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Original Article

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Comparison of Harmonic scalpel and conventional homeostasis in understanding complications followed by total thyroidectomy

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ABSTRACT

BACKGROUND & OBJECTIVE: Thyroidectomy is a classic surgical procedure used worldwide for thyroid gland excision. A study was conducted to compare the outcomes (mean operative time, drainage volume, postoperative pain and hospital stay) and postoperative complications of Harmonic scalpel and conventional homeostasis in patients who underwent total thyroidectomy

METHODOLOGY: A prospective observational study was conducted at the department of general surgery, POF hospital Wah Cantt. The study duration was six months (June 2020-Novemebr 2020). A sample size of 70 patients was calculated using the WHO calculator. Patients for total thyroidectomy were selected through a non-probability consecutive sampling. Patients whose total thyroidectomy was planned were divided into two groups using a random number table. In Group A, we used a harmonic scalpel, while in Group B, we used the conventional homeostasis method to secure homeostasis operatively. Patients were followed after 4 weeks for complications. Chi-Square test and t-test was applied.

RESULTS: A total of 70 patients were included in the study. The mean operative time was 44.5 min±1.4 in the HS group and 66.0 min±2.0 in the conventional homeostasis group ($p \leq 0.001$). Hospital stay was significantly less in the HS group as compared to the conventional homeostasis group (2.3 days ±0.4 vs 3.3 days ±0.4, $p \leq 0.001$). Postoperative drainage was significantly high in conventional homeostasis group as compared to HS group (56.4±1.5 mL vs 36.5±1.5 mL, $p \leq 0.001$).

CONCLUSION: Harmonic scalpel is an effective, reliable and safe tool for better outcomes in terms of less operative time, lower drainage volume and short duration of hospital stay as compared to conventional methods.

KEYWORDS: Harmonic scalpel, Conventional homeostasis, Transient hypocalcemia.

INTRODUCTION

Thyroidectomy is a classic procedure used worldwide for thyroid gland excision [1]. Thyroidectomy is an effective surgical procedure used in modern medicine for treatment of benign, hormonal diseases and malignancies [2]. Total thyroidectomy is a challenging procedure due to the delicate anatomy of anterior neck and the critical nature of adjacent structures. With the passage of time, the total thyroidectomy procedure is evolved with better anatomical understanding [3,4].

Indications of thyroidectomy include thyroid cancer, toxic adenomas, Graves' disease, toxic multinodular goiter and goiter with compressive symptoms. There are a few contraindications, including massive goiter, locally advanced carcinoma, challenging hemostasis, difficult thyroidectomy in graves disease and extensive substernal goiter[5].

Harmonic scalpel (HS) was 1st introduced two decades ago. The device has a dual action of cutting and tissue coagulation simultaneously by using mechanical vibration 55.5kHz. HS procedure has no link with neuromuscular stimulation, having less lateral thermal tissue injury and avoidance of electrical energy transmission through patients. The adoption of harmonic scalpel is common in modern surgical practice. Literature reported that HS is associated with diminished blood loss and less operative time [6].

In a study, it was reported that mean operative time was significantly less in the HS group as compared to the group that underwent conventional homeostasis thyroidectomy (47.2min vs 79.2min, p=0.000). Postoperative transient

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hypocalcemia is more frequent in conventional groups as compared to HS group (48% vs 16%, p=0.01) [7]. Limited literature is available in pre and postoperative blood loss in HS and conventional thyroidectomy. So, our study aims to compare outcomes (mean operative time, drainage volume, postoperative pain and hospital stay) and postoperative complications of Harmonic scalpel and conventional homeostasis group in patients underwent total thyroidectomy.

METHODOLOGY

We conducted a prospective study at the department of general surgery, POF hospital Wah Cantt. The study duration was six months (June 2020-Novemebr 2020). We took official IRB approval from respective hospital (ERC#POFH/ERC/11/19). A sample size of 70 patients (35 patients in each group) was calculated using a WHO calculator with μ1=65.5, μ2=58.5, SD=10, 5% level of significance and 80% power of study [5]. Patients were selected through nonprobability consecutive sampling technique. Inclusion criteria were based on age 18-55 years. Patients of both genders were eligible for thyroidectomy. Exclusion criteria were based upon the need for central or lateral lymph node dissection, previous neck surgery/irradiation, concomitant parathyroid disorders, requiring minimal invasive video assisted thyroidectomy. All participating patients signed a written consent form.

Patients underwent preoperative examination for disease. The preoperative assessment was based on serum thyrotropin levels, gland volume, and evaluation of nodule size with ultrasonography and fine needle aspiration cytology. Total thyroidectomy was performed with general anesthesia, and endotracheal intubation was used in all cases. The inferior, middle and superior thyroid vessels were divided into two main groups. In Group A, we used harmonic scalp, while in Group B, we used the conventional homeostasis method for vessel control following total thyroidectomy. The overall blood loss was measured after the procedure using suction drainage.

Drains were removed post-operatively for 24-36 hours. Serum calcium levels were checked. All patients were given 1000mg of diclofenac every 8 hours (for the first 24 hours) after surgery to control postoperative pain. Patients were evaluated for complications after 4 weeks of surgery.

Data was entered and analyzed using SPSS version 24. Mean and standard deviation was measured for numerical variables, while frequency and percentages were calculated for categorical data. Independent t-test and Chi-square test was applied. p-value≤0.05 was considered significant.

