Original Article

Thyroidectomy With Safe Vocal Cord Functions

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ABSTRACT

Objective: To compare the prevalence of vocal cord dysfunctions due to recurrent laryngeal nerve (RLN) injuries in thyroidectomy with and without identification of RLN.

Design: A prospective comparative study.

Place and Duration of Study: The study was conducted in the Department of Surgery, Allied Hospital Faisalabad from October 1st, 2008 to September 30th , 2009.

Patients and Methods: With an informed and explained consent, the study was conducted on two groups of patients who had thyroidectomy for the treatment of primary goitre. Patients were distributed on alternate basis irrespective the type of goitre into groups A and B for "thyroidectomy with identification of RLN" and "thyroidectomy with out identification of RLN" respectively. Patients of both groups were compared for the prevalence of post-operative vocal cord dysfunctions in association with recurrent laryngeal nerve injuries.

Results: Groups A and B had 52 and 53 patients respectively. Post-thyroidectomy vocal cord functions were remained safe in all the patients of group A. However, 3 (5.66%) patients of group B showed altered vocal cord functions in post operative follow up. Prevalence of RLN injuries in Group A and B remained 0% and 3(2.97%) respectively. Out of three RLN injuries in group B, 2(1.98%) were transient and 1(0.99%) was permanent.

Conclusion: Preservation of vocal cords functions and recurrent laryngeal nerves in thyroidectomy is more likely with the exposure and identification of RLN up to larynx.

Keywords: Primary goitre, Thyroidectomy, Recurrent laryngeal nerve injury, Vocal cords functions

INTRODUCTION

Thyroidectomy is one of the most frequent head and neck surgical procedures worldwide.[1] Injury to recurrent laryngeal nerve (RLN) with consequent vocal fold immobility is one of the most serious complications in thyroid surgery. Paralysis of vocal cords is a common sequela of thyroidectomy and it may cause serious phonatory, respiratory and psychological problems that limit working capacities and social relationships of the patients. [2]

Injury to recurrent laryngeal nerve (RLN) may happen due to a variety of insults, such as secondary to direct trauma, sharp dissection, un-intentional sectioning, stretching, ligature entrapment or thermal or electrical injury.[3] Reported recurrent nerve palsy rates vary widely depending on definition, patient selection, surgeons' patient volume, the underlying disease and types of thyroidectomy.[4]

Identification and preservation of RLN has a major concern in thyroid surgery. However, routine dissection and demonstration of the recurrent nerve is controversial.[5] In the past, most of the surgeons avoided dissections in close proximity to the RLN to prevent it from injury. But, recent endocrine surgeons consider this as totally unacceptable. Now, it is being believed that careful exposure, identification, and tracing of RLN throughout its course up to larynx are the most important and essential factors for the preservation of RLN and vocal cord functions.[6,7]

Like other parts of the world, thyroidectomy is a common surgical procedure in Allied Hospital Faisalabad. But, up till now, no study has been conducted to define the role of surgical technique in thyroidectomy for the preservation of RLN and vocal cord functions. To assess the role of surgical technique for the preservation of vocal cord functions and recurrent laryngeal nerves, a comparative study was planned in patients of primary goitre who will go for thyroidectomy with and without identification of recurrent laryngeal nerves. This study will help us to conclude a safe choice of surgical technique in thyroidectomy that may be followed in future for the preservation of recurrent laryngeal nerves and

prevention of serious voice problems due to recurrent laryngeal nerve injuries.

OBJECTIVES

1. To determine and compare the prevalence of vocal cord dysfunctions due to recurrent laryngeal nerve injuries in thyroidectomy, with and without identification of RLN.
2. To declare a safe choice of surgical technique in thyroidectomy for the preservation of RLN and hence the vocal cords functions

PATIENTS AND METHODS

This prospective comparative study was carried out in surgical department, Allied Hospital Faisalabad from October 1st, 2008 to September 30th, 2009 in two groups of patients who underwent thyroidectomy for primary goitre. Group A was marked as "thyroidectomy with identification of RLN". While, group B was labeled as "thyroidectomy without identification of RLN". Patients were distributed into groups A & B on alternate basis, irrespective the type of goitre, grade of goitre, indication for surgery and type of thyroidectomy. Clinical variables included in study were age, sex, type of goitre, clinical grade of goitre [8], functional status of thyroid, type of thyroidectomy, postoperative vocal cord dysfunctions (hoarseness of voice, dyspnea/ cough due to laryngeal aspiration, vocal cords immobility) and recurrent laryngeal nerve injuries. Other complications like hypocalcemia, wound hematoma / seroma and wound infection were also studied. After an informed and explained consent, the relevant performa of every patient was completed and the data was analyzed.

