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Original Research Paper

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MICROSCOPIC VERSUS CONVENTIONAL THYROIDECTOMY-A COMPARATIVE STUDY IN A TERTIARY CARE CENTRE, RIMS , RANCHI.

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ABSTRACT This is a prospective study done to compare microscopic & conventional thyroidectomy. Before surgery, patients were assigned either to the microscopic thyroidectomy group (MT group) or the conventional thyroidectomy group (CT group). Outcome measures were operative time , injury to the recurrent laryngeal nerve (RLN) , external branch of the superior laryngeal nerve (EBSLN) , hypocalcemia and wound haematoma. A total of 15 patients (7 patients in the MT group, 8 patients in the CT group) were operated. Mean age was 40.3±7.6 years in CT group and 41.6±8.3 years in MT group. The operative time was 75.2±27.4 minutes in the CT group and 100.6±18.4 minutes in MT group. One patient had RLN palsy, another had hypocalcemia in CT group. One patient also developed post op wound haematoma. There was no complication observed in MT group. In conclusion, microsurgical thyroidectomy greatly reduces the complications of thyroid surgery without much increase in the operating time.

KEYWORDS : Thyroidectomy, microscopic thyroidectomy, Laryngeal nerve injury, Hypocalcemia

INRTODUCTION- Thyroidectomy is a commonly performed surgical procedure performed by ENT surgeons. Although with advancement and use of magnification thyroid surgery has become a relatively safe surgical procedure but the risk of complications related to closely investing structures such as the laryngeal nerves and the parathyroid glands continues to remain a challenge to surgeons.

There is no doubt that one of the most important factors in minimizing these complications is also the surgeon's experience, visualization and surgical technique in the critical areas. These critical areas include the recurrent laryngeal nerve (RLN), parathyroid glands and the external branch of the superior laryngeal nerve (EBSLN). In 1938, Lahey was the first to suggest the identification and the meticulous dissection of the RLN in thyroid surgery [1]. He demonstrated that the incidence of RLN injury could be decreased by this surgical technique. In 1975, Attie and Khafi described a fine dissection technique using magnification in thyroid surgery [2]. The authors reported that the incidence of postoperative hypoparathyroidism was decreased with this technique. The basic advantage of using microscope is that magnification can be changed from site to site, depending upon the surgeon requirement.

To evaluate the possible advantages and disadvantages and the challenges faced in using the surgical microscope, we compared microscopic thyroidectomy with the conventional thyroidectomy in a prospective case-controlled study.

Materials and methods

All patients undergoing thyroidectomy between August 2018 and August 2019 at our institution, Department of ENT, RIMS, Ranchi were considered eligible. Exclusion criteria was preoperative laryngeal nerve palsy.

Eligible patients were assigned either to the microscopic thyroidectomy group (MT group) or conventional thyroidectomy group (CT group). The patients were randomly divided in both the groups. All patients had a routine preoperative work-up for their disease . All operations were performed under general anesthesia. Our general strategy in thyroid surgery is to perform either unilateral lobectomy plus isthmectomy or total thyroidectomy. All procedures were performed or supervised by the same surgeon, who was familiar with both thyroidectomy techniques.

Mean outcome measures included complications regarding injury to the RLN, the EBSLN and hypocalcemia. Additional outcome measures were operating time and intraoperative blood loss. Other complications, such as wound haematoma and were also studied. For microscopic cases Zeiss sensera microscope was used. Preoperative and postoperative laryngeal examinations were performed by an experienced otolaryngologist who was masked to the surgical technique. Hypocalcemia was defined as a patient with symptoms or an ionized calcium value of less than 1.0 mmol/l. The patients with hypocalcemia were treated with calcium supplementation.

Surgical technique

The technique we applied was an entirely conventional extracapsular dissection. Briefly, a 4- to 6-cm horizontal incision was made two finger breadth above the sternal notch. The upper and lower subplatysmal flaps were raised. The cervical linea alba was divided longitudinally. After the dissection of the lobe from the strap muscles had been carried out completely, the middle thyroid vein was divided and ligated if present.

