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Thyroidectomy Under Microscopic Guidance Our Experience

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ABSTRACT

To study the variations in anatomy in thyroid surgery and reducing the morbidity caused by recurrent laryngeal nerve (RLN), external branch of Superior laryngeal nerve (EBSLN) paralysis and postoperative hypocalcemia in post thyroidectomy patients using microscopic aid. A total of 15 patients with different thyroid lesions were operated upon for a period of one year from February 2023 to February 2024 in department of ENT, Head and Neck surgery, Government Medical college, Haldwani, Uttrakhand, India with microscopic guidance. The anatomical variations in recurrent laryngeal nerve branching pattern, relation of Inferior thyroid artery (ITA) with Recurrent laryngeal nerve and likely locations of superior and inferior Parathyroids were identified with identification of external branch of Superior laryngeal nerve at the superior pole in cases of benign and malignant thyroid lesions. Neck dissection was performed wherever indicated. In our study the postoperative RLN palsy was reported in one case of Papillary carcinoma and EBSLN palsy was not reported in any case, two patients (0.3%) developed transient hypocalcemia with one case (0.15%) developing permanent hypocalcemia. RLN was found to be branched in all cases as it ascends superiorly towards cricothyroid joint. Up-to 5 branches of RLN were identified with differing relation of it with ITA. Thyroidectomies under the guidance of microscope is highly recommended as it improves the dexterity in dissection, reduces morbidity caused by damage of critical structures and also improves field of vision. It is good teaching tool as well.

INTRODUCTION

Thyroid surgery was started by Kocher in 1878 and since that day the technique to perform thyroidectomies has continuously evolved. There is now increased awareness about techniques to reduce morbidities of thyroid surgery, decreasing it to around 0.065% as compared to the data of early 1900[1]. The use of microscope in neck surgeries is not a new technique but its role in thyroidectomies is quite beneficial. Recurrent laryngeal nerve (RLN) palsy and post-operatively pocalcemia are the most dreaded complications of thyroidectomies[2]. Intra operative preservation of RLN and Parathyroids however remains the gold standard to ensure absence of postoperative hypoparathyroidism and RLN palsy. Assessment of vascularity in the parathyroid by color assessment is subjective, hence the use of adjuncts to identify the gland[3,4]. RLN injury is a relatively frequent complication with its incidence reported to range from 0-4% for permanent and from 0-15% for transient injury[5,6].

The importance of preserving external branch of superior laryngeal nerve (EBSLN) is also described in the literature and its preservation is utmost necessary in professional voice users. Most of the surgeons do not identify this nerve while ligating the vessels at the superior pole[7]. This nerve is in close proximity to the branches of Superior thyroid artery. With the guidance of microscope the identification of this slender nerve becomes easy. The aim of our study is to use microscopic guidance to reduce the morbidity produced by thyroid surgeries and also identifying anatomical variations and relations of the critical structures to one another in thyroid surgery such as relationship of RLN with inferior thyroid artery (ITA).

MATERIALS AND METHODS

It is a Prospective hospital based case study done in the department of ENT, Head and Neck surgery, Government Medical College, Haldwani, Uttarakhand India over a period of one year from Feb 2023-Feb 2024. Patients between age 20-60 years with complaint of thyroid swelling including colloid goitre, medullary thyroid carcinoma, papillary thyroid carcinoma, follicular adenoma were screened by detailed history, clinical examination, USG, FNAC, thyroid function test and all other routine blood examinations.

Inclusion Criteria:

- Patients between age group of 20-60 yrs
- Patients having solitary and multi nodular goitre
- Patients having follicular adenoma, medullary carcinoma, papillary carcinoma

Exclusion criteria:

- Patients having anaplastic thyroid carcinoma
- Patients undergone previous thyroid surgery
- Patients refusing to give consent

Preoperative evaluation included detailed ENT history and clinical examination, USG, FNAC, Thyroid function tests and all other routine blood work-up.