RESULTS

A total of 70 patients were included in the study. There were 39(54.2%) male and 31(44.3%) female. The mean age of patients was 41.9 years±8.8SD. There were 27(38.6%) patients in age group 18-40 years and 43(61.4%) patients in age group >40-55 years. The duration of the disease was 2.9years±0.9SD. The diagnosis was simple multinodular goiter in 64(91.4%) patients and 6(8.6%) in toxic multinodular goiter.

The mean operative time was 44.5min±1.4 in HS group and 66.0 min±2.0 in the conventional homeostasis group (p≤0.001). Hospital stay was significantly less in HS group as compared to the conventional homeostasis group (2.3 days ±0.4 vs 3.3 days ±0.4, p≤0.001). Postoperative drainage was significantly high in conventional homeostasis group as compared to HS group (56.4±1.5 mL vs 36.5±1.5 mL, p≤0.001), as shown in table-I.

Table-I: Comparison of outcomes in HS and conventional homeostasis group.

Outcomes	Interventional groups		p-value
	HS groups (n=35)	Conventional groups (n=35)	
Operative time (min)	44.5±1.4	66.0±2.0	≤0.001
Hospital stays (days)	2.3±0.4	3.3±0.4	≤0.001
Postoperative drainage (mL)	36.5±1.5	56.4±1.5	≤0.001

Table-II: Comparison of Complication and pain in both groups.

Complications	Interventional groups		Total	p-value
	Hs groups (n=35)	Conventional group(n=35)		
Transient recurrent laryngeal nerve palsy(complication of airway management)	2(2.9%)	8(11.4%)	10(14.3%)	
Transient hypocalcemia (corrected calcium ≤ 8.4 mg/Dl)	8(11.4%)	16(22.9%)	24(34.3%)	0.003
Nill	25(35.7%)	11(15.7%)	36(51.4%)	
Total	35(50%)	35(50%)	70(100%)	
Pain (VAS)				
No-Mild (0-3 scores)	15(21.4%)	7(10%)	22(31.4%)	
Moderate (4-7 scores)	18(25.7%)	12(17.1%)	30(42.9%)	0.001
Severe (8-10 scores)	2(2.9%)	16(22.9%)	18(25.7%)	
Total	35(50%)	35(50%)	70(100%)	

In our study, Transient RLN palsy was found in 8(11.4%) of the conventional group patients and 2(2.9%) in HS group. Transient hypocalcemia was reported in 8(11.4%) of HS group and 16(22.9%) in conventional group (p=0.003). All patients recovered, and no definitive hypothyroidism was reported. Patients in conventional groups were more prone to have high pain scores as compared to HS group (p=0.001), as shown in table-II.

DISCUSSION

Homeostasis is one of the very important factors in thyroid surgery associated with the control and division of numerous blood vessels (before gland excision) [8]. Traditional methods were hand-tied ligatures, while other sophisticated means were lasers, staples, clips and bipolar electrocautery for controlling the ends of the vessel before division [9]. The use of monopolar electrocautery for dissection is an important modification in thyroidectomy in the last few decades due to several practical, technical and anatomical reasons [10]. There are several disadvantages of conventional methods, including dislodgment of clip in large vessels, bipolar electrocautery is associated with preventing freedom of applicability at different angles for a surgeon, staples are costly, and lasers are hindered by risk of injury to other structures like recurrent laryngeal nerves [11].

Our study compared harmonic scalpel and conventional methods. We found significantly less operative time, short duration of hospital stays and less postoperative drainage. In another study, it was found that the use of harmonic scalpel is time-saving with limited complications as compared to conventional methods [12]. Another similar study reported that harmonic scalpel is associated with less average time (26 minutes of surgery) and less blood loss, reduction in the incidence of transient hypothyroidism and less postoperative analgesic consumption. They also reported harmonic scalpel as cost-effective as long as 15 patients are sharing the initial cost [13]. Another similar study reported that harmonic scalpel is more effective in terms of bleeding reduction and less operative time than a multifire clip applied for short gastric vessel division [14].

In our Study conventional group was associated with more transient RLN palsy, transient hypocalcemia and postoperative pain as compared to harmonic scalpel. Another study reported that harmonic scalpel is associated with no transient RLN palsy, and less frequency of transient hypocalcemia; however, they reported a significant difference in postoperative bleeding of between the conventional method and harmonic scalpel [15]. A similar study reported that a harmonic scalpel is a reliable and safe tool [7]. The HS is associated with no definitive hypoparathyroidism, less transient hypocalcemia and transient RLN palsies [16-18].

LIMITATION: Conduction of study at a single center limits the generalizability of the study. In our setup, usually surgeons dissect and apply the scalpel (leaving other various surgical maneuvers to assistants. We recommend better team cooperation to further decrease the surgical time.

CONCLUSION

Harmonic scalpel is an effective, reliable and safe tool for better outcomes in terms of less operative time, lower drainage volume and short duration of hospital stay as compared to conventional methods. Moreover, harmonic scalpel is associated with fewer complications. Effective cooperation of surgical staff leads to better outcomes of surgery.

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Author's Contribution:

Munawer Latif Memon: Drafting the work or revising it critically for important intellectual content.
Ijaz Ali: Analysis and interpretation of data.
Brig Muhammad Ali: Substantial contributions to the conception or design of the work, the acquisition, analysis, or interpretation of data for the work.
Sarwat Saeed: Final approval of the version to be published.

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