

A COMPARATIVE STUDY OF THE OUTCOMES OF THE MIDLINE AND THE LATERAL APPROACH FOR THYROIDECTOMY- AN INSTITUTIONAL EXPERIENCE

Otorhinolaryngology

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ABSTRACT

Aim: To compare the outcomes of the conventional Midline (MA) and Lateral (LA) approaches in thyroidectomy with respect to identification of vital structures, operative time, postoperative pain, and complications. **Materials and Methods:** This prospective, descriptive observational study (November 2022–April 2024) included 40 adults (n=20 per group) undergoing thyroidectomy for benign or localized malignant lesions at a tertiary center in Eastern India. Patients with retrosternal goitre, prior neck irradiation, bilateral disease, or significant comorbidities were excluded. Intraoperative identification of the EBSLN, RLN, parathyroid glands, and strap muscle cutting were documented in both the approaches alongside operative time, postop VAS pain scores, surgical complications, and histopathological correlation. Statistical analysis was performed using descriptive methods to evaluate the safety and efficacy of both approaches. **Results:** The LA group demonstrated significantly higher identification rates of the EBSLN (75% vs. 35%, $p=0.025$) and parathyroid glands (100% vs. 70%, $p=0.02$). Strap muscle division was required in 65% of MA cases but none in LA ($p<0.00001$). LA showed shorter mean operative time (90.65 vs. 131.25 min, $p<0.001$) and significantly lower postoperative pain (VAS 1.7 ± 0.7 vs. 2.9 ± 0.8 , $p<0.001$). Complications were fewer in LA (10% voice change) compared to MA (15% voice change, 15% dysphagia, 10% seroma). Histopathology showed 42.5% carcinoma, predominantly papillary type. **Conclusion:** The lateral backdoor approach provides better identification of critical structures, reduces operative time, postoperative pain, and complications, while avoiding strap muscle transection. It is a safe and effective alternative to the conventional midline approach in thyroidectomy.

KEYWORDS

Thyroidectomy, Midline Approach (MA), Lateral Approach (LA), Recurrent Laryngeal Nerve.

INTRODUCTION

With the increasing detection rates of thyroid nodules and a substantial rise in thyroid cancer incidence worldwide, thyroidectomy has emerged as the most frequently performed endocrine surgery globally [1]. Over the past few decades, advancements in surgical techniques have transformed thyroidectomy into an exceptionally safe procedure, yet the quest for further refinement continues.

The midline approach (MA) remains the standard technique for thyroidectomy, involving midline strap muscle splitting for thyroid exposure. Common complications are recurrent laryngeal nerve (RLN) injury, external branch of superior laryngeal nerve (EBSLN) injury, para thyroid insufficiency and hemorrhage. Additionally, transection of the strap muscles, often necessary in larger goiters, can lead to fibrosis, laryngo-tracheal fixation, and impaired vertical mobility, adversely affecting voice and swallowing function[2].

Lateral approach (LA), also known as the 'Backdoor approach', has emerged as a promising alternative which uses the same central neck incision but differs in the plane of dissection. Instead of splitting the strap muscles at the midline, LA approaches the thyroid gland posterolaterally via the natural tissue plane between the anterior border of sternocleidomastoid (SCM) and strap muscles. It only requires opening the investing layer of deep cervical fascia and then the gland is delivered easily into operative field without much retraction and pulling of strap muscles [3]. This technique provides direct visualization of critical structures such as parathyroid glands, RLN, EBSLN and the vascular pedicles- superior thyroid artery (STA) and inferior thyroid artery (ITA), minimizing injury risk. Also we can easily start the lateral neck dissection (if needed). Moreover, individual ligation of the superior thyroid vessels in LA minimizes the risk of EBSLN injury, a common concern in midline approaches. In LA there is no need to cut the strap muscle irrespective of the size of thyroid gland. Notably, modern transaxillary endoscopic and robotic thyroidectomy techniques also utilize a lateral access route, reinforcing its feasibility and effectiveness [4-6].

