgeon.<sup>9</sup> It is generally accepted that extended resections carry a higher risk of RLN palsy.<sup>10</sup> Vocal palsy rates may vary for different thyroid diseases, with a higher expected risk of intraoperative nerve damage for thyroid cancer, Graves' disease, and recurrent goiter. Primary surgery for benign thyroid disease with routine identification of RLN has been reported to have a very low incidence of vocal cord palsy.<sup>11</sup>

The incidence of recurrent laryngeal nerve injury varied from 13% of patients with transient vocal cord dysfunction to 2% of patients with permanent cord paralysis. Factors that increase the risk of nerve injury include inherent variability of the nerve course, local and regional disease involvement of the surrounding tissues, and proficiency of the surgeon in performing the required dissection.<sup>12</sup>

## METHODS

This prospective cross-sectional study was done on fifty patients with recurrent MNG. The study was done in the period between December 2018 to October 2019 at General Surgery Department, Faculty of Medicine, Al-Azhar University Hospitals and Tanta Cancer Center and follow up of all patients clinically and within 1 month after surgery by indirect laryngoscopy all finished in December 2019.

Approval of the ethical committee and a written informed consent from all the subjects were obtained.

**Inclusion criteria:** Patients eligible for enrolment into this study were  $> 18$  and  $< 5$  years age and Patients underwent other forms of surgery for multinodular goiter like subtotal and hemithyroidectomy.

**Exclusion criteria:** Patients with voice changes, RLN injury from previous operation and other type of cancer thyroid were excluded from the study. We evaluated the pre-operative voice assessment clinically by voice counselling and by laryngoscopy. Therefore, all patients were reported to have intact RLN before the surgery and history of other forms of surgery for multinodular goiter like subtotal and hemithyroidectomy.

**Surgical Techniques:** Remove of the residual or recurrences of thyroid tissue and to identification of recurrent laryngeal nerve during completion of thyroidectomy. Postoperative care: change in voice or hoarseness, Postoperative assessment of vocal cords during extubation by anesthesiologist, Post-operative day 0 and 3 clinically and within 1 month after surgery by indirect laryngoscopy.

Data collected for all patients undergoing thyroid surgery over 10 months on a prospective basis standard surgical technique we followed in each case. No additional dissection beyond the standard operative technique was performed to improve nerve exposure. After mobilization of the thyroid lobe, the RLN identification was carried out clinically and after surgery was assessed with laryngoscopy.

## RESULTS

Fifty patients undergoing thyroid surgery were included and constituted for the study were summarized in table 1.

Personal data	No.	%
<b>Sex</b>		
Male	6	12 %
Female	44	88 %
<b>Age (years)</b>		
Min. – Max.	18 – 65	
Mean $\pm$ SD.	39.82 $\pm$ 14.44	
Median (IQR)	36.50 (27.75 – 54.50)	

**Table 1:** The demographic characteristics of the included patients.

Regarding the diagnosis of the included (50) patients, recurrent multi-nodular goiter was found in 43 patients (38 female & 5 male), 5 patients with recurrent Solitary thyroid nodule (4 female & 1 male), and 2 female patients with residual thyroid as shown in Table 2.

Diagnosis	Sex				Total	FE p
	Male (n=6)		Female (n=44)			
	No.	%	No.	%		
R. MNG	5	83.3	38	86.4	43	1.000
R. STN	1	16.7	4	9.1	5	0.487
Residual thyroid	0	0	2	4.5	2	1.000

**Table 2:** Patient's data regarding the diagnosis and the cause of surgery.  
FE: Fisher Exact p: p value for comparing between male and female

The primary procedures	Sex				Total	FE p
	Male (n=6)		Female (n=44)			
	No.	%	No.	%		
<b>I-Total thyroidectomy</b>	1	16.7	2	4.5	3	0.324
<b>II-Subtotal thyroidectomy</b>	3	50.0	35	79.5	38	0.141
<b>III-Near-total thyroidectomy</b>	2	33.3	7	15.9	9	0.293

**Table 3:** FE: Fisher Exact p: p value for comparing between male and female. The surgical decisions were clarified and taken with every case with the consideration of the pre-operative investigation and diagnosis were summarized in Table 4. The interval between 1<sup>st</sup> and 2<sup>nd</sup> operation ranged from two to twenty-three years.

