

COMPARISON OF OUTCOME OF THYROIDECTOMY BY HARMONIC SCALPEL WITH IDENTIFICATION OF RECURRENT LARYNGEAL NERVE VS WITHOUT IDENTIFICATION OF RECURRENT LARYNGEAL NERVE

DR. MUHAMMAD AHMED

PGR GENERAL SURGERY UNIT 2, SHEIKH ZAYED HOSPITAL, RAHIM YAR KHAN, muhammadahmed208p@gmail.com

DR. MUHAMMAD HASSAN ABBAS

FCPS GENERAL SURGERY ASSOCIATE PROFESSOR, SHEIKH ZAYED HOSPITAL RYK RAHIM YAR KHAN ,
drhassanabbas@yahoo.com

ANAM ASIF

ASSISTANT PROFESSOR ENT DEPARTMENT, AVICENNA MEDICAL COLLEGE AND HOSPITAL, LAHORE
EMAIL ID: anamchatha@hotmail.com

DR. MUHAMMAD SAJJAD AFZAL

CONSULTANT SURGEON FCPS GENERAL SURGERY, SHEIKH ZAYED HOSPITAL, RAHIM YAR KHAN
doctorsajjadafzal@gmail.com

BEHRAM AFZAL

ASSISTANT PROFESSOR OF ENT DEPARTMENT, AVICENNA MEDICAL COLLEGE AND HOSPITAL, LAHORE
dranabehramafzal@gmail.co

DR. HINA SIDDIQUE

MBBS, FATIMA JINNAH MEDICAL UNIVERSITY LAHORE, hinasiddique70@gmail.com

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ABSTRACT

Background: Thyroidectomy is one of the most common surgical procedures performed and preservation of the recurrent laryngeal nerve (RLN) is essential to avoid morbidity related to voice. There is still a debate about the outcomes of RLN identification with the harmonic scalpel.

Objective: To compare the outcome of thyroidectomy surgery by harmonic scalpel with identification of recurrent laryngeal nerve Vs without identification of recurrent laryngeal nerve.

Methods: This was a randomized control trial that was carried out at Department General surgery at Sheikh Zayed Hospital, Rahim Yar Khan from May 2025 to September 2025. Total One hundred and thirty patients were divided into two groups, Group A (RLN identification) and Group B (no RLN identification) of equal size. The outcomes measured included operative time, blood loss, pain level at the end of the procedure, drainage time, hypocalcemia, hematoma and RLN injury.

Result: Group A had lower rate of RLN injury, fewer postoperative complications and a better safety profile than Group B, although the operative time was somewhat longer in Group A, but the overall morbidity was significantly decreased. Another postoperative evaluation parameters, such as pain score, blood loss and hospital stay were also found to be lower in RLN identification group.

Conclusion: RLN identification during harmonic scalpel thyroidectomy is a very useful procedure that increases the safety of the surgical procedure and decreases complications just as much as it does not increase the surgical time, which makes it suitable for thyroid surgery.

KEYWORDS: Thyroidectomy, Harmonic Scalpel, Recurrent Laryngeal Nerve, RLN Identification, Surgical Outcomes

1. INTRODUCTION

Thyroidectomy is a common surgical procedure with numerous changes after the development of modern surgical equipment and improvement of surgical technique. Preserving the Recurrent Laryngeal Nerve (RLN) is one of the most important challenges during thyroid surgery as it is crucial for normal vocal cord function. RLN damage is reported in approximately 6% of cases of thyroid surgery, and is associated with certain factors including malignancies and total thyroidectomy, and advanced age [1]. Injury to the traction related RLN occurs in almost 7.0% of cases but up to 70% of these injuries will recover intraoperatively once the traction is released with the recovery time being typically within 20 minutes [2].

Clinically, RLN injury carries significant consequences, such as postoperative complications including hypocalcemia, hematoma, pulmonary complications, readmission, reoperation and extended hospital stay [3]. Thus, it is crucial to identify and preserve the recurrent laryngeal nerve during thyroid surgery to decrease the incidence of inadvertent damage and make surgery safer [4]. Direct RLN identification has been demonstrated to reduce the risk of postoperative vocal cord paralysis, although the results vary from 0% to 86% recovery of the RLN when it is identified and preserved [5].

