

Thyroid Surgery Outcome Benefits with Energy Based Devices Over Conventional Technique: A Comparative Study

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ABSTRACT

Background: Thyroidectomy is the most commonly performed surgery worldwide for both benign and malignant lesions of thyroid. New surgical technologies have been introduced in thyroid surgery to achieve vessel sealing and hemostasis with an added advantage over conventional method. **Aim:** The primary aim of study was to compare the surgical outcome benefits of harmonic focus, LigaSure vessel sealer with conventional techniques of clamp and suture in thyroid surgeries. **Objectives:** The objectives of this study were to compare the three methods in terms of the overall time difference, the total blood loss in thyroid surgery, postoperative drainage output, and surgical complications. **Methodology:** The prospective study was conducted in Government Medical College, Anantnag, Kashmir, between 2020 June and May 2022, over a period of 2 years by the Department of ENT and HNS. A total of 84 patients who underwent thyroid surgeries (total/hemithyroidectomy) were divided into three groups: Group H ($n = 28$), Group L ($n = 28$), and Group C ($n = 28$). The patients were divided according to age, preoperative diagnosis (benign and malignant), and thyroid nodule size and stage of thyroid lesion to generate homogeneous groups. All cases were operated by the same surgeon to prevent surgical bias. **Results:** The three groups were homogeneous in terms of age, gender, clinical status, and pathology. In Group H and Group L, the mean operative time was 25–30 min shorter than Group C ($P < 0.001$). In Group H and Group L, the blood loss was significantly less as compared to Group C ($P < 0.001$). The comparison of pain score, postoperative drainage, complication rates as well as mean hospital stay was similar between the three groups ($P =$ Statistically non significant). **Conclusion:** The use of surgical devices is as safe and effective for vessel dissection and hemostasis likewise conventional clamp suture technique. A significant reduction of the operative time and intraoperative blood loss was found with harmonic focus and LigaSure method compared to conventional method with comparable differences in postoperative complications, pain score, and drainage in all the three groups.

Key words: Harmonic focus, LigaSure, thyroidectomy

INTRODUCTION

Thyroidectomy is routinely performed surgery for benign and malignant thyroid lesions. Over the years, the technique of thyroidectomy has evolved many folds to achieve the highest skills to decrease the incidence of complications to minimal levels. Essentially to achieve that skill and reduce complications, surgeons needed an adequate control of hemostasis during the procedure to prevent the inadvertent risk of damage to the superior and recurrent laryngeal nerves (RLNs) and the parathyroid glands. Conventional way of achieving hemostasis is using clamp and suture method with satisfactory results.

In recent years, several novel instruments have been developed and implemented in both open and

laparoscopic surgeries. Many methods designed to maintain surgical hemostasis are presently used: Ligation and suturing (threads, clips, and staplers), coagulation (monopolar and bipolar electrocoagulation), ultrasonic coagulation (Ultracision, Harmonic Scalpel, Ethicon Endo-surgery), and electroligation sealing (LigaSure Vessel sealing system; Valleylab, Boulder, CO, USA).^[1,2]

Several studies in that prospective have been published comparing one method with other with one or other parameters. In comparison to the conventional method

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Table 1: General information of the participants

Variable	n (%)
Gender	
Female	66 (78.5)
Male	18 (21.4)
USG TIRADS score	
3	8 (9.6)
4	23 (27.3)
5	53 (63.4)
FNAC Bethesda	
3	7 (8.3)
4	15 (17.8)
5	39 (46.5)
6	23 (27.3)
Type of surgery	
Hemithyroidectomy	30 (35.7)
Total thyroidectomy	54 (64.2)

USG: Ultrasonography, TIRADS: Thyroid Imaging Reporting and Data System, FNAC: Fine-needle aspiration cytology

of achieving homeostasis by clamp and knot method, the LigaSure vessel sealer and harmonic focus have proven added advantages in several studies in one or other parameters preoperatively and postoperatively with some debatable comparative results. The comparative study was conducted considering all parameters together and comparing conventional with energy-based homeostasis devices.

METHODOLOGY

Study design

This was a prospective case-matched study.

The study was conducted in Government Medical College, Anantnag, Kashmir, between 2020 June and May 2022, over a period of 2 years by the Department of ENT and HNS. A total of 84 patients who underwent thyroid surgeries (total/hemithyroidectomy) were divided into three groups: Group H ($n = 28$), Group L ($n = 28$), and Group C ($n = 28$); the patients were divided according to age, preoperative diagnosis (benign and malignant), and thyroid nodule size and stage of thyroid lesion to generate homogeneous groups. The primary objectives of the comparative study were as follows:

- To study the overall time difference between harmonic focus, LigaSure, and conventional method
- To compare the total blood loss in thyroid surgery between harmonic group and LigaSure group with conventional group
- To determine postoperative pain score between three methods
- To compare the postoperative drainage output

- To compare the surgical complications (hypocalcemia and RLN palsy) between the three groups.