Inclusion Criteria:

- Patients of primary goitre having age 14 years or above.
- Patients with pre-operative euthyroid status, irrespective hyperthyroid or hypothyroid in past for which they were medicated to prepare for thyroidectomy.
- Patients with normal pre-operative vocal cord functions on laryngoscopy.
- Patients with operable malignant goitre.
- Patients who consented for thyroidectomy and participation in study.

Exclusion Criteria:

- Patients with benign recurrent or metastatic malignant goitre.
- Patients who required completion of thyroidectomy.
- Patients with preoperative altered vocal cord functions or having co-existing vocal cord, laryngeal or tracheal pathology.
- Patients who developed anesthetic or cardiovascular complications during thyroidectomy.
- Patients who did not consent or respond for follow up

Operational definitions

Vocal cord palsy (VCP): Absent or decreased mobility of the vocal cord during phonation on laryngoscopy. VCP was labeled transient if the mobility of vocal cord recovered within 6 months after thyroidectomy, otherwise, it was marked permanent.[3]

Recurrent laryngeal nerve injury: Injury to RLN was declared when the patients revealed absent or decreased mobility of vocal cords on laryngoscopy and had symptoms of hoarse of voice and / or laryngeal aspiration. RLN injury was labeled permanent if the immobility of vocal cords persisted up to 6 months after thyroidectomy. [3]

Age and Sex Distribution: Mean age and sex ratio of patients in both groups was calculated. Subgroups of the patients for their age are given in table-1.

Pre operative assessment: All the patients were assessed pre operatively by a joint collaboration of surgery and otolaryngology departments. The diagnosis was established by clinical assessment, free T_3, free T_4, thyroid stimulating hormone (TSH), ultrsound and fine needle aspiration cytology (FNAC). The diagnosis was confirmed by histopathology. Goitre size in all the patients was graded clinically by inspection and palpation.[8] Vocal cords were assessed by laryngoscopy. Additional investigations like thyroid scan, x-rays neck or chest, CT scan etc. were carried out in relevant patients in whom goitre had pressure symtoms, retresternal extension or malignancy.

Operative Technique: Thyroidectomy in all the patients of both groups was done by the same team of surgeons. The basic difference in operative technique of thyroidectomy between two groups was the prior identification of RLN before excision of diseased thyroid in group A, while, the excision of diseased thyroid was done without identification of RLN in group B. In group A, firstly we located inferior thyroid artery with its branches up to thyroid to trace the RLN in tracheo-esophageal groove. Once the RLN was identified, it was exposed to trace its branches up to

larynx. Ligation of inferior thyroid artery or its branches was done on the thyroid under vision to avoid the ischemia of parathyroid glands. Later, keeping a vision on RLN, excision of gland was completed in accordance with the nature of diseased thyroid. While tracing the RLN, a special care was taken to avoid the use of electro-cautery, blind sharp dissection, blind ligature or forceful traction on the gland.

Postoperative follow up: Post operative management in both groups was same in accordance with the nature of disease and type of thyroidectomy. Every patient in both groups was called to revisit on 7th post operative day to assess the vocal cord functions in association with RLN injury. Those patients who showed immobility of vocal cords on laryngoscopy, they were counseled for their further follow up visits at intervals of one month, 3 months, 6 months and 9 months after operation to see the signs of recovery or persistence of vocal cord dysfunctions. The patients who had post-operative hypocalcemia, their follow ups were also continued up to 9 months.

Statistical Analysis: The data was analyzed by calculating the number and percentage of RLN injuries out of nerves at risk and patients who developed vocal cord dysfunctions. The results were compared to find out the prevalence vocal cord dysfunctions in association with RLN injuries in two groups.

RESULTS

In accordance with inclusion and exclusion criteria, total 105 patients were included in study. Out of total 105 patients, group A and B had 52 and 53 patients respectively. Mean age of the patients in group A remained 34 years and their age ranged from 14–75 years. While, mean age in group was found to be 34.5 years with age range from 16-77 years. Sub-groups of patients for their age are shown in table-1.