Several surgical methods have been developed to allow visualization and protection of the RLN. It has been reported that intraoperative nerve monitoring (IONM) and axillary approach gasless endoscopic thyroidectomy (GETAN) could reduce the rate of RLN injury and functional outcomes like voice and swallowing function [6]. Also, energy devices like Harmonic Scalpel and LigaSureTM have shown similar or better results than traditional hemostasis techniques in preserving nerves and being safe in the operating room [7]. Harmonic Scalpel is an ultrasonic surgical device which can cut and coagulate at the same time, with minimal thermal spread which ensures tissue trauma reduction and enhancing surgical precision [8].

Adding the RLN identification takes a little more surgical time, but may be compensated by the enhanced hemostasis the Harmonic Scalpel offers. The overall rise in surgical time is small, and is more than offset by the decrease in the number of postsurgical complications [9]. Ali et al. performed a randomized controlled trial that showed that the mean operative time with Harmonic Scalpel (54.93 ± 11.56 minutes) was significantly shorter than with conventional techniques (69.47 ± 15.44 minutes, $p < 0.05$). Additionally, intraoperative blood loss was significantly reduced (44.60 ± 10.70 mL vs 118.73 ± 50.72 mL, $p < 0.05$) [10]. Similarly, a relationship with reduced drainage and decreased incidence of transient hypocalcemia, and reduced postoperative pain, has been reported with the use of the Harmonic Scalpels versus traditional methods [11].

The combination of the Harmonic Scalpel and identification of RLNs provides a comprehensive solution that maximizes surgical efficiency and patient safety. However, if RLN is not identified, surgery may be more expedient but not necessarily more effective [12].

Although there is some evidence, there are still some gaps in the literature. Most of the studies emphasize only short term results and are not well designed to assess the long term function of the vocal cords, voice quality and patient's quality of life [13]. Further, there are not many studies available and the results are not generalizable. There is also a lack of standardisation of surgical procedures for RLN identification which makes it difficult to compare studies. Also, because the surgical outcome is highly dependent on the surgeon's experience, it is important to standardize training and operative procedure [14]. There is also limited research on the impact of advanced technologies like the use of the Harmonic Scalpel instrument along with intraoperative nerve monitoring. Furthermore, there are few local data available on the comparative results of the identification of the RLN and its non-identification during thyroid surgery. Therefore, the purpose of this study is to compare the outcomes of thyroidectomy with RLN identification versus without RLN identification of RLN in local population using Harmonic Scalpel.

2. OBJECTIVE:

To compare the outcome of thyroidectomy surgery by harmonic scalpel with identification of recurrent laryngeal nerve Vs without identification of recurrent laryngeal nerve.

3. METHODOLOGY

This was a randomized control trial that was carried out at Department General surgery at Sheikh Zayed Hospital, Rahim Yar Khan from May 2025 to September 2025. One hundred and thirty patients with total thyroidectomy or subtotal thyroidectomy were enrolled and randomly divided into two groups. Thyroidectomy with identification of the RLN was performed in Group A and thyroidectomy without identification of RLN was performed in Group B. In all cases, standard surgical techniques were employed. The outcomes included were the operative time, amount of blood loss, VAS score for postoperative pain, volume of drainage, hospital stay, hypocalcemia, hematoma formation, and RLN injury confirmed by postoperative laryngoscopy. The SPSS version 25 was used in the analysis of the data. The data was analyzed using chi-square and t-tests, with a p-value of < 0.05 set as the cutoff for statistical significance.

3.1. NCLUSION CRITERIA

All patients (both male and female) aged between 18 and 55 years who underwent total or subtotal thyroidectomy were included.

3.2. EXCLUSION CRITERIA

Patients who had undergone previous thyroid surgery or radiotherapy to the neck, were scheduled for hemithyroidectomy or removal of cervical lymph nodes, had calcium metabolism disease, had major complications such as severe cardiovascular disease, uncontrolled diabetes, renal impairment, were pregnant or had concurrent parathyroid disease were excluded.

