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Original Research Article

Minimally invasive thyroidectomy versus conventional thyroidectomy in a tertiary care centre

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ABSTRACT

Background: Since the advent of minimally invasive surgery, it has been applied for various intra-abdominal, retroperitoneal and even surgeries of the limbs. Thyroidectomy is one of the most performed endocrine surgeries. The first minimally invasive neck surgery was performed in 1997 following which, different approaches have been developed to reach the neck. Conventional open thyroidectomy remains the gold standard, while minimally invasive and endoscopic approaches are gaining popularity for their cosmetic and recovery advantages. To compare outcomes between conventional thyroidectomy and minimally invasive thyroidectomy in terms of operative time, postoperative pain, hospital stay, complications, cosmetic satisfaction and the feasibility of this new modality in a tertiary care centre.

Methods: A prospective comparative study was conducted at the Department of General Surgery, Mysore Medical College and Research Institute from November 2021 to August 2025, including 15 patients undergoing thyroidectomy. Patients were divided into two groups–Group A (Conventional Thyroidectomy) and Group B (Minimally invasive thyroidectomy).

Results: Minimally invasive thyroidectomy showed a longer operative time compared to conventional surgery, but had less postoperative pain, reduced hospital stay and superior cosmetic satisfaction. All patients were assessed postoperatively for complications and followed up for 3 months for cosmetic outcome. Minimally invasive thyroidectomy offers great benefits in terms of cosmetic outcome.

Conclusions: Minimally invasive thyroidectomy is a safe and effective alternative to conventional thyroidectomy with better cosmetic outcomes and faster recovery, although requiring longer operative time and advanced surgical expertise.

Keywords: Conventional, Minimally invasive, Thyroidectomy

INTRODUCTION

The term 'thyroid' comes from the Greek word 'thyreoides' which describes its shieldlike shape in the anterior neck.[1] While the anatomy of the thyroid gland was understood by the 16th and 17th centuries, its physiological functions were not clarified until the 19th century. Theodor Billroth and Emil Theodor Kocher were pioneering surgeon-physiologists who revolutionized thyroid surgery.[2] They conducted thousands of successful operations. Kocher significantly reduced the mortality rate of thyroid surgery from 1 in 6 to less than 1 in 500. For his ground breaking contributions to thyroid physiology, pathology and surgery, Kocher received the Nobel Prize in 1909. The introduction of minimally invasive surgery in the 20th century transformed the approach to complex surgeries. The emphasis shifted to achieving early recovery, minimizing pain, reducing hospital stays and improving cosmetic outcomes. The first endoscopic surgery in the neck was performed by Gagner et al in 1996 for a parathyroidectomy.[4] In 1997, Huscher et al in Italy carried out the first endoscopic

thyroidectomy.[5] The slower adoption of minimally invasive thyroidectomy can be attributed to the challenges of a narrow operative field and the presence of numerous vital structures. Since the inception of minimally invasive thyroid surgery in 1997, various techniques have been developed, including semi-open or partially endoscopic minimal neck incision, video assisted thyroidectomy and minimally invasive thyroidectomy. They can be classified into direct/cervical approach and indirect/extra-cervical approach.[6,7] The direct approach involves a small incision being made over the neck 2 cm above the sternal notch with thyroidectomy carried out in conventional manner, albeit using endoscopic instruments. The extra-cervical approaches include axillary, post-auricular and areolar approaches.[6]

Robotic thyroidectomy represents the most advanced and rapidly evolving area within minimally invasive neck surgery.[8] Various studies have compared the feasibility and complications of minimally invasive thyroidectomy with traditional open thyroidectomy, yielding mixed results.[9-11] While minimally invasive thyroidectomy is noted for its superior cosmetic outcomes and shorter hospital stays, factors such as its feasibility, operating time, rate of conversion to open surgery and associated complications require further investigation, particularly in a tertiary care setting. Thyroidectomy is performed for various benign and malignant disorders of the thyroid gland. This study compares conventional thyroidectomy with minimally invasive techniques in terms of operative parameters, complications and patient satisfaction.

