

Risk Factors for Injury to Recurrent Laryngeal Nerve in Thyroid Surgeries - A Tertiary Care Centre Experience

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Author's Contribution

^{1,3,4} Conception of study
^{1,2} Experimentation/Study conduction
^{1,2,3} Analysis/Interpretation/Discussion
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Abstract

Objective: To evaluate the risk factors of recurrent laryngeal nerve injury during thyroid surgery.

Study Design: Descriptive study.

Place And Duration Of Study: Department of Otorhinolaryngology-Head and Neck Surgery, Sindh Government Lyari General Hospital / Shaheed Mohatarma Benazir Bhutto Medical College and Dr Ruth K. M. Pfau Civil Hospital Karachi, Dow University of Health Sciences from July 2014 to August 2018.

Methods: Every patient with goiter (multinodular / solitary nodule) admitted for primary or revision surgery with normal vocal cord movements were included in this study, while patients having hoarseness due to impaired vocal cords movements were excluded from this study.

Results: Out of 120 Patients 28 (23.33%) were operated for Total Thyroidectomy, 4 (3.34%) had Near total thyroidectomy and 49(40.83%) for Right lobectomy with isthmusectomy, 35(29.17%) for Left lobectomy with isthmusectomy and 4(3.3%) cases operated for recurrent goiter. Transient unilateral vocal cord paralysis occurred in 5 cases, became permanent in 3 cases. Bilateral vocal cord paralysis was seen in revision thyroidectomy in 1 case.

Conclusion: With this study we have tried to evaluate the relation of injury to RLN and type of surgery performed. It can be concluded that thyroid surgery, if performed by expert surgeons carries low risk of injury to RLN. Lobectomies have a slightly lower risk of nerve injury compared to total thyroidectomies. In revision surgeries RLN are at greater risk. Careful dissections of nerve make an important pillar in preservation of RLN during surgery.

Keywords: Thyroidectomy, Recurrent Laryngeal Nerve Palsy, Risk Factors.

Introduction

Thyroid surgery is a common surgical procedure all over the world as well as in Pakistan¹. Most common complications of thyroid surgeries are bleeding, hypoparathyroidism and recurrent laryngeal nerve

Injury (RLNI) these represent nearly half of all the complications of thyroid surgery. Many techniques have been introduced to prevent injury, still the incidence of recurrent laryngeal nerve palsy varies between 0.4% to 7.2% for temporary paresis and from 0% to 5.2% for permanent paralysis².although this

complication is infrequently encountered, it can affect the quality of life^{3,4}.

Hoarseness can occur with unilateral RLN Injury while bilateral RLN Injury can lead to aphonia, dyspnoea and often life-threatening glottic obstruction. The incidence of RLN Injury has been found to be higher during re-explorations and Total thyroidectomy for thyroid carcinoma procedures.⁵

RLN Injury is a major concern in thyroid and parathyroid surgery^{6,10}. Injury to the RLN can result from oedema, neuropraxia resulting from excessive stretching, complete or partial transection, contusion, crushing, clamping, burn, and ligation or from compromised blood supply. Recurrent laryngeal nerve injury results in true vocal cord paresis or paralysis which may be unilateral or bilateral and may be temporary or permanent. If both the recurrent laryngeal nerves are damaged, it results in permanent tracheostomy and makes life of such patients miserable⁷. Therefore, methods used that can decrease the incidence of this complication are of great interest an almost certain way to ensure the integrity of the RLN is to always identify the nerve during all surgical procedure on thyroid and parathyroid glands^{8,9}. The aim of the present study is to evaluate the factors influencing the risk of RLN injury during thyroid surgery.

Patients and Methods

STUDY DESIGN: Descriptive study.

INCLUSION CRITERIA: All admitted patients in mentioned institutions with goiter (multinodular / solitary nodule) for primary or revision surgery with normal vocal cord movement were included in this study. Study period was from July 2014 to August 2018

EXCLUSION CRITERIA: Patients having hoarseness due to impaired vocal cords movements were excluded from this study.

DATA COLLECTION: Methods: It was a descriptive analytical study conducted in the ENT & Head and Neck Surgery Department of Shaheed Mohatarma Benazir Bhutto Medical College/ Sindh Government Lyari General Hospital and Dr Ruth K.M Pfau Civil Hospital /Dow university of Health Sciences Karachi between July 2014 to August 2018. Adult patients between ages of 22 and 74 years of either gender with goiter (enlarged thyroid gland) were admitted and assessed according to a set standard protocol for the management of particular thyroid disease. In all cases, surgery was performed accordingly. A detailed

history, clinical examination, routine/special investigations such as thyroid function tests and ultrasound scans were done in all patients, while CT scans and FNAC were performed in selected patients. Contrast enhanced CT scans neck and thoracic inlet done to assess the retrosternal extent of the goiter, and FNAC for histopathology of lesion. FODL examination was done in all patients to assess mobility of vocal cords. For ultrasound and CT scans patients referred to Radiology Department of Dr Ruth K M Pfau Civil Hospital Karachi. Detailed Operative notes (Total, Near total, Hemithyroidectomy) with special reference to per-operative identification of the recurrent laryngeal nerve were written. Pre-operative and post-operative indirect laryngoscopy / Fiberoptic direct laryngoscopy were recorded. Dysphonia or vocal cord paralysis detected on indirect laryngoscopy and recovered within 6 months was considered as temporary paralysis and continued beyond 6 months considered as permanent vocal cord paralysis.