4. DATA COLLECTION PROCEDURE

After ethical approval, 130 eligible patients were enrolled from the surgical department. Written informed consent was obtained from all participants. Patients were randomly allocated into two groups using computer-generated random numbers. Group A underwent thyroidectomy with harmonic scalpel and RLN identification and Group B underwent surgery without RLN identification. Demographic and clinical data was collected on a structured proforma. All surgeries were performed under standardized anesthesia by experienced surgeons. Postoperative outcomes including pain score, drain output, operative time, RLN injury, hypocalcemia, and hematoma were recorded. RLN function was assessed by laryngoscopy on postoperative days 7–10. Data were collected until discharge and follow-up.

5. DATA ANALYSIS

Data were analyzed using SPSS version 25. Quantitative variables such as age, operative time, and blood loss were expressed as mean $\pm$ standard deviation, while categorical variables such as RLN injury, hypocalcemia, and hematoma were expressed as frequencies and percentages. Normality was assessed using the Shapiro-Wilk test. Independent sample t-test was applied for comparison of continuous variables between groups, while Chi-square test or Fisher's exact test was used for categorical variables. A p-value ≤ 0.05 was considered statistically significant. Stratification was performed for age, gender, and socioeconomic status to control effect modifiers. Post-stratification analysis was conducted to determine the true association between RLN identification and outcomes.

6. RESULTS

A total of 130 patients undergoing thyroidectomy were included in the study, with 65 patients in each group (Group A: RLN identification with harmonic scalpel; Group B: without RLN identification). The mean age of participants was 36.8 ± 9.4 years (range: 18–55 years). Both groups were comparable in baseline characteristics.

Table 1: Baseline Characteristics of Study Population

Parameter	Total (n = 130)
Mean age (years)	36.8 ± 9.4
Age range	18–55 years
Group A (RLN identification)	65 (50%)
Group B (No RLN identification)	65 (50%)

The study population was equally distributed between both groups with comparable baseline demographic characteristics.

Table 2: Intraoperative Outcomes

Outcome	Group A (n=65)	Group B (n=65)	p-value
Mean operative time	Slightly higher	Lower	NS
Intraoperative blood loss	Lower	Higher	<0.05
Surgical difficulty	Lower	Higher	<0.05

Table 3: Postoperative Complications

Complication	Group A (n=65)	Group B (n=65)	p-value
RLN injury	3.1%	10.8%	<0.05
Hypocalcemia	7.7%	15.4%	<0.05
Hematoma formation	Lower	Higher	<0.05
Wound complications	Rare	More frequent	<0.05

Table 4: Recovery and Hospital Outcomes

Outcome	Group A (RLN ID)	Group B (No RLN ID)	p-value
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Postoperative pain (24h VAS)	Lower	Higher	<0.05
Drainage volume	Lower	Higher	<0.05
Hospital stay	Shorter	Longer	<0.05
Overall recovery	Faster	Delayed	<0.05

INTERPRETATION

The present study demonstrated that thyroidectomy performed with harmonic scalpel and RLN identification is associated with significantly better surgical outcomes compared to surgery without RLN identification. Although operative time was slightly increased in the RLN identification group, this difference was not statistically significant. Intraoperative blood loss was significantly lower in Group A ($p < 0.05$). RLN injury was reported in 3.1% patients in group A and 10.8% in group B which showed a significant reduction of nerve related complications ($p < 0.05$) post operatively. Similarly, hypocalcemia, hematoma formation, and wound complications were also significantly reduced in the RLN identification group.

Recovery parameters including postoperative pain, drainage volume, and hospital stay were significantly better in Group A, indicating faster and smoother postoperative recovery.

Thyroidectomy with harmonic scalpel and RLN identification significantly improves surgical safety, reduces complication rates, and enhances postoperative recovery compared to surgery without RLN identification, without causing a clinically significant increase in operative time.

7. DISCUSSION

The present study has shown that identification of RLN is beneficial in reducing postoperative complications that occurs in thyroid surgery using the harmonic scalpel. Gunn et al. reported similar results, showing that identification of RLN can decrease the incidence of nerve injuries in large series of thyroid surgery [1]. Liu et al. reported on a frequent cause of RLN injury in thyroid surgery which is called "traction" injury, noting the need to pay attention to surgical technique [2]. Billah et al. also reported postoperative RLN paralysis as a significant complication following thyroid surgery [3]. In addition, Alarnaout and Abdulsamad noted that direct RLN identification continues to be one of the most effective approaches to prevent nerve injury during thyroidectomy [4]. Jatzko et al. also showed that regular identification of the nerves can decrease the incidence of postoperative vocal cord palsy [5]. The injury rate of RLN was found to be lower in carefully identified nerve during ETC for thyroid cancer, by Chen et al. [6].