Inclusion criteria

- Differentiated thyroid malignancies such as papillary and follicular carcinoma
- Medullary carcinoma
- Multinodular goiter
- Acceptance to participate in the study (signed informed consent form).

Exclusion criteria

- Coagulation disorders or on antiplatelet drugs
- Pregnancy
- Total thyroidectomy for advanced or malignant invasive cancer
- Previous neck surgery
- History of neck irradiation.

The parameters that have been evaluated in each of the 84 patients were preoperatively age, gender, diagnosis, thyroid hormones (thyroid-stimulating hormone, T3, and T4), and calcium levels. Blood loss during the operation: duration of the operation (measured in minutes), complications, and weight of the thyroid gland removed. Case matching was done for the division of cases into three groups. The total duration starting from incision to closure was calculated in all, blood loss average weighing the gauzes pre- and postoperatively, postoperative 24 h and 48 h drainage was tabulated and all immediate postoperative complications such as pain, vocal cord palsy, hypocalcemia calcium levels in the 2nd and 5th postoperative day, hospital stay and finally presence or absence of dysphonia, and late-onset seroma formations wound healing was documented. All cases were operated by the same surgeon to prevent surgical bias.

RESULTS

Total of 84 patients were considered in comparative study over 2-year time three homogenous groups were made with 28 patients in each group selected randomly, total of 66 female patients with 18 males. Patients were well matched for age, gender, pathology, and weight of the thyroid gland, and no significant difference among the three groups was detected [Table 1].

In each group, 18 patients were for total thyroidectomy and 10 were for hemithyroidectomy. The preoperative serum calcium level was considered in all three groups with no statistical significance. The average operative time in Group C is $115.13.6 \pm 13.6$ min, 92.3 ± 11.5 min

in Group H, and 91.3 ± 12.2 min in Group L, which was seen as statistically significant [$P \leq 0.001$, Figure 1]. The average amount of intraoperative blood loss using the standard absorptive gauze measuring was calculated to be 98.2 ± 12.2 ml, 65.5 ± 13 ml, and 61.4 ± 11 ml, respectively, in Group C, Group H, and Group L, and this difference is considered to be extremely statistically significant [$P \leq 0.001$, Figure 2]. The amount of postoperative fluid drained in Group C is 46.2 ± 7.2 ml, for Group H is 42.7 ± 5.5 , and for Group L is 45.6 ± 7.2 ml, and this is insignificant [$P = 0.11$, Table 2]. The three groups also did not present any statistically significant differences in terms of postoperative complications such as hypocalcemia, RLN palsy, seroma formation, and wound infection [Table 3 and Figure 3]. The mean duration of hospital stay was shorter in Groups L and H than Group C (2.52 ± 1.79 days and 2.47 ± 1.79 days, respectively, in Groups L and H) than Group C (2.98 ± 0.18); this difference was found significant [$P = 0.04$, Table 2].

DISCUSSION

Thyroid surgery requires a skillful surgical technique to identify and respect essential anatomical structures. A strict control of hemostasis is required to avoid serious complications and to reduce the incidence of common postoperative complications involving RLN and parathyroid glands.

LigaSure vessel sealer and harmonic focus permit dissection in addition to homeostasis. The latter has the advantage of directly cutting the tissue after its application while the former requires the use of scissors. LigaSure is capable of hemostasis of blood vessels up to 7 mm in diameter with a thermal damage limited to 2–3 mm while harmonic focus can seal vessels up to 5–6 mm with 2 mm of thermal damage and has an acoustic signal.^[3-5] The main advantages using energy-based hemostasis devices is they act as dissector and has an ergonomic design, similar to traditional instruments, rendering it comfort and easier to use. The advantage of coagulating while cutting characteristics is probably responsible for the reduction in the duration of surgery we observed in the study.