In this study, we have aimed to provide a detailed comparison of the midline approach (MA) and lateral approach (LA) to thyroidectomy, focusing on surgical technique, anatomical principles, and safety in light of operative time, blood loss, need for transection of strap muscles, and complications associated with vital structures involved in thyroidectomy. By highlighting the strengths and limitations of these techniques, this study contributes to the ongoing evolution of thyroid surgery, with the ultimate goal of enhancing patient safety, surgical precision, and postoperative quality of life.

Aims & Objectives

To identify the nuances of lateral approach of thyroid surgery and to compare the results between the midline and lateral approach.

MATERIALS AND METHODS

A prospective and descriptive observational study was undertaken from November 2022 to April 2024 in a tertiary care hospital. Predesigned and pretested proforma was used for data collection. 40 subjects were divided equally into 2 groups:

Inclusion Criteria:

1. Adult male and female (age above 18 years)
2. Euthyroid state.
3. Benign primary thyroid lesion requiring surgery.
4. Thyroid malignancy without neck node metastasis.
5. Completion thyroidectomy.
6. Thyroid malignancy without extrathyroid extension.

Exclusion Criteria:

1. Adults with any acute illnesses or chronic debilitating diseases
2. Retro-sternal goitre
3. History of neck irradiation
4. Patients planned for total thyroidectomy
5. Patients unfit for surgery
6. Patients not giving consent

Study Method:

Detailed history, assessment of the general status and pre-operative assessment of the thyroid gland using USG, FNAC, USG guided

FNAC (if needed), Thyroid Function Test, CT Neck and Thorax and MRI neck (if required), Fibre Optic Laryngoscopy were done.

Operative Procedure :

- Under general anaesthesia both techniques involved making a 4-6 cm collar incision 2 cm above the suprasternal notch. Subplatysmal flap was elevated.
- The Midline approach involved midline separation of the strap muscle whereas in the Lateral approach (LA), investing layer of deep cervical fascia was incised in between lateral border of strap muscle and SCM. The anterior border of the SCM muscle was skeletonized and retracted laterally. The superior belly of the omohyoid muscle was traced up to its attachment to the hyoid bone and lifted in a cranial direction to expose the inferior constrictor muscle. The ansa cervicalis was identified coursing inferomedially, giving branches to the strap muscles which were retracted medially to expose the underlying thyroid lobe (Fig 1). The LA thus offered more direct access to the lateral aspect of the gland.

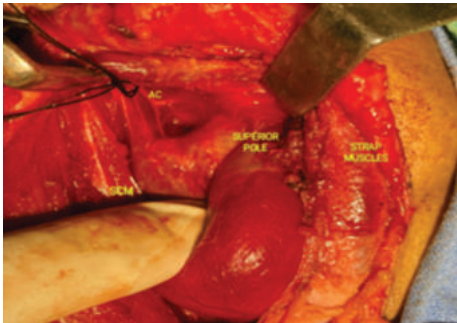


Fig 1: Visualisation of superior thyroid pedicle (right side) after retraction of strap muscle (SM) medially, sternocleidomastoid (SCM) laterally and superior belly of omohyoid superiorly. Ansa Cervicalis (AC) is also visualised.

- Beyond the initial exposure, the subsequent surgical steps, including dissection of vascular pedicles, identification and preservation of the RLN, external branch of SLN and parathyroid glands, and lobectomy were performed in a similar manner in both approaches.
- The deep fascia was sutured and the midline strap muscles were approximated in MA. In cases where SCM was cut it was repaired. In LA the space between lateral border of strap muscle and SCM was left open without suturing.

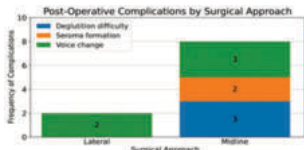
Intra-operative assessment was done for identification of EBSLN, RLN, parathyroid gland and note any strap muscle cutting.

Table 1: Shows Intraoperative Assessment of Various Parameters In Both the Approaches.