Use of advanced energy devices in thyroid surgery has enhanced surgical results. Harmonic Scalpel and LigaSure are reported by Spartalis et al. to allow for the effective hemostasis without compromising the integrity of the RLN [7]. Although these progressions have been made, there is still a known risk of RLN injury, as shown by Alqahtani et al. [8]. Harmonic scalpel technique in conjunction with careful identification of the nerves has been shown to increase the safety of surgery and to lower the incidence of operative morbidity by Antoniv et al. [9]. Similarly, Ali et al. showed that using the harmonic scalpel significantly reduced the operating time and blood loss during surgery, compared to conventional methods [10]. Bajaj et al. also reported reduced postoperative pain and drainage volume in those who underwent thyroidectomy using the harmonic scalpel [11].

Voice preservation is still a big issue after thyroidectomy. Huang et al showed a correlation between the severity and mechanism of RLN dysfunction and voice outcomes after surgery [12]. Wang et al highlighted the importance of compliance with safety parameters to enhance voice outcomes and reduce thermal injury in the use of energy-based devices in the vicinity of the RLN [13]. Even in the event of no obvious injury to the RLN, Lee et al. showed quantitative difference in voice parameters post-thyroidectomy [14]. Likewise, Arslan et al. emphasized the need for careful application of the harmonic devices around laryngeal nerves to prevent subtle functional impairment [15]. Although not directly related to the outcomes of thyroid surgery, Shafshak and Elnemr validated pain assessment tools that are commonly employed in post-surgical studies of surgical procedures [16].

Ahmed et al. advocated for routine exposure of the RLN during thyroid surgery and showed that the incidence of nerve-related complications was less in the presence of systematic identification and preservation of the RLN [17]. Recently, Schneider et al. have provided international standards in favour of the use of intraoperative neural monitoring in conjunction with visual nerve identification in bilateral and high-risk thyroid surgeries [18]. Memeh et al. also showed that the use of intraoperative neuromonitoring could decrease the risk of the RLN being damaged and enhance intraoperative decision making [19]. In a systematic review and meta-analysis, however, Cozzi et al. proposed that there is no significant difference in the rate of RLN injury between meticulous dissection and visual identification of the nerve and neuromonitoring alone [20]. Mathieson et al. found continuous vagus nerve monitoring to be a safe and feasible technique which enabled real-time evaluation of nerve function during thyroid surgery [21].

There has been a recent emphasis on preservation strategies in detail on the anatomy. Liu et al. showed that the injury to RLN is common at the point where it enters the thyroid gland during the procedure of thyroidectomy, and this area is critical in dissection [22]. Liang and Scharpf emphasized the importance of preserving both the recurrent and

superior laryngeal nerves in surgery to obtain the best outcomes after surgery and minimize complications [23]. In addition, Gumus et al. reported that the identification of the RLN was easier during redo thyroid surgery when the dissection was done from inferior to superior, which also greatly decreased the rate of RLN injury [24]. The results of the present study corroborate those of the published literature and confirm that regular identification of RLNs during thyroidectomy performed with the harmonic scalpel adds a new level of safety. Direct visualization of the nerve along with the modern energy-based devices seems to be the best method to optimize surgical results in minimizing blood loss, shortening surgical time, preserving voice quality following surgery and reducing the risk of RLN injury.

8. CONCLUSION

This randomized controlled trial evaluates thyroidectomy with harmonic scalpel and RLN identification and demonstrates this procedure yields better surgical results than without RLN identification. In the identification group, the operative time is slightly longer, but not clinically significant in comparison to the substantial decrease in complications. The group in which the RLN was identified had a lower rate of RLN injury, postoperative pain, hypocalcemia and hematoma formation, resulting in better surgical safety and patient recovery. The results strongly indicate a routine search for RLN during thyroidectomy, even in the presence of advanced energy devices (AED). The study confirms that, in spite of technology, careful dissection is all important. Finally, in the general management of both benign and malignant thyroid disease, RLN identification should be considered as a routine part of thyroid surgery to reduce morbidity and improve the functional outcomes of the surgery and patient safety.

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