

Original Research Article

Role of magnification and microscope in thyroid surgery safety and efficacy

Ravi K. S.*, Kiran M. Naik, Swarna Priya M., Abhishek M. P.

Department of ENT, Adichunchanagiri Institute of Medical Sciences and Research Institute, B. G. Nagar, Nagamangala, Mandya, Karnataka, India

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*Correspondence:

Dr. Ravi K. S.,

E-mail: draviksgowda@gmail.com

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ABSTRACT

Background: Thyroid surgery becomes challenging, due to closely related structures like recurrent laryngeal nerve and parathyroid gland. Microscope assisted surgery has better visualization for dissection, and decreases the risk of injury to the nerve, parathyroid gland, and its vascular pedicle. Hence it decreases the operative complications.

Methods: This is a retrospective study of microscope-assisted thyroidectomy at Adichunchanagiri hospital and research centre, from May 2016 to April 2020. Ethical approval was obtained from institutional review committee. Types of surgery, post-operative hypocalcemia and recurrent laryngeal nerve function were analysed descriptively.

Results: Out of total 30 microscope assisted thyroidectomy, 26 were female, 42 (87.5%) benign pathology, 6 (12.5%) malignant. Hemithyroidectomy was done in 25 (83.3%), total thyroidectomy 4 (13.3%), and completion thyroidectomy with neck dissection in 1 (3.3%). Among total thyroidectomies, transient hypocalcemia occurred in 2 (6.6%) and no temporary or permanent recurrent laryngeal nerve palsy.

Conclusions: The use of microsurgical technique and loupes magnification in thyroid surgery are safety and effective procedures that require an appropriate training in microsurgery, but may significantly reduce post-operative complications.

Keywords: Microsurgery loupes magnification, Thyroid nodule, Parathyroid gland, Recurrent laryngeal nerve, Hypocalcemia, Complication

INTRODUCTION

Thyroid surgery is a commonly performed procedure for thyroid nodules. Although the mortality rate is remarkably reduced (0.065%) compared to the early 1900s, thyroid surgery is still not free from risk of complications such as those related to the injury of laryngeal nerves and parathyroid glands because of the close proximity of the structures with thyroid gland.¹⁻³ The two most common early complications of thyroid surgery are hypocalcemia (20-30%) and recurrent laryngeal nerve injury (5-11%).² The rate of these complications is directly related to the extent of

thyroidectomy and to a radical thyroid excision as well as to the surgeon's experience.⁴⁻⁶

In 1938, Lahey was the first to demonstrate that the incidence of RLN injury could be decreased by the careful dissection of RLN and meticulous surgical technique.⁷ In 1975, Attie and Khafi described a fine dissection technique using magnification in thyroid surgery.⁸ The authors reported that the incidence of postoperative hypoparathyroidism was decreased with this technique

Use of magnification in the ENT surgeries is a routine practice presently. Microscope is the versatile tool as far

the magnification is considered for the surgery. The use of a surgical microscope during thyroidectomy provides better illumination and magnification which allows precision in dissection and hemostasis.⁹ Better visualization, meticulous dissection, and proper hemostasis decrease the risk of injury to the recurrent laryngeal nerve (RLN), the parathyroid gland, and its vascular pedicle, leading to a decrease in complications like recurrent laryngeal nerve palsy and hypocalcemia.²

Therefore, the aim of the present retrospective study was to review thyroid surgeries performed with use of loupes magnification and microsurgical technique by our team in our centre and discuss the safety and efficacy of microscope-assisted thyroidectomy which has a reduced complication and morbidity like dysphonia and permanent hypocalcemia.

METHODS

This is a hospital based retrospective observational study. All patients undergoing thyroidectomy, consecutively, between May 2016 and April 2020 at Adichunchanagiri hospital and research centre, a tertiary teaching hospital were identified retrospectively from operation theatre records. Operative indications were scrutinised, and those performed for retrosternal goitres and patients with pre-operative nerve palsy were excluded from further study.

The convenient sampling technique was used as the number of microscopic thyroidectomy performed were few in number and all the patients who underwent thyroidectomy under magnification were included in the study.

Detailed review of case notes and hospital records was performed for eligible patients and the following data were extracted: patient demographics, operative details and surgical complications-chiefly that of RLN injury and hypocalcaemia. Clinical information was collected on sex, age, thyroid disease, and histology.

The hospital records showed transcervical dissection and preliminary mobilisation of the gland were performed in a conventional manner. Subsequently, the operating microscope was utilised to aid visualisation of RLNs and parathyroid glands with blood supply during dissection. Surgery was carried out by the same microsurgical team with a high level of expertise in thyroid surgery and microsurgical technique.

All patients were postoperatively assessed for nerve injuries and for hypocalcaemia. We defined permanent RLN palsy and persistent hypocalcaemia as that which remains, or still requires calcium supplementation, 6 months following the original procedure. Postoperative RLN function was assessed by fibre-optic laryngoscopy in all patients. Ethical approval was obtained from Institutional ethical committee. Data were analysed

descriptively for frequency and percentage using Microsoft excel.

RESULTS

Thirty thyroidectomies were included in the study. Various observations were made and presented in the Table 1.

Table 1: Demography of patients undergoing microscope-assisted thyroidectomy (n=30).