Operative Procedure: A skin crease incision was given two fingers above the supra sternal notch approximately, extending from anterior border of one sternocleidomastoid muscle to anterior border of muscle on another side and was modified according to need in cases of cancer patients. Subplatysmal flap was raised superiorly up-to hyoid bone and inferiorly upto supra sternal notch. Deep cervical fascia was identified and dissected followed by identification and retraction of strap muscles. For further surgical steps microscopic view was used. Paratracheal and parathyroid vascular plane and great vessels were identified. Inferior thyroid artery along with branches and superior and inferior parathyroids were identified. Recurrent laryngeal nerve was identified in LORE'S triangle, further relation between recurrent laryngeal nerve and inferior thyroid artery was noted giving focus on branching pattern of recurrent laryngeal nerve superiorly. At superior pole external branch of superior laryngeal nerve was preserved during dissection and ligation. Thyroid lobe was dissected from Berry's ligament and pretracheal fascia for specimen delivery. In cases of hemithyroidectomy thyroid lobe with isthmus and in total thyroidectomy complete thyroid as a whole were delivered and sent for HPE. Neck dissection was performed according to need.

RESULTS AND DISCUSSIONS

Age and Gender: A total of 15 patients were taken in the study out of which 7 (53%) were in the age group of 40-60 years and 8 (47%) of age group 20-40 years. A

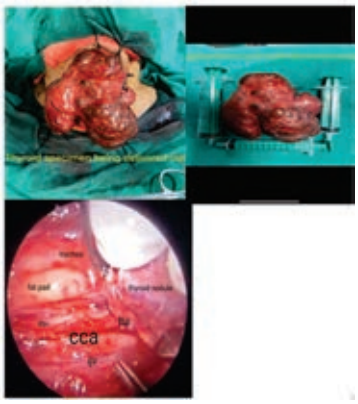

Fig. 1: Boundaries of Lore's triangle

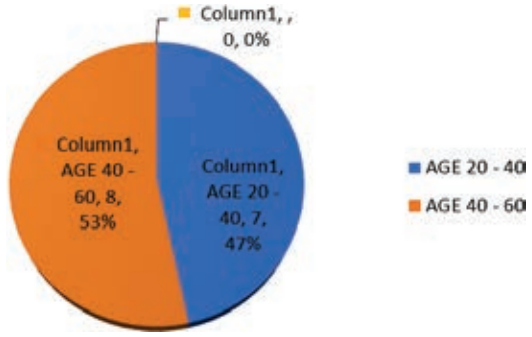

Fig. 2: Age 20-60

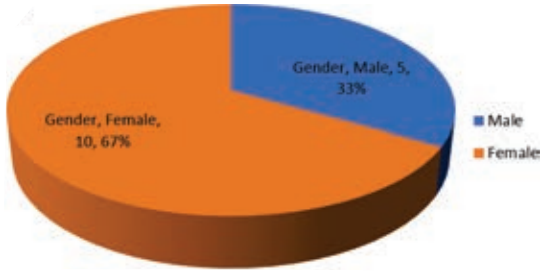

Fig. 3: Gender

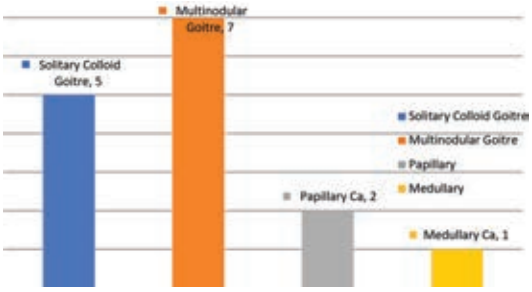

Fig. 4: Pathology

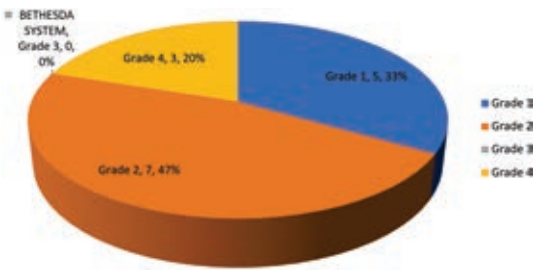

Fig. 5: Bethesda system

total of 10 male patients(67%) and 5 female patients (33%) were present.