Follow up ranged from 6 months to 2 years. Patients with no morbidity postoperatively were followed up to 6 months. Patients who developed hoarseness postoperatively and documented vocal cord palsy post operatively on FODL were followed for up to 2 years. Duration of this follow up was to record progression of palsy and concerns of patients. Record of all patients was collected initially in hard copy format, with complete biodata, contact information, details of disease, procedure done and outcome. This data was then transferred to soft copy, with specifics recorded in form of variables in SPSS 20. All these patients were called for follow-up with their provided phone numbers. One author from each institute was designated for collection and recording all details pre and post operatively.

Sampling technique was convenience sampling with all cases of thyroid surgery meeting inclusion criteria during duration of study in both institutes included in this study.

Result

120 patients underwent thyroid surgery during the study period. The ages of patients ranged between 35 to 55 (Mean 45.89 SD± 4.17). Most of the patients were females 108 (90.0%). Multinodular goiter were found in 32(26.7%) cases, solitary nodule was present in 84 (70.0%) and 4 (3.33%) were with recurrent thyroid swelling. Transient unilateral vocal cord paresis noted in 4 cases and bilateral vocal cord paralysis in 1 case. Permanent paralysis occurred in 3 cases, one in total

thyroidectomy, one in right lobectomy and one in reoperation for a goiter. The case which was a reoperation developed bilateral vocal fold paralysis.

Table 1- Types of operations and RLN Injury.

Operations	No. Of Patients	No. Of RLN Paralysis			
		Transient Unilateral	Bilateral	Permanent Unilateral	Bilateral
1.Total Thyroidectomy	28 (23.33%)	02		01	
2.Near Total Thyroidectomy	04 (3.34%)	01			
3. Rt. Lobectomy	49 (40.83%)	01		01	
4. Lt. Lobectomy	35 (29.17%)				
5. Reoperation for recurrent goiter	04 (3.33%)		01		01
Total	120	04 (3.33%)	01 (0.83%)	02 (1.66%)	01 (0.83%)

Table 2-Risk factors for injury to RLN

Risk Factors	No. of Patients	No. Injury
Gender		
Male	12 (10%)	01 (0.83%)
Female	108 (90%)	02 (1.66%)
Category of Operation		
Primary	116 (96.66%)	02 (1.66%)
Secondary	04 (3.33%)	01 (0.83%)
Pathology		
Benign	114 (95%)	01 (0.83%)
Malignant.	06 (5%)	02 (1.66%)
Type of operation		
Lobectomy	84 (70%)	01 (0.83%)
Total/Near Total	32 (26.66%)	01 (0.83%)
Thyroidectomy	04 (3.33%)	01 (0.83%)
Revision Surgery		

Total number of patient: 120 and number of patients with permanent injury: 3 (2.5%)

Discussion

In this study we have tried to elaborate the risk factors which lead to paralysis of recurrent laryngeal nerve. This study was done in tertiary care setup. Teams of expert head and neck surgeons performed these surgeries, which had similar experiences in field of head and neck. In our study we had 12 males (10%) and 108 females (90%), which clearly demarcates that thyroid diseases have a great predilection for females. This finding is universally true^{13,14}. Furthermore, benign disease of thyroid such as multinodular goiter, make up the bulk of sample. In our sample we had 114 patients with benign pathology (95%) compared to 6 malignant cases (5%). This finding correlates with studies done in different setups. A study done by Qureshi IA et al. in Saudi Arabia showed that goiters were likely to be multinodular in nature in 76.1% of the cases¹⁵, another recent study by Khan A et al. done

in Peshawar also showed 71% of the cases were of benign pathology in a clinical goiter¹⁶. In our study 95% occurrence of benign pathology which is slightly higher than other studies can be attributed to non-randomized convenience sampling technique.