After these steps, the surgical procedure for the identification and the preservation of the parathyroid glands with its blood supply, the RLN and the EBSLN was continued either under direct vision or with the use of a surgical microscope (3 to 5 magnification under Zeiss sensera, with a 250-mm ocular lens). Attention was directed toward visualization of the superior and inferior parathyroid glands. Once they were identified, efforts were made to preserve the blood supply to these glands. During this process, the superior and inferior parathyroid glands were reflected posterolaterally along with their vascular pedicule. The RLN on right has slight oblique course from lateral to medial side.It is always traced near root of neck where it exits from thorax. It is also advisable to trace the RLN trunk in lower neck as it gives branches as it ascends upwards. The branching always occur after the nerve is crossed by inferior thyroid artery.

Dissection is further carried to identify superior and inferior parathyroid gland. Parathyroids are not very consistent in

their location. Generally inferior parathyroid are located below inferior thyroid artery (ITA) and superior parathyroid above ITA. Also superior parathyroid are located deeper to plane of RLN and inferior parathyroid are located superficial to plane of RLN. The most easy way to identify the parathyroids is to follow the blood vessels to the parathyroids.Inferior and superior parathyroids are supplied by branches from ITA. Superior parathyroid gets additional supply from STA. Parathyroids are reddish brown in color in younger patients and in older patients it appears yellowish .

Dissection is then continued on the superior pole, and the avascular cricothyroid space was carefully examined for the EBSLN . Routinely, the superior pole vessels and the loose areolar tissue surrounding them were not dissected until the SLN was explored, whenever possible. Then, superior thyroid vessels were individually ligated and transected near the thyroid capsule.

The thyroid lobe was elevated from the pretracheal fascia, and dissection was completed by mobilizing the isthmus and pyramidal lobe. For unilateral disease, if the specimen was benign or the pathologist's report was inconclusive, the operation was terminated. If the specimen was malignant, total thyroidectomy was performed, using the same technique for the contralateral lobe.

The data of the groups were analyzed and compared. The statistical analysis was performed by using Student's t test for continuous variables and the chi-squared with Fisher's exact test as appropriate for categorical variables, and was considered significant at $P<0.05$.

Results

A total of 15 patients underwent either unilateral lobectomy or total thyroidectomy (7 in the MT group, 8 in the CT group). Mean age of CT group was 40.3±7.6 years and of MT group was 41.6±8.3 years (P value >0.05). Table 1 summarizes Age and diseasewise distribution of both group. There were two male patients one in each group, rest all were females. The mean size of tumor was 6.4±1.6 cm with smallest being 3.8 cm and largest being 12 cm. All benign thyroid disease came out to be colloid nodule in histopathology. In malignant disease three out of four patients came out to be papillary carcinoma and one patient reported follicular carcinoma on histopathology. Although there were more total thyroidectomies in the CT group but the number of patients were also more and the difference was not statistically significant (P value >0.05). One patient in the CT group and one patients in the MT group had lobectomy done, and then the completion thyroidectomy was done as the case was carcinoma, which was not recognized until the final histopathological reports were available.

Table 1 Age And Diseasewise Distribution Of Both Group

	CT group	MT group
Total no patients	8	7
Mean Age (years)	40.3±7.6	41.6±8.3
Total thyroidectomy	3	2
Unilateral lobectomy	5	5
Benign pathology (colloid nodule)	6	5
Malignant tumor	2	2
Papillary	2	1
Follicular	0	1

The mean ± SD operating time was 75.2±27.4 minutes (range 50–120) in the CT group and 100.6±18.4 minutes (range 80–155) in the MT group (P>0.05). Table 2 summarizes the incidence of complications. There was one permanent recurrent nerve palsy and hypocalcemia in CT group. The difference was not statistically significant (P>0.05).One patient developed post op wound haematoma in CT group which was later re-explored. There was a large haematoma which was drained. A persistent spurter from thyroidima artery was identified which was due to slippage of knot. However during the process of achieving haemastasis RLN was injured and the patient developed hoarsness. There was no SLN palsy in either group. Blood loss was almost similar in both group. The recovery period for hypocalcemia lasted for three months. In patient with hypocalcemia, final pathological diagnosis was malignant tumor (follicular carcinoma).