Pathology: Out of 15 patients, 5 patients were of solitary nodular goitre, 7 of Multi nodular goitre

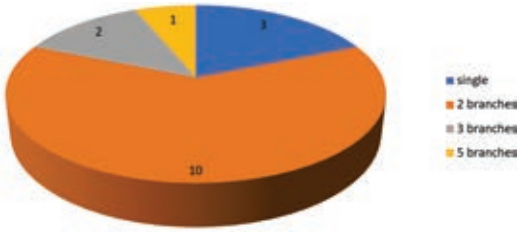

Fig. 6: Branches of RLN

Fig. 7: Showing RLN bifurcation (2 branches)

Fig. 8: Microscopic picture showing trifurcation (3 branches of RLN)

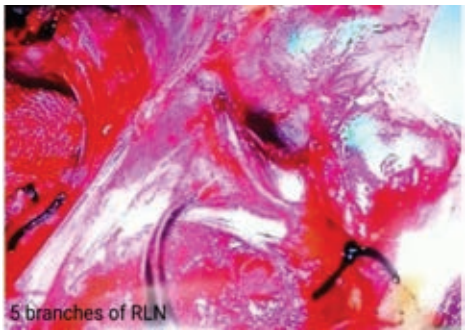

Fig. 9: Microscopic picture showing 5 branches of RLN

whereas 2 patients had Papillary Carcinoma thyroid and one had Medullary Carcinoma.

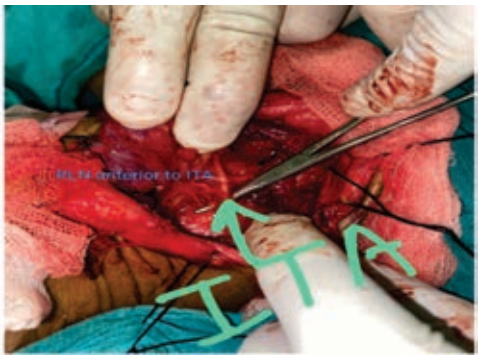

Fig. 10: Showing RLN anterior to ITA

Fig. 11: Showing ITA anterior to RLN

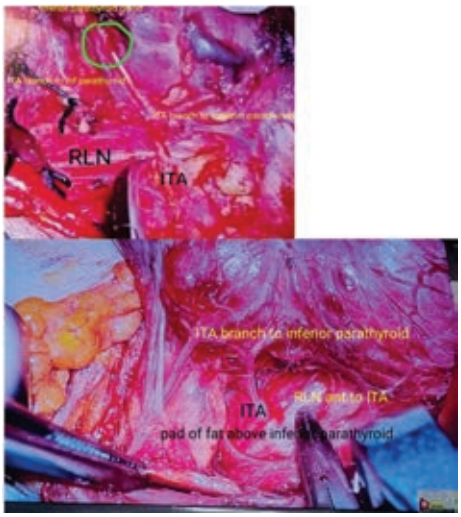

Fig. 12,13: Showing branches of ITA towards Parathyroid and Postoperative complications

FNAC (Bethesda Grading) Findings: According to Bethesda system of grading of FNAC for thyroid swellings, following were the results in our study

Type of Surgery: Both hemi as well as total thyroidectomy was done according to the pathology as showed in the table.

Complications: The postoperative complications including RLN palsy, EBSLN palsy, temporary hypocalcemia and permanent hypocalcemia is as follows.

Branches of RLN: In our study we found a pattern of terminal RLN branching near its entry at the cricothyroid joint. We found single branch/no branch in 3 cases, 2 branches (bifurcation) in 10 cases, 3 branches (trifurcation) in 2 cases whereas in one case there were 5 branches.

Relation of ITA with RLN: In our study 66.67% cases showed nerve (RLN) anterior to the artery and in 33.3% artery (ITA) anterior to the nerve.

There has been a continuous evolution in thyroid surgery, from the earlier days when Kocher began performing thyroidectomies from 1878 to early years of 1900, to when Frank Howard Lahey FH8 stressed upon the importance of identification of recurrent nerves for the purpose of their protection, to Lahey FH and Hoover WB9 promoting the use of magnification loupes, with magnification of two and half times, to the use of microscopes instead of loupes, to the era of endoscopic robotic thyroidectomy which began in early years of 2000. Microscope is a familiar equipment for the otolaryngologist and the optical magnification it offers is helpful in clearly identifying not just recurrent laryngeal nerve but also preserving superior laryngeal nerve and the parathyroid glands along with its blood supply, thus minimizing the morbidity associated with thyroid surgery. With the conventional techniques literature reports recurrent nerve palsy and hypocalcemia to be around 5-11% and 20-30% respectively[10].