Approach	EBSLN Identification		RLN Identification		Parathyroid gland Identification		Strap Muscle Cutting		Average Operation Duration (mins)
	Yes	No	Yes	No	Yes	No	Yes	No	
Lateral	15	5	20	0	20	0	0	20	90.7±17.4
Midline	7	13	17	3	14	7	13	7	131.2±29.8
P value	< 0.05		> 0.05		< 0.05		< 0.001		< 0.001

Comparison of Post-operative Findings Between LA and MA Groups: The average post-operative D1 pain score (VAS) for the LA group is 1.7±0.7 whereas for the MA group it is 2.9±0.8 (P<0.001) showing there is significantly reduced post op pain in LA requiring less analgesics.

The most common complication in both groups was transient voice change, which was relatively more frequent in the MA group compared to LA group (15% vs. 10%, P=1). The second common complication in both groups was deglutition difficulty, which was found in 3 cases (15%) of MA group. Seroma was the third complication seen in 2 cases (10%) of MA group which resolved well without the need for reexploration. There were no mortalities during follow up (Graph 1).



Graph 1: Stacked Histogram Showing Post Operative Complications in Both Approaches

Post-operative assessment included operative time (in mins), mean drain collection after 48 hours, post-operative pain via visual analogue scale (VAS) score (after 24 hours) and note for any complications. Follow up was done after 1, 3 and 6 week.

Data were compiled and analyzed using Microsoft Excel, applying descriptive statistical methods.

RESULTS AND ANALYSIS

Baseline clinicopathologic characteristics of the study patients: In our analysis of 40 cases, 33 were female (82.5%) and the rest were male (17.5%), with a male-to-female ratio of 1:4.7. The mean age of the study patients was 41.2 ± 10.8 years (range: 25-63) years. Most common age group was 41-50 years (32.5%) followed by 31-40 years (25%).

Preoperatively most cases were Bethesda II on FNAC (52.5%), followed by Bethesda III (32.5%).

Comparison of Intra-operative Findings Between LA and MA Groups:

All the surgeries were done in euthyroid state. Pre-operative statuses of vocal cord mobility were normal in all cases.

EBSLN was identified in 15 cases of lateral approach and in 7 cases of midline approach (75% vs 35%, P=0.025) indicating a statistically significant advantage of the lateral approach in EBSLN identification.

RLN was identified in all cases of lateral approach and 17 cases of midline approach (100% vs 85%, P=0.23). The study shows that LA is not significantly better than MA in identifying RLN.

Either or both of the parathyroid glands were identified in all cases of lateral approach and 14 cases of midline approach (100% vs 70%, P=0.02) demonstrating a significant advantage of the lateral approach in parathyroid gland identification.

Strap muscle was resected in none of the cases of lateral approach but in 13 cases of midline approach (0% vs 65%, P<0.00001) strap muscle had to be cut to improve exposure. This study shows that strap muscle is significantly affected in MA. In none of the case of LA superior belly of omohyoid had to be sacrificed.

The mean operation time for the LA group was significantly shorter than that of the MA group (90.65 vs. 131.25 minutes, P<0.001). This shows that the LA approach is quicker compared to MA (Table 1).

Post op histopathology suggested 17 cases (42.5%) of carcinoma and rest were of benign pathology. Among thyroid carcinoma, papillary carcinoma was the most observed entity followed by follicular carcinoma.

DISCUSSION

Thyroidectomy is a common endocrine surgery where meticulous anatomical knowledge is essential to minimize complications such as RLN and EBSLN injuries, hypoparathyroidism, and hemorrhage.

The LA technique ('Backdoor approach') is an established method for exploration of parathyroid lesions and re-exploration of thyroid gland [7,8]. Bhuiyan et al. in their study highlighted its viability as an alternative to MA for traditional thyroidectomy as well as for re-exploratory thyroid surgery and parathyroid exploration [9]. The LA by approaching the gland laterally avoids the dense midline adhesions from previous surgery. In general, all alternate incision site thyroidectomies use this lateral approach purely or a combination of lateral and midline approach as in the Bilateral Axillo-Breast Approach (BABA) technique except for the Transoral endoscopic technique which use the midline approach [10]. Ishikawa et al. described a video-assisted lateral technique utilizing the backdoor

approach, differing from the traditional midline strap separation technique of Miccoli's minimally invasive video assisted thyroidectomy (MIVAT) [11,12].