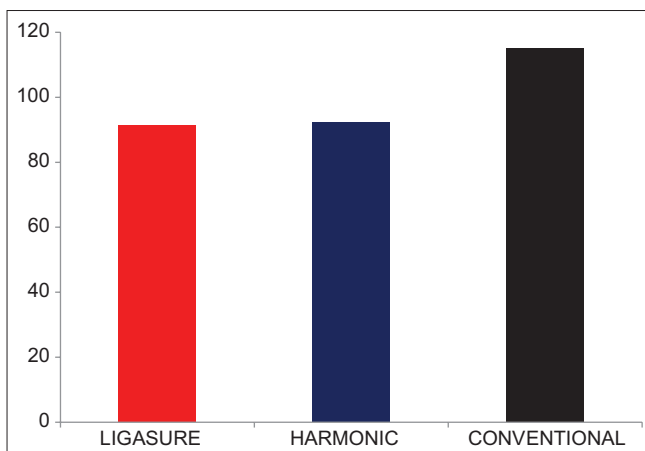


Figure 1: Average operating time in minutes

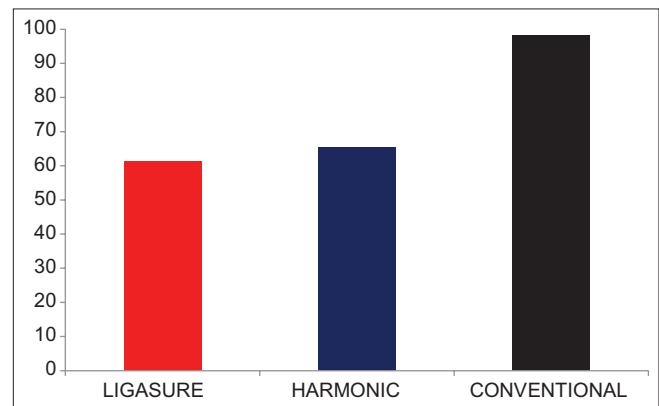


Figure 2: Mean blood loss in milliliters in three groups

Table 2: Parameters compared in three groups				
Variable	Group C	Group H	Group L	P
Age	40.5	42.5	42.5	
Sex				
Male	6	5	7	
Female	22	23	21	
Type of surgery*				
Total thyroidectomy	18	18	18	
Hemithyroidectomy	10	10	10	
Preoperative calcium level	9.3±0.1	9.2±0.3	9.2±0.49	0.3
Average intraoperative blood loss (mL)	98.2±12.2	65.5±13	61.4±11	<0.001
Drain output 2 nd day (mL)	46.2±7.2	42.7±5.5	45.6±7.2	0.11
Postoperative calcium level (mg/dL)	8.2±1	8.0±0.3	8.1±0.2	0.47
Average operative time (min)	115±13.6	92.3±11.5	91.3±12.2	<0.001
Average pain score (0-10) scale	6.2±0.4	6.1±0.3	6±0.6	0.2
Duration of hospital stay (days)	2.98±0.18	2.47±1.79	2.52±1.79	0.04

*Total thyroidectomy, hemithyroidectomy

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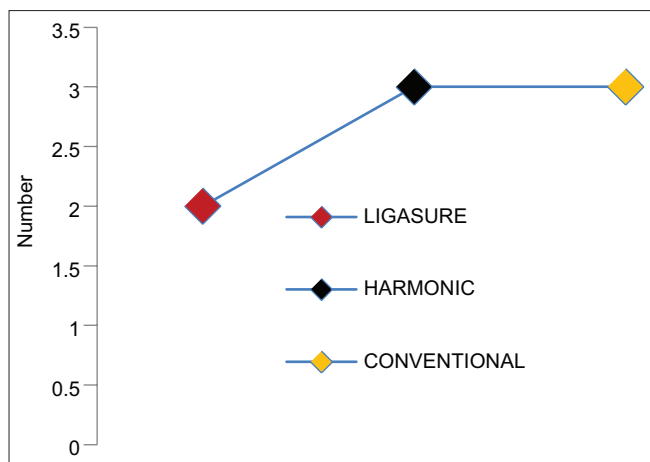


Figure 3: Average number of hypocalcemic events

Our experience shows that both harmonic focus and LigaSure vessel sealing system have a good advantage in thyroid surgery over conventional method in reducing overall operative time, reducing blood loss like studies analyzed by Upadhyaya *et al.*^[1] In our study, there was no improvement in postoperative complications such as hypocalcemia, RLN palsy, wound healing, or seroma formation unlike in various studies done by Spartalis *et al.*^[6] and Salim Mohammed *et al.*^[7] We indeed found an homogeneous distribution of postoperative complications in the three groups of patients without statistically significant differences.

Future randomized control trials of larger patient cohorts with more detailed data of postoperative complications, hospital stay and cost-effectiveness, randomization procedures, and blinding of outcome assessors are needed to draw more meaningful conclusions.

Disclosure

This material has never been published and is not currently under evaluation in any other peer-reviewed publication.

Ethical approval

The permission was taken from the Institutional Ethics Committee prior to starting the project. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Table 3: Postoperative complications in three groups

Variable	Group C	Group H	Group L
Hypocalcemia			
Temporary	3	3	2
Permanent	0	0	0
Recurrent nerve palsy			
Unilateral	2	0	0
Bilateral	0	0	0
Seroma			
Yes	3	0	0
No	25	28	28
Wound infection			
Yes	0	0	1
No	28	28	27

Informed consent

Informed consent was obtained from all individual participants included in the study.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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