In the present study we operated upon 80% benign thyroid swellings and about 20% malignancy with neck dissection wherever applicable. In a study done by Jain *et al*[7]. in 2020 similar percentage of cases of benign and malignant pathologies were taken with a large sample size. In a study by D'Orazi[11] where they had put in 10 years of experience of microsurgical technique of thyroid surgery on 782 patients, operated 70% patients with benign pathology and 30% with malignant pathology.

Anatomical Variations: In our study we found that there were at least 2 terminal branches of RLN were there, which is known before in literature, with some cases having 3 branches. In one case we found 5 branches of RLN, which was a peculiar finding in our study. In the literature multiple branches of RLN are reported as in a study done by Henry MB *et al*[12]. Found no branching in 23.4% in their study cases (n = 28387 nerves), bifurcation in 61%, trifurcation in 9% and multiple branches in 6.5% cases. In our study few

Table 1: showing type of surgery

Pathology	Hemithyroidectomy		Total Thyroidectomy
	Right	Left	
Solitary nodular goitre	2	3	nil
Multi nodular goitre	3		4
Papillary ca	nil		2
Medullary ca	nil		1

Table 2: showing post-surgical complications

Pathology	Hemithyroidectomy	Total Thyroidectomy	RLN palsy	EBSLN palsy	Temporary hypocalcemia	Permanent hypocalcemia
SNG	5	NIL	NIL	NIL	NIL	NIL
MNG	3	4	NIL	NIL	2 (0.3%)	NIL
Papillary CA	NIL	2	1(0.15%)	NIL	NIL	1(0.15%)
Medullary CA	NIL	1	NIL	NIL	NIL	NIL

Table 3: showing relation of RLN with ITA

Nerve anterior to artery	10 (66.67%)
Artery anterior to nerve	5 (33.3%)

cases (66.67%) in our study the relation of RLN was found above the ITA(nerve anterior to artery) and in 33.3% cases it was below the artery(artery anterior to nerve) as shown in the fig. In a study done by Agyun *et al*[13]. Which enrolled 1170 neck sides and concluded that the extralaryngeal branching rate of RLN was 35.5%. 45.9% of RLNs were anterior and 44.5% were posterior to the ITA, and 9.6% were crossing between the branches of the ITA. The branching pattern and relationship of nerve to artery is shown in figure

Location of Parathyroids: In our study we traced the parathyroid glands on the basis of their blood supply which is mainly from the branches of ITA. The superior parathyroid sre more constant in location according to their descend embryo logically i.e. near cricothyroid joint. The branch from inferior thyroid artery is traced superiorly anteromedial to the RLN and the position of superior parathyroid is located as a mahogany colored highly vascular gland. Similarly the location of inferior parathyroids were also traced as their location is much variable. Our findings and method of tracing Parathyroid glands is consistent with the study done by Jain S *et al*[7]. Kumar A *et al*[14].

Out of total 15 cases in the present study, RLN palsy was observed in one case (0.15%), temporary hypocalcemia in two cases, permanent hypocalcemia in one case whereas there was no EBSLN palsy reported in any case. In the previous studies, figures reported in contemporary series from high-volume institutions suggest rates of 0.7-1.9% for permanent RLN injury and 2.6-4% for persistent hypocalcaemia[15,16]. Williams *et al*[17]. reported the temporary palsy in around 2.0% and no permanent palsy in any of their patients. Permanent hypocalcemia was seen in 1.7% patients wherein none of the patients who underwent total thyroidectomy developed permanent hypocalcemia whereas 2 patients of completion thyroidectomy developed it. In the study done by Jain *et al*[7]. the temporary RLN injury is around 1.87% and permanent RLN injury is 0.3% while in the patients undergoing total or completion thyroidectomies, temporary hypocalcemia was seen in 8.77% and permanent hypocalcemia in 0.6% of patients. The EBSLN could easily be identified using microscope by dissecting the Joll's triangle at superior pole of thyroid gland during the surgeries done in our study. Cerneaet al[18]. also reported that the size of the gland correlated with the proximity of the nerve and the gland. Therefore surgeon must be cautious in large goiters. In study by Patnaik *et al*[19]. using standard dissection techniques, they could identify nerve in 83% of their patients.

CONCLUSION

Thyroidectomy surgery under the guidance of microscope is highly recommended as it improves the dexterity in dissection, reduces morbidity caused by damage of critical structures and also improves field of vision. It is good teaching tool as well. We recommend the use of microscope in every neck surgery even at the start of surgery or at least once the skin flaps are raised so as to improve the visualisation and reducing morbidity.