Table 2 Post op Complications observed in both groups

Complications	CT group	MT group
RLN injury	1	Nil
EBSLN injury	Nil	Nil
Hypopcalcemia	1	Nil
Wound hematoma	1	Nil

DISCUSSION-

Thyroidectomy is a very common surgery performed by ENT specialist and microscopic thyroidectomy is not new in this era. The technique in Microscopic thyroidectomy is technically very similar to traditional thyroidectomy and differs only that it requires a microdissection technique using the surgical microscope, which is used routinely for other operations in otolaryngology and head and neck surgery.

The first documented use of magnification for thyroid surgery was described by Lahey in 1938. He recommended use of Bereny binocular loupes and he was able to magnify the nerve by two and half times [1]. Dorzai et al. retrospectively analysed their 10 years' experience using magnification. Out of 738 patients included in their study and they showed remarkable result using magnification with just one patient developing transient nerve palsy after thyroid surgery [3].

The complications of thyroid surgery are generally directly related to the extent of the thyroidectomy, the experience of the surgeon and the use of careful dissection in the critical areas [4,5]. The microscope provides better illumination and magnification, allowing for greater precision in the dissection and the hemostasis.

One of the most important complications of thyroid surgery is RLN palsy resulting from intraoperative damage. We also observed RLN palsy one patient of CT group. In literature RLN palsy frequency ranges from 0 to 5.8% [5-9]. The RLNs are located in each tracheoesophageal groove and it turns toward the cricothyroid joint to innervate the laryngeal muscles (Fig no.1&2). RLN injury happens generally during surgery because of direct mechanical damage with or without disruption. Therefore, techniques that prevent this complication during surgery are of great importance. One method to prevent palsy is RLN is to identify it and preserve it during surgery. However, exposure of the nerve itself increases the rate of complication resulting from mechanical injury or inadequate nutrition [5]. Besides, since there is a rich network of veins in the tracheoesophageal groove, which is the most critical area for RLN injury, dissection may lead to an oozing of blood complicating that not only complicates the nerve identification but also increases the risk of nerve injury in this area with the dangerous hemostasis maneuvers. The microscope allows for greater precision in the dissection and hemostasis in this area thus preventing nerve injury very effectively.

The EBSLN is also at risk for injury during mobilization of the superior pole of the thyroid gland. However, injury to the SLN after thyroid surgery are common, but frequently overlooked. However in our case we did not observe any EBSLN palsy in any group .EBSLN palsy frequency ranges from 0 to 58% [10-

14]. The variation in results is explained by the difference between diagnostic methods used. There are various opinions concerning means of avoiding injury to the EBSLN. Many authors advocate identification of the EBSLN as a routine procedure in thyroid surgery, whereas others suggest careful skeletinizing of the superior pole vessels with protective attention to the nerve, without thinking to identify it [4,11-13].We prefer identifying of EBSNL as a routine procedure in all cases.

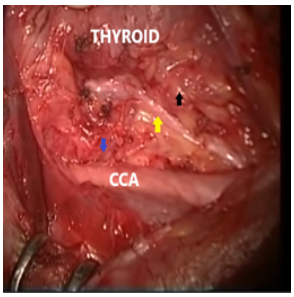

Fig no 1 showing microscopic view of right RLN (yello warrow), parathyroid(black arrow),Inferior thyroid artery(blue arrow). CCA(common carotid artery)

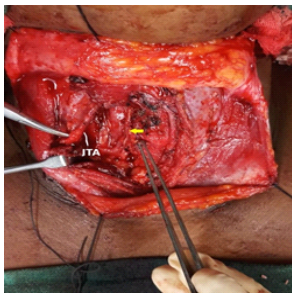

Fig no 2 showing Right laryngeal nerve in tracheoesophageal groove (yellow arrow). ITA (inferior thyroid artery)

In our study we found lower incidence of nerve palsy (RLN and EBSLN) with the MT technique. The difference, however cannot be said to be significant because of the small number of patients in both group. However as supported by other studies the use of the microscope greatly reduces the incidence of nerve palsies.