METHODS

We conducted a prospective comparative study in Department of General Surgery, Mysore Medical College and Research Institute, Mysuru, Karnataka. The study was initiated after approval from institutional ethics committee. The study was conducted in accordance with the Ethical Guidelines for Biomedical Research on Human Subjects (Indian Council of Medical Research) and the Declaration of Helsinki

A total of 15 patients undergoing thyroidectomy were included after obtaining informed written consent and divided into two groups: Group A Conventional (open) thyroidectomy. Group B Minimally invasive thyroidectomy.

Inclusion criteria

Patients aged 18–60 years with benign thyroid swellings suitable for surgery.

Exclusion criteria

Malignant lesions, recurrent goitre and previous neck surgeries.

All patients were evaluated pre-operatively using TFT, lateral neck X-ray, routine blood investigations, ultrasonography and fine-needle aspiration cytology. All patients underwent pre-operative indirect laryngoscopy to assess vocal card motility.

The control group was chosen with the same inclusion criteria used for minimally invasive Thyroidectomy. The main surgical outcome measures were operative time (the interval from the skin incision to closure of the skin), postoperative hospital stays, identification of recurrent laryngeal nerves (RLN), identification of parathyroid glands, conversion to an open surgical procedure, postoperative hypocalcaemia, postoperative vocal alteration, postoperative complications.

The complications were analyzed transient or permanent RLN palsy, transient or permanent hypocalcaemia and postoperative pain. Patients were tested for hypocalcaemia pre-operatively and on postoperative days 1 and 30. All patients with postoperative calcium level below the lower limit of the normal range (8.2–10.6 mg/dl) were considered as having hypocalcaemia. In this study, hypocalcaemia and RLN palsy were defined as permanent when there was no evidence of recovery within 30 days after surgery. The patients in both groups were followed up at days 7 and 30 through hospital visits or phone calls. Follow-up examination included hoarseness of voice, swallowing difficulty, paraesthesia and cosmetic satisfaction. The patients were asked to grade the cosmetic appearance of their wound 1 month after surgery. All patients were provided with four ratings of cosmetic satisfaction: poor, acceptable, good and excellent. The data were analysed for statistical significance using a student's t-test and Chi-square test; p values <0.05 were considered significant

Outcome measures

The primary endpoints of the study were measurement of postoperative pain after 24 and 48 hours of the operation and self-rated patient satisfaction with the cosmetic outcome, three months postoperatively. Postoperative pain scores were measured using a 10-point visual analogue scale (VAS) postoperatively. A higher numeric pain score represented more severe pain. Satisfaction with cosmetic outcome was measured at the follow-up using a 10-point VAS.

The secondary outcome measures were operative time, incidence of temporary and permanent recurrent laryngeal nerve injury, postoperative haematoma formation, length of incision and duration of hospital stay. The operative time was measured from initiation of the incision to conclusion of the skin closure, to the nearest minute. Recurrent laryngeal nerve function was assessed with preoperative and postoperative fibreoptic laryngoscopy. Postoperative hematoma was considered significant if it required return to the operating room

(OR) for evacuation. Incision length was measured to the closest millimeter at the final follow up.

Surgical technique

Minimally invasive (axillary) approach

The patient was placed in a supine position with mild neck extension. The arm on the side of the lesion was elevated above the head and held parallel to the low chin. The first skin incision, about 1 cm in length, was made over the anterior axillary line and a subcutaneous tunnel was dissected with Kelly dissection.[12,20] One 10 mm trocar was inserted with a CO2 insufflator with the pressure set under 6 mmHg. The other two trocars were inserted from another axillary incision (5 mm) and a supra-areolar region incision (5 mm).

The subcutaneous working space was created with electric cautery under direct vision until the sternocleidomastoid muscle was exposed.[13] Dissection was cranially extended to the hyoid bone superiorly and inferiorly to the sternal notch. An incision was made along the border of the strap muscle and the omohyoid muscle was pushed below to the strap muscle. The thyroid gland was identified (Figure 1) and pulled upward with nontraumatic forceps. The thyroid gland was rotated anteriorly, exposing branches of the inferior thyroid vessels and middle thyroid vein, parathyroid glands and recurrent laryngeal nerve.