REFERENCES

1. Gómez-Ramírez, J., A. Sitges-Serra, P. Moreno-Llorente, A.R. Zambudio, J. Ortega-Serrano, M.T.G. Rodríguez and J.V. del Moral, 2015. Mortality after thyroid surgery, insignificant or still an issue? Langenbecks Arch. Surg., 400: 517-522.
2. Lekacos, N.L., P.J. Tzardis, P.G. Sfikakis, S.D. Patoulis and S.D. Restos, 1992. Course of the recurrent laryngeal nerve relative to the inferior thyroid artery and the suspensory ligament of Berry. Int. Surg., 77: 287-288.
3. Su, A., Y. Gong, T. Wei, R. Gong, Z. Li and J. Zhu, 2018. A new classification of parathyroid glands to evaluate in situ preservation or auto transplantation during thyroid surgery. Medicine, Vol. 97. 10.1097/md.0000000000013231

4. Barczynski, M., F. Golkowski and I. Nawrot, 2017. Parathyroid transplantation in thyroid surgery. Gland Surg., 6: 530-536.
5. Bliss, R.D., P.G. Gauger and L.W. Delbridge, 2000. Surgeon's approach to the thyroid gland: Surgical anatomy and the importance of technique. World J. Surg., 24: 891-897.
6. Casella, C., G. Pata, R. Nascimbeni, F. Mittempergher and B. Salerni, 2008. Does extralaryngeal branching have an impact on the rate of postoperative transient or permanent recurrent laryngeal nerve palsy? World J. Surg., 33: 261-265.
7. Jain, S., N. Gupta, R. Gupta, A. Jain and T.S. Naidu, 2020. Microscopic thyroidectomy: The way we do it. Indian J. Otolaryngol. Neck Surg., 72: 437-442.
8. Lahey, R.F., 1938. Routine dissection and demonstration of recurrent laryngeal nerve in subtotal thyroidectomy. Surg. Gynecol. Obstet., 66: 775-777.
9. Lahey, F.H. and W.B. Hoover, 1938. Injuries to the recurrent laryngeal nerve in thyroid operations. Ann. Surg., 108: 545-562.
10. Christou, N. and M. Mathonnet, 2013. Complications after total thyroidectomy. J. Visc. Surg., 150: 249-256.
11. D'Orazi, V., 2016. Use of loupes magnification and microsurgical technique in thyroid surgery: Ten years experience in a single center. G. Ch., 37: 101-107.
12. Henry, B.M., J. Vikse, M.J. Graves, S. Sanna and B. Sanna *et al.,* 2016. Extralaryngeal branching of the recurrent laryngeal nerve: A meta-analysis of 28, 387 nerves.
13. Agyun, N., M.T. Unlu, O. Caliskan, M. Kostek, A. Isgor and M. Uludag, 2024. The relation of recurrent laryngeal nerve to inferior thyroid artery and extralaryngeal nerve branching may increase the risk of vocal cord paralysis in thyroidectomy. Turk. J. Surg., Vol. 2024. 10.21203/rs.3.rs-3842178/v1
14. Kumar, A., A.K. Tyagi, S. Varshney, M. Malhotra and M. Priya, 2018. Microscopic thyroidectomy: A prudent option.
15. Connolly, T.M. and D.A.K. Watters, 2010. Monitoring performance in thyroidectomy: Cumulative sum analysis of outcomes. Thyroid, 20: 407-412.
16. Vaiman, M., A. Nagibin and J. Olevson, 2010. Complications in primary and completed thyroidectomy. Surg. Today, 40: 114-118.
17. Williams, S.P., M.D. Wilkie and J. Tahery, 2014. Microscope-assisted thyroidectomy: Our experience in one hundred and twenty-one consecutive cases. Clin. Otolaryngol., 39: 307-311.
18. Cernea, C.R., A.R. Ferraz, S. Nishio, A. Dutra, F.C. Hojaij and L.R.M.D. Santos, 1992. Surgical anatomy of the external branch of the superior laryngeal nerve. Head and Neck, 14: 380-383.
19. Patnaik, U. and A. Nilakantan, 2013. Identification of external branch of the superior laryngeal nerve in thyroid surgery: Is it always possible? J. Thyroid Disord. Ther., Vol. 2. 10.4172/2167-7948.1000127