Table 1:
Age wise distribution of patients

Sr. No.	Subgroups	Group A Patients with exposure and Identification of recurrent laryngeal nerves			Group B Patients without exposure and identification of recurrent laryngeal nerves	
		No.	Percentage		No.	Percentage
1	13-20 Years	9	17.31 %		10	18.87 %
2	21-30 Years	13	25.00 %		11	20.76 %
3	31-40 Years	17	32.69 %		19	35.85 %
4	41-50 Years	8	15.38 %		7	13.21 %
5	51-60 Years	2	3.85 %		3	5.66 %
6	61-70 Years	2	3.85 %		2	3.77 %
7	71 years & above	1	1.92 %		1	1.88 %
8	**Total patients**	**52**	**100 %**		**53**	**100 %**

Post-thyroidectomy vocal cord functions remained safe in all the patients of group A. While 3(5.66%) patients in group B showed unilateral vocal cords dysfunctions in association with RLN injuries. Out of them, 2(3.77%) patients had transient and 1(1.89%) patient had permanent immobility of vocal cords. Prevalence of recurrent laryngeal nerves in group A remained 0% in comparison to 3(2.97%) RLN injuries which happened in group B. Out of those three RLN injuries in group B, 2(1.98%) were transient and 1(0.99%) RLN injury was permanent. Moreover, It was also observed that permanent RLN injury happened in that patient who had total thyroidectomy for papillary carcinoma. While, the other two patients who developed unilateral transient RLN injuries, one had grade III multinodular goitre and the other had grade II diffuse goitre. Both patients were hyperthyroid, required medications to make them euthyroid before surgery and were treated by near total thyroidectomy.

Table 2:
Comparison of clinical variables in two groups of thyroidectomy

Sr. No.	Clinical variables along with their characteristics		Group A Patients with identification of RLN (Total No. 52)		Group B Patients without identification of RLN (Total No. 53)	
			No.	%age	No.	%age
1	Sex	**Females**	45	86.54 %	47	88.68 %
		Males	7	13.46 %	6	11.32 %
2	Type of goitre	**Multinodular goitre**	28	53.86 %	29	54.72 %
		Diffuse goitre	13	25.00 %	12	22.64 %
		Solitary nodule	4	7.69 %	5	9.44 %
		Follicular Adenoma	3	5.77 %	2	3.77 %
		Papillary Carcinom	1	1.92 %	2	3.77 %
		Follicular Carcinoma	1	1.92 %	1	1.89 %
		Thyroid cyst	1	1.92 %	2	3.77 %
		Ch. L. Thyroiditis	1	1.92 %	0	0 %
3	Functional status of thyroid	**Euthyroid**	43	82.69 %	45	84.91 %
		Hyperthyroid (Medicated & euthyroid before surgery)	9	17.31 %	8	15.09 %
		hypothyroid	0	0 %	0	0 %
4	Clinical grade of goitre	**I**	5	9.62 %	6	11.32 %
		II	36	69.23 %	33	62.26 %
		III	11	21.15 %	14	26.42 %
5	Type of operation	**Subtotal thyroidectomy**	30	57.69 %	32	60.38 %
		Near total thyroidectomy	9	17.31 %	11	20.76 %
		Total thyroidectomy	7	13.46 %	5	9.43 %
		Lobectomy	6	11.54 %	5	9.43 %

Though, our study was basically concerned to determine and compare the prevalence of vocal cord dysfunctions and RLN injuries in two groups of thyroidectomy. But, we compared the results of other clinical variables and post operative complications in both groups as well. Comparative analysis of other clinical variables and post operative complications are given in tables 2 and 3 respectively.

Table 3:

Comparison of vocal cords dysfunctions, RLN Injuries and other Post operative complications in two groups of thyroidectomy

Sr. No.	Clinical variables and their characteristics			Group A Patients with identification of RLN (Total No. 52)			Group B Patients without identification of RLN (Total No. 53)	
				No.	%age		No.	%age
1	Recurrent laryngeal nerves	**Total nerves**		**104**	**100 %**		**106**	**100 %**
		Nerves at risk out of total nerves		98	94.23 %		101	95.28 %
		Nerve injuries out of nerves at risk	**Total**	0	0 %		3	2.97 %
			Transient	0	0 %		2	1.98 %
			Permanent	0	0 %		1	0.99 %
		Safe nerves out of nerves at risk		98	100 %		98	97.03 %
2	**Vocal cord functions**	**Normal**	**Bilaterally**	52	100 %		50	94.34 %
		Altered	**Bilaterally**	0	0 %		0	0 %
			Unilaterally	0	0 %		3	5.66 %
			Transient	0	0 %		2	3.77 %
			Permanent	0	0 %		1	1.89 %
3	**Hypocalcemia**		**Transient**	3	5.77 %		2	3.77 %
			Permanent	0	0 %		0	0 % %
4	**Laryngeal edema**			1	1.92 %		0	0 %
	Post-operative seroma			4	7.69 %		3	5.66 %
	Wound infection			0	0 %		2	3.77 %
	Mortality			0	0 %		0	0 %