The traditional MA requires midline separation of strap muscles, occasional transectioning, vigorous pulling of muscles during superior pole dissection (which causes denervation and fibrosis), and re-suturing of muscle in the midline. Kim in his study mentioned that handling of strap muscles and reconstitution or even excessive retraction may affect voice quality and swallowing function post-thyroidectomy [13]. The LA by avoiding these cause a much lower incidence of adhesions and helps in preserving voice and swallowing functions and may inherently have lower post op pain scores. In our study the LA approach didnot need strap muscles transection, hence, lower postoperative voice quality loss was seen along with significantly reduced post op pain score. It is in line with the study by Singaporewalla et al. which concluded that post-operative pain and rate of transection of strap muscles was significantly lesser in lateral approach compared to midline approach[14]. Also the study by Kwangsoon Kim et al (2020) showed that the LA group needed significantly less painkillers (1.2 ± 0.5 vs. 2.7 ± 1.6 , $P < 0.001$) than the MA group [15].

Another significant advantage of LA approach is the persistent gap between the anterior SCM border and the lateral strap muscle end that is left open after thyroid resection. This gap acts as a safety valve in case of significant postoperative bleeding, allowing blood to flow superficially under the skin flap and reducing the risk of tracheal compression, laryngeal edema, and stridor. In contrast, the MA approach involves midline reapproximation of the strap muscles, creating a confined space that may lead to a life-threatening hematoma beneath the strap muscles should there be a significant postop bleed. In our study there was higher incidence of post op seroma formation in MA group.

A recent metaanalysis found a range of reported post-thyroidectomy hematomas that require surgical intervention from 0.4% to 6.5% [16]. Although 2 cases in MA group developed seroma, it resolved using conservative management. No cases in LA group developed post op hematoma/seroma (Graph 1) and we attribute this to enhanced exposure of the vascular pedicle, which allows for greater control of hemostasis.

The only potential risk of LA is the risk of injury of the sympathetic chain which was safeguarded by careful handling of the carotid sheath by avoiding excessive retraction or dissection behind it. We didnot encounter any injury to sympathetic trunk in both the approaches.

Demographically, our patient group mirrored established thyroidectomy trends, with a female predominance (M:F = 1:4.7) and peak incidence in the 41–50 year age group, consistent with large epidemiological studies [17,18].

Palazzo et al. concluded that the mean operating time for endoscopic thyroidectomy via the LA was 99 minutes (range, 64–150 minutes) [4]. In our trial using LA, the average operative time was 90.7 ± 17.4 minutes compared to 131.2 ± 29.8 minutes in MA. Jyotirmoy Phookan et al concluded that the thyroid swelling can be quickly and precisely removed with the least amount of difficulties via the lateral approach and that finding the omohyoid's superior belly should be the first step in any lateral approach [19].

Carolyn DeBiase et al in their study concluded that by providing maximum exposure of the laryngeal nerves and major vessels, lateral approach lowers the risk of nerve damage and bleeding [20].

In our study, after follow-up on the 6th week, both approaches showed excellent results in terms of cosmesis of the surgical scar.

CONCLUSION

In conclusion, this study demonstrates that, the LA to thyroidectomy, guided by the superior belly of the omohyoid, offers significant advantages over the conventional midline approach. It ensures better identification of critical structures like the EBSLN and parathyroid glands, avoids strap muscle transection, reduces operative time and post-operative pain, and is associated with fewer complications. It is also a safe alternative to conventional methods for re-exploratory thyroid surgery and parathyroid exploration.

Limitations of the Study

There are notable short comings in this study. The sample size was small (40 cases), and the study duration was limited to 1 year and 6 months, preventing long-term follow-up. Being a single-centre study conducted in a tertiary care hospital, selection bias and limited population diversity are possible. Follow-up was done by the same operating team, not a neutral observer, which may affect objectivity. Cases of total thyroidectomy with neck dissection were excluded, limiting generalizability to such patients.

In consensus with our results, a larger study can be performed to prove the advantages of LA over MA with inclusion of cases of total thyroidectomy with neck dissection.

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