Postoperative hypocalcemia is a frequent complication following total thyroidectomy, its occurrence ranging from 0.3 to 65% [2,15-17].We also observed post op hypocalcemia in one patient in CT group. Several factors have been involved in the development of postoperative hypocalcemia after thyroidectomy [6,15-18]. The real cause is yet unclear, but postoperative hypoparathyroidism developing because of blood supply injury seems to be one of the most important factor. As the parathyroid glands and their blood supply are tenuous they get easily injured by excessive manipulation. Hence meticulous and gentle dissection along the thyroid capsule, separating the parathyroid gland from the thyroid tissue, is key to prevent postoperative hypocalcemia. However this may not be possible because of intracapsular localization in some cases. Then the parathyroid should be autotransplanted, preferably in the sternocleidomastoid muscle [15,17]. In our case we had one case of persistent hypocalcemia in CT group who underwent total thyroidectomy .It recovered in 3 months of time. In general hypocalcemia occurred at a significantly lower rate in the microscopic assisted surgeries mainly due to the microdissection technique, which helps to find and to better dissect the parathyroid glands without blood supply injury.

It was also reported that the operating time with the use of the microscope in thyroid surgery was longer [19]. In our case also using the microscope did increase the duration of thyroidectomy but this was not significant($P > 0.05$). We prefer to use microscope after identifying paracarotid tunnel and not from the beginning thus greatly reducing the time of the procedure. Although the dissection time appeared longer with the MT technique, very little time was spent trying to achieve hemostasis at the end of surgery, and the was no nerve injury thus preventing life long morbidity to patients.

For mastering Microscopic thyroidectomy there is a learning curve but surgeons with background of doing microscopic surgeries can learn this technique quite fast. In our department we use microscope routinely for parotid and ear surgeries, it is not difficult for transition from conventional method to microscopic method. But surgeons who are not in routine practice may take sometime. The use of micro instruments, a bloodless technique and patience are prerequisites for microdissection. A major advantage of this technique is the possibility of attaching a camera to the microscope, thereby greatly facilitating the surgeon's ability to teach how to perform a meticulous dissection in the critical areas. Furthermore, it has the possibility of recording the operations with clear visualization makes it easy for young surgeons to see steps of thyroid surgery. Further the high-quality data can be recorded and can safeguard surgeons against the medico legal litigations. The use of microscope provides excellent magnification to the details that vasa nervosa of the nerve can also be identified and preserved. In addition to the great learning tool, the microscope aid can provide excellent patient outcomes.

The limitation of our study is small sample size, our sample size is inadequate to compare this technique to the established technique. The sample size is too low to comment on patient's complication rates and patient out- comes. Our study mainly demonstrates the applicability of microscopic techniques in preserving the critical structures in thyroid surgery due to its better illumination and magnification and it is not difficult to adopt this technique for ENT surgeons.

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CONCLUSION

Microscope is routinely used by ENT surgeons for different surgeries. Use of microscope for thyroidectomy significantly reduces the postoperative complications as compared to conventional thyroidectomy. Our study ,though small, suggest that microscopic thyroidectomy is a very good option not only for good surgical outcome but also for demonstration of different anatomical stuctures to the learners so that they can have clear concept right from the beginning.

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Compliance with Ethical Standards

Conflict of interest -Authors declares that they have no conflict of interest.

Proper ethical clearance was taken from concerned authority.

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