Characteristics	Variables (%)
Age (years)	Range 20-55
Sex	Female 26
	Male 04
Diagnosis	Colloid goitre 23 (76.6)
	Multinodular goiter 04 (13.3)
	Papillary carcinoma 02 (6.6)
	Follicular adenoma 01 (3.3)
Thyroidectomy	Right hemi thyroidectomy 15 (50)
	Left hemi thyroidectomy 10 (33.3)
	Total thyroidectomy 05 (16.6)

The operative time was between 60 and 180 minutes (mean 90 minutes). The mean postoperative stay was 3 days (range 2-5 days) and the mean follow-up was 20 days (range 14-180 days).

Various post-operative complications after thyroidectomies under magnification

Table 2: Complications after microscopic thyroidectomies.

Complications	Numbers
Unilateral/bilateral temporary vocal cord palsy	Nil
Unilateral/bilateral temporary vocal cord palsy	Nil
Temporary hypocalcaemia	02
Permanent hypocalcaemia	Nil

In our series there were no cases of unilateral or bilateral permanent vocal cord palsy.

Regarding the injuries of parathyroid glands, only 2 patients (6.6 %) presented with signs of temporary paraesthesia and numbness of the fingertips and perioral area and Chvostek's sign positivity, associated with alteration of biochemical parameters of serum calcium and ionized calcium and the resolution of symptoms occurred between 2 and 6 weeks (mean 20 days) in both

cases and there was no permanent hypoparathyroidism with permanent hypocalcemia in any cases.

DISCUSSION

The thyroid surgeries require a meticulous dissection of delicate structures, such as laryngeal nerves and parathyroid glands, whose damage can have serious repercussions on the patient's life quality. The application of microsurgery in thyroid surgery, as well as in other areas of general surgery, requires experience with microsurgical instruments and confidence with magnifying optical devices. This technique makes no changes to the surgical steps of the traditional technique, but adds the use of dedicated instruments particularly thin and precise as well as optical magnification for the success of the interventions.

The first documented use of magnification for thyroid surgery was described in article dealing with recurrent laryngeal injuries by Lahey in 1938. He recommended use of Bereny binocular loupes and he was able to magnify the nerve by two and half times.⁷

Recently in 2016, an article was published by Dorzai et al where they have retrospectively analysed their 10 years' experience using magnification. There were total 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 and only three patients out of 738 developed permanent hypocalcemia.¹⁰

In this retrospective study we analysed the outcomes of 30 patients that underwent thyroid surgery by using microsurgical technique and loupes.

In agreement with the concept that microsurgical technique allows to remarkably reduce the complications of thyroid surgery, in our series there were no cases of unilateral or bilateral permanent vocal cord palsy, only one patient reported transient hypocalcemia while no cases reported of permanent hypocalcemia.

Particular care should be taken during the dissection of the recurrent nerve near the trunk of the inferior thyroid artery avoiding devascularization of the parathyroid glands and dissecting the arterial branches with thin ties near their entry into the gland.¹¹ Based on our experience; however, we suggest that the use of operating microscope greatly facilitates such diligent dissection, and our favourable rates of both transient and permanent hypocalcaemia attest to this notion. The use of a microscope in thyroidectomy gives an excellent visualization and makes dissection precise. This prevents inadvertent injury to the RLN and the para-thyroid gland.

ENT specialists are trained in the use of the operating microscope for a variety of procedures, and the

magnification offered is unmatched by the majority of surgical loupes.

It can thus be considered a natural extension for the ENT surgeon performing thyroidectomy to use the operating microscope to acquire unparalleled magnification during the identification and preservation of RLN and parathyroid glands, with potentially appreciable improvements in surgical outcomes.

Microscope-assisted thyroidectomy has also been championed for its ergonomic benefits to the surgeon. Davidson et al have proposed the operating microscope as a method to maintain an upright posture with neutral cervical position during thyroid surgery and so reduce occupational musculoskeletal risk.¹²

The use of the operating microscope also allows for recording which has obvious benefits for both teaching purposes and from a medico-legal standpoint.¹³

There is learning curve for this technique but surgeons with background of doing microscopic surgeries can learn this technique quite fast. In our department surgeons use microscope routinely for ear and laryngeal surgeries, it is not difficult for transition from conventional method to microscopic method. The same has been concurred by the Nielsen study in which otologists who are already accustomed with use of microscope find this technique easy to adopt.¹²

Although we did not have a control group of patient undergoing standard thyroid surgery, we are pretty confident that the use of microsurgical technique and loupes magnification could have remarkably reduced the post-operative complications, in agreement with the first observation made with the use of magnification and in accordance with the few literature reported using microsurgical techniques and magnification and compared to the literature reporting the use of other surgical techniques.¹¹⁻¹⁸

The present study 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. The criticism 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 outcomes.

CONCLUSION

Results from our series showed that, thyroid surgery with a microscope significantly reduces the complication without increasing the operative time compare to without microscopes. For the ENT surgeon performing thyroid surgery, the operating microscope is a familiar piece of equipment, and we believe that microscope-assisted

thyroidectomy is, undoubtedly, a technique of considerable worth. Therefore, to better support microsurgical technique and magnification in thyroid surgery, it is important to present additional studies with a larger number of patients.

Also, one more area where the need for further studies required is the problems and difficulties which are faced while using the microscopies during the surgeries since the microscopic technique for dealing with the thyroid tumour is not a new concept and several articles reported its usefulness in surgery but the problems faced while using microscope need further discussion.

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