Operation	No.	%
Total thyroidectomy	43	86
Compilation of thyroidectomy	5	10
Recurrent Nodules	2	4
Interval between 1 <sup>st</sup> and 2 <sup>nd</sup> operation	Years	
Min. – Max.	2– 23	
SD.±Mean	6.16±13.28	
Median	14.0	

**Table 4:** Distribution of the studied cases according to second operation.

Among the included 50 cases: recurrent laryngeal never was identified and dissected in all patients. The identification of the RLN was succeeded in 45 patients and failed in 5 patients due to sever fibrosis of pervious surgery. Intra-operative identification of both RLN done in 34 patients, we identify Right RLN only in 8 patients while left RLN identified in 3 patients. During dissection intra-operative injury of RLN, happen in 4 patients on one side only all this were summarized in Table 5.

Intra-operative identification of RLN	No.	%
Right RLN	8	16
Left RLN	3	6
Both	34	68
None of them	5	10
<b>Intra operative injury of RLN (on side only)</b>	4	8

**Table 5:** Distribution of the studied cases according to Intra- operative identification of RLN

There was no operative mortality. Persistent or transient vocal cord paralysis was not encountered in any patients. The assessment of voice changes was done after the surgery. Out of the included patients, only seven patients developed hoarseness of voice, which was transient, and the voice returned after three weeks up to two months. Regarding the postoperative indirect laryngoscopy, only four patients suffered from immobile vocal cord on one side as shown in Table 6.

Postoperative complication	No.	%
No complication	43	86
Hoarseness	7	14
Stridor	0	0
Tracheostomy	0	0
Postoperative indirect laryngoscopy	No.	%
Free mobile "both side"	46	92
<b>Immobile</b>		
Unilateral	4	8
Bilateral	0	0

**Table 6:** Distribution of the studied cases according to Postoperative Complication & Postoperative indirect laryngoscopy.

thyroidectomies performed within 1 year in 31 endocrine surgical units from

**DISCUSSION**

Patients undergoing revision surgery are at increased risk of RLN injury, although wide ranges of palsy rates are reported. It is estimated that the risk of RLN paralysis is between 2 and 30 % in revision surgery. The British Association of Endocrine and Thyroid Surgeons (BAETS) audit showed that the incidence of a postoperative palsy was six times higher in revision surgery.<sup>8</sup>The incidence of Injuries to the recurrent laryngeal nerve has been reported between 1% to 2% from different thyroid surgery centers when performed by experienced neck surgeons. This incidence is higher when thyroidectomy is performed by a less experienced surgeon.<sup>9</sup> The 2012 Scandinavian quality register was based on the findings of approximately 2000

Sweden and Denmark. A temporary rate of 3.02 % ( $\leq 6$  weeks) and permanent rate of 1 % ( $\geq 6$  months) was reported. However, postoperative routine laryngoscopy was performed in only 52 % of patients<sup>6</sup> Risk to the nerve during thyroid surgery increases when the nerve is not identified routinely, and it may not be identified in up to 18% of procedures. One study quoted an incidence of nerve paralysis three to four times greater in cases in which the recurrent nerve was not localized compared with cases in which it was localized.<sup>13</sup>

In the current study, we committed in all cases the routine identification of the RLN during thyroid surgery this significantly decreased RLN injury specially when performed by

experience surgeon to achieve a better balance between hemostasis and tissue preservation, so only four patients in this study have RLN injury intra-operative due to sever adhesion and fibrosis from previous operation. In thyroid and parathyroid surgery, there is importance of pre- and postoperative ENT examinations for several reasons. First, it allows a precise preoperative assessment of the vocal cord movement (landmark) and can serve as medicolegal proof. Second; it permits to have a more adequate postoperative comparison with the preoperative examination.<sup>14</sup>

In our study: seven patients developed hoarseness of voice, which was transient, and the voice returned after three weeks up to two months, evolution of postoperative RLN injuries by indirect laryngoscope after thyroid surgery show that 4 patients presented by transient vocal cord paresis. Various treatments have been described according to the severity of the injury, Speech therapy or vocal exercises are usually the first measures.

### CONCLUSION

This study showed that previous history of thyroid surgery is not significant and intraoperative RLN injury is significant so incidence of re-operation related transient vocal cord paresis was rare in our study only four cases so the most important predictor is routine identification of the RLN during thyroid surgery and specially when performed by experience surgeon have a significant outcome.

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