DISCUSSION

Voice disturbance in association with recurrent laryngeal nerve injury is a well-recognized morbidity of thyroidectomy and has been involved in most claims concerning complications of thyroid surgery.[9,10] Estimation of iatrogenic RLN paralysis in thyroid surgery is variable. Despite no apparent surgical insult, rarely, patients may have a RLN vocal card paralysis without any recognized intra operative event and it has been revealed in literature that upto 50% of patients may have asymptomatic paralysis of their vocal cords.[11,12] The reported incidence of permanent RLN nerve palsy varies widely from 0% to 7.9% after thyroid operations.[13,14] However, the incidence of permanent recurrent nerve paralysis could be as high as 13% and 30% in patient with thyroid cancer and secondary thyroidectomy, respectively.[15] Surgical experts have linked the safety of vocal cord functions with the exposure, identification and preservation of RLN in thyroid surgery, particularly during subtotal lobectomy.[13,16]

Comparative results of our study showed safe vocal cord functions in all the patients of group A, while in group B, 3 (5.66%) patients developed unilateral vocal

cord dysfunctions in association with RLN injuries. The prevalence of RLN injuries in group B was found to be 3 (2.97%) out of nerves at risk, while, this figure remained 0% in group A. Among those three patients who developed RLN injuries in group B, two patients (3.77%) showed full recovery their vocal cord functions within three months after operation. So, their RLN injuries (1.98%) were found to be transient. Both these patients were hyperthyroid and they were treated by near total thyroidectomy. There was only one patient (1.89%) in group B who could not recover the mobility of vocal cord up to 6 months after thyroidectomy and was labeled to have permanent RLN injury (0.99%). This patient was suffering from papillary carcinoma and was managed by total thyroidectomy.

A comparative observational study was conducted at Liaquat University of Medical and Health Sciences, Jamshoro in two groups of patients to see the incidence of nerve injury in thyroidectomy with and without exposing the RLN. The results showed a significant decrease in the incidence of nerve injury from 5% to 1.6% with identification of RLN.[17] Similar observations were found in two other local studies which were conducted for the morbidity of thyroidectomy and incidence of RLN injuries. It was also observed that the RLN injuries had an association with huge multinodular goitres and total thyroidectomy.[18,19]

In international literature, a comparative study conducted in Turkey revealed intact recurrent laryngeal nerves with safe post-operative vocal cord functions in all the patients of that group in which RLN was exposed and identified during thyroidectomy. On the other hand, 7.9% patients faced RLN injury in the second group of patients in which thyroidectomy was completed without exposing and identifying the RLN.[13]

Several other studies in literature have also demonstrated that the risk of permanent RLN palsy is less with the identification of the nerve. While, non-identification may lead to damage to the nerve without one's knowledge and it will be recognized only during extubation or later on when the patient is symptomatic. Once the surgeon identifies the nerve, he is sure that he has not damaged the nerve and even if accidental damage occurs, the injury can be recognized on table and repaired, or marker can be put for future repair.[5,20,21,22,23]

In our study, the comparison of other post- operative complications like hypocalcemia, wound hematoma / seroma and infection in both groups did not show any association with post operative vocal cord dysfunctions or recurrent laryngeal nerve injuries. Therefore, we did not consider necessary to comment these post operative complications.

Keeping in view the results of our study and that of literature, the prevalence of vocal cords dysfunctions in association with RLN injuries is more in patients who undergo thyroidectomy without exposure and identification of RLN. Moreover, the risk of RLN injuries increases in patients who have thyroidectomy for massive, hyperthyroid and malignant goitres.

CONCLUSION

Thyroidectomy with safe vocal cords functions and RLNs is more likely with exposure and identification of recurrent laryngeal nerves. However, subtotal excision can be considered in cases with failure to identify the recurrent laryngeal nerves.

RECOMMENDATIONS

Further studies should be conducted to see the prevalence of vocal with safe vocal cord dysfunctions in association with RLN injuries in thyroidectomy with identification of RLN on the individual types of goiters.

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