The terminal branches of the inferior thyroid vessels and middle thyroid vein were divided with a 5 mm Harmonic scalpel under direct visualization after the protection of the recurrent laryngeal nerve. Next, the thyroid gland was pulled inferiorly to expose the branches of superior thyroid vessels. The vessels were dissected free and separately clamped to avoid injury to the external branches of the superior laryngeal nerve. Finally, the thyroid gland was divided into two parts over the isthmus with the Harmonic scalpel. The specimen extracted out through the wound.[14] After hemostasis, a drain was inserted and the wound was closed layer by layer. The surgical area was compressed with elastic adhesive tape to avoid postoperative subcutaneous hematoma and bleeding and wound inspection done after 2 days (Figure 2).

Conventional thyroidectomy

Under general anaesthesia, the patient was placed in a supine position with mild neck extension. A 3–5 cm collar incision was made one fingerbreadth above the sternal notch. A vertical incision was made over the midline of the strap muscle and the thyroid lobe was dissected from the strap muscle. The thyroid vessels and parenchyma were divided. The recurrent laryngeal nerve and parathyroid glands were identified and preserved. After haemostasis, a drain was placed in the paratracheal space and the surgical wound was closed in layers.

RESULTS

Patient characteristics

Age range

The age range was from 23–65 years (mean 42.4 years).

Sex distribution

It includes 29 females (96.7%), 1 male (3.3%).

Lobe involvement

Right – 46.6%, Left – 23.3%, Both – 30%.

In minimally invasive group 9 nodules were on right, 3 nodules were on left and 3 patients had both the lobes involved.

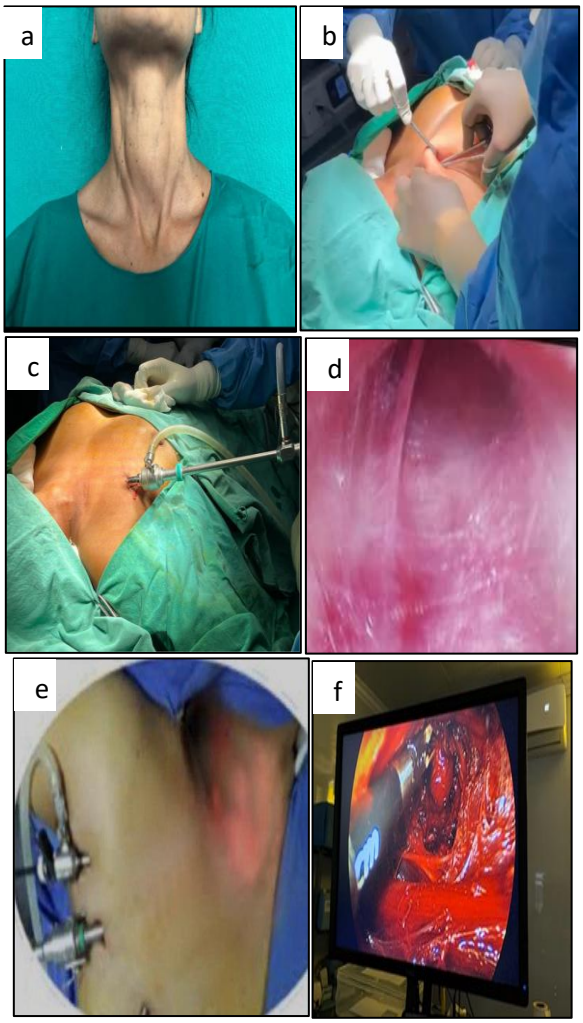

Figure 1 (a-f): The overview of minimally invasive video assisted thyroidectomy starting from the preop pictures to Kellys dissection for creation of subcutaneous tunnel and insertion of Endoscope and dissection of thyroid gland.

Figure 2: Post operative day 2 picture of patient following Minimally invasive video assisted thyroidectomy.

Operative details and complications

Operative findings

Mean operative time

89.33 min (MIT) vs. 70.17 min (Conventional), p=0.001.

Drain removal

2.53 vs. 2.82 days.

Complications

Hypocalcemia

2 transient cases noted (6.6%) in conventional group.

RLN injury

1 bilateral injury (conventional).

Surgical site infection

2 diabetic patients who underwent thyroidectomy in conventional group.

Conversion

2 cases converted to open thyroidectomy (MIT → open due to CO_2 leak and bleeding).

Table 1: Age wise distribution of patients who underwent thyroidectomy (both groups included).