Most common type of operation performed in our study was lobectomy 84 cases (70%) followed by total/near total thyroidectomy in 32 cases (26.6%). 4 cases in our study were operated elsewhere and were reoperated in our setup due to recurrence of goiter. Out of 32 cases operated for total or near total thyroidectomy, permanent paralysis was found only in one case (3.12%) and similarly out of 84 cases of lobectomy only one patient (1.19%) had complete paralysis. 1 of our case that was a revision surgery developed permanent bilateral recurrent laryngeal nerve paralysis. This can be due intense fibrosis that accompanies the surgical field in revision surgery making the preservation and identification of nerve difficult. In a study done by Serpell JW et al. showed 1.5% rate of RLN palsy when thyroidectomise were done in 3,408 patients¹⁷. Another study by Lo CY et al. showed 1% occurrence of RLN paralysis after thyroidectomise¹⁸. Literature reports that revision surgeries on thyroid bed are increasingly difficult with RLN paralysis rate in such cases ranging from 1%-12%¹⁹. Kim MK et al. reported in his experience that with use of intraoperative nerve monitoring and careful dissection in revision cases none of his patient who had normal preoperative nerve function developed any post-operative paralysis¹⁹.

Paralysis of recurrent laryngeal nerves manifested depending of severity of nerve injury and whether paralysis was unilateral or bilateral. All cases of unilateral nerve paralysis were noted as hoarseness on first post operative day. Fiberoptic direct laryngoscopy (FODL) were then done in these patients which revealed an immobile vocal fold. These patients were then put on systemic steroid therapy (Prednisolone 1mg/kg of body weight in tapering doses) and were followed upto six months with serial FODL every month. 4 patients had transient unilateral vocal cord paralysis that improved with treatment. 2 patients had permanent paralysis that did not improve with treatment. Voice of patients with transient paralysis also improved with voice becoming normal after six months of treatment. Patients with bilateral nerve paralysis were identified post operatively as patients who were unable to maintain oxygen saturation just after extubation. We had two patients with bilateral vocal cord paralysis. Both of these patients needed immediate re-intubation and tracheostomy on

operating table. These patients were also given steroid therapy. Paralysis in one patient improved with mobility of vocal folds becoming normal after six, in other it did not. Both of these cases were re-operation surgeries with initial surgeries done in other setups.

Intraoperative nerve monitoring is being increasingly used in thyroid surgeries. Many studies are validating its effectiveness in preserving RLN. A study by Vasileiadis I et al. in 2556 patients reported that a significant improvement in postoperative results were noted in cases operated with intraoperative nerve monitoring²⁰. Barczyński M et al. reported in his study of reoperations of thyroid that transient and permanent RLN injuries were found respectively in 2.6 % and 1.4 % nerves with intraoperative nerve monitoring versus 6.3 % and 2.4 % nerves without monitoring²¹. This shows that adoption of intraoperative nerve monitoring can lead to better results of recurrent laryngeal nerve preservation.

In relation to risk factors discussed in table: 2, nature of pathology has important impact on chances of injury to RLN during surgery. It was observed that out of 6 cases operated for malignant pathology 2 had injury of RLN compared to only 1 case of nerve injury out of 114 for benign pathology. This shows nerves are at greater risk when operation is being done for malignant disease. Chiang FY et. al., reported operations for thyroid cancer is a significant risk factor for development of RLN paralysis²². In his study invasion of RLN was identified in 19.4% of patients with thyroid cancer. He also reports intentional sacrifice of 26 RLNs in 20 patients of thyroid cancer which were then excluded from analysis. Male gender appears to be less involved with thyroid diseases when compared to females, but proportion of sinister pathologies in males associated with thyroid is high²⁴. In our study we had 12 males with 1 patient developing permanent paralysis. Studies with bigger sample sizes are needed to make any inferences about risk that male gender might pose relating to palsy of RLN during thyroid surgeries. Hye-Seon et al. reported in their paper the young age (age < 40) and male gender were independent risk factors for large volume lymph node metastasis in central compartment of neck in papillary microcarcinoma of thyroid²⁵.

Extent of operation also bears significant impact on status of RLN postoperatively (table: 2). 1 (1.19%) patient developed RLN paralysis out of 84 lobectomies done. This when compared to RLN injury in 1 (3.12%) patient out of 32 total/near total thyroidectomy and 1 (25%) patient out 4 patients for revision surgery show

as extent of surgery increases there is greater risk for injury to RLN. Erbil et al. concluded that a 12.6 times greater risk ($P < 0.05$) of RLN paralysis exists in patients undergoing extended thyroidectomy (lobectomy or total thyroidectomy) compared with conservative surgery (sub-total resection) for thyroid carcinoma and malignancy in a study of 3250 patients²³.

Conclusion

With this study we have tried to evaluate the relation of injury to RLN and its risk factors. It can be concluded that thyroid surgery, if performed by expert surgeons carries low risk of injury to RLN. Lobectomies have a slightly lower risk of nerve injury compared to total thyroidectomies. In revision surgeries RLN are at greater risk. Careful dissection of nerve makes an important pillar in preservation of RLN during surgery.

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