Age group (in years)	Number of patients	(%)
20-30	3	10
30-40	10	33.3
40-50	12	40
50-60	4	13.3
60-70	1	3.3

Table 2: Gender distribution of patients who underwent thyroidectomy procedure both the groups included indicating prevalence of thyroid disease in females who are cosmesis oriented.

	Male	Female
Number of cases	1	29

Table 3: Lobes involvement prevalence of disease is more in right f/b both lobes and left lobes considering the less sample size.

Lobes involved	Number of cases	%
Right	14	46.66
Left	7	23.33
Both	9	30

Table 4: Mean operative time more in MIVAT compared to conventional group as endoscopic/video assisted thyroidectomy requires specific skills and considering the learning curve involved.

Parameter	Conventional thyroidectomy	Minimally invasive video assisted thyroidectomy	P value	Remarks
Mean operative time (min)	70±10	89±15	<0.05	Longer in minimally invasive group
Hospital stays (days) parameter	4.0±0.5	2.5±0.4	<0.05	Shorter stay in minimally invasive group

Outcome measures

Of the 15 patients, 8 underwent conventional thyroidectomy and 7 underwent minimally invasive thyroidectomy. Mean operative time was longer in the MIT group (110±15 min) compared to the conventional group (75±10 min). Mean postoperative pain scores and hospital stay were significantly lower in the minimally invasive group. Cosmetic satisfaction was rated higher in patients who underwent minimally invasive thyroidectomy.

DISCUSSION

In study conducted by Yeung GH demonstrated various approaches for Endoscopic thyroid surgery today: A Diversity of Surgical Strategies.[7] This study shows that in patients with small thyroid nodules the minimally invasive approach to thyroidectomy has some advantages over conventional thyroidectomy. The benefits of the MIT technique were demonstrated by less pain in the early postoperative period and superior cosmetic results at the three-month follow-up.[6,11] The MIT approach represents a refinement in operative technique for thyroidectomy, which is applicable to small symptomatic nodules, toxic nodules and follicular lesions, requiring further histological assessment.[12,14,15] The advantages of minimally invasive thyroidectomy have been demonstrated by other groups. As in this study, the major benefits on reduction in pain and improvement in cosmetic results. Most of these studies have evaluated the MIT technique.[16]

The operative time for MIT remains greater than that of conventional surgery, a finding which is common to several studies of minimally invasive approaches to the thyroid. With greater experience, it is probable that operative times for MIT will decrease, particularly with the refinement of electrothermal vessel sealing devices, which have now become the preferred method for vessel control and dissection in open and minimally invasive thyroidectomy. This technology, in addition to the fact that MIT minimizes the amount of unnecessary dissection required to expose the thyroid will probably result in the decrease in operative time in the future.[17,19]

Authors hypothesize that the smaller skin incision and decreased area of dissection associated with MIT, results in less disruption of the cutaneous nerve supply, thus translating to less postoperative pain. To avoid the potential problem of information bias influencing the reporting of pain and cosmetic scores, we blinded patients preoperatively.[18] Postoperatively, there is the potential for bias in reporting of pain scores from the MIT group; however, the combined reduction after day one pain scores and analgesic requirement suggests that the improvement effect is real.

Thyroid nodules are more prevalent in women and cosmetic outcomes are a major consideration. The axillary approach eliminates visible neck scars, significantly improving patient satisfaction.[10,13,18] Although MIT required a longer operative time due to the steep learning curve, it offered comparable complication rates and faster recovery.[12]

The findings align with international literature demonstrating improved aesthetic outcomes and similar safety profiles for MIT compared to open thyroidectomy. The magnified view aids in identifying the RLN and parathyroids, reducing the risk of iatrogenic injury.[21]

CONCLUSION

In this era of minimally invasive surgeries and patients demanding better cosmesis minimally invasive thyroidectomy is the need of the hour. Minimally invasive thyroidectomy provides excellent cosmesis with less pain with comparable rates of complications. It provides a good alternative to conventional surgery for benign thyroid nodules with size less than 5 cms. Hence, minimally invasive thyroidectomy can be recommended for small benign thyroid nodules. It is a technically feasible procedure which can be easily performed once surgeon has achieved the steep learning curve. It can be considered an excellent alternative to conventional thyroidectomy in appropriately selected patients.

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