

Comparison of Total Thyroidectomy with Ligasure Small Jaw Device and Harmonic Scalpel

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ABSTRACT

Objective: To compare our experience with the LigaSure small jaw device and Harmonic scalpel in total thyroidectomy regarding operative time and major complications associated with surgery.

Study Design: Prospective comparative study.

Place and Study Duration: General Surgery Department, Pak Emirates Military Hospital, Rawalpindi and Combined Military Hospital, Kohat Pakistan, from Oct 2017 to Apr 2020.

Methodology: This study included 150 patients diagnosed with simple/toxic multinodular goitre, thyroid carcinoma, and diffuse thyroid enlargement. Eighty-one patients were randomly assigned to the LigaSure Group and 69 to the Harmonic Group who underwent total thyroidectomy. Mean operative time and major complications like blood loss, hematoma, hypocalcemia, recurrent laryngeal injury, and surgical site infection were compared.

Results: Median (IQR) operative time of the LigaSure small jaw device was 55.00(11) minutes, and that of the Harmonic scalpel was 60.00 (11) ($p<0.001$). The postoperative hematoma formation in the LigaSure small jaw device was 1(1.2%), and that in the Harmonic scalpel Group was 0(0%) ($p=0.35$). There was no bilateral nerve injury in both Group. The percentage of hypocalcemia (second postoperative day to seventh postoperative day) in the LigaSure small jaw device was 2(2.5%), and that in the Harmonic scalpel Group was 2(2.9%) ($p=0.9$).

Conclusion: The mean operative time of Thyroid surgery with a LigaSure small jaw device is less than that with a Harmonic scalpel. There is no difference in intraoperative blood loss and postoperative complications between them.

Keywords: Harmonic scalpel, LigaSure small Jaw device, Thyroidectomy.

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INTRODUCTION

Albucasis first performed thyroid surgery back in 952 AD. Billroth and Kocher gave this procedure a new lease of life.¹ Initially, such surgeries were associated with lethal complications due to their highly vascular nature and proximity to vital structures in the neck.^{2,3} The complication rate in the literature was up to 50%, with a mortality rate of 20%.⁴ With time and advancement in surgical techniques, the complications of thyroid surgery have been reduced to a minimum. The two common complications, which include permanent hypocalcemia and permanent recurrent laryngeal nerve injury, have also been reduced to 1% or even less in centres of excellence.⁵

Bloodless surgery is an important aim of a surgeon because intraoperative bleeding is a major concern. Many techniques and new surgical instruments have been devised to address this concern.⁶ LigaSure Small Jaw Energy Devices (LSJ) and Harmonic Scalpel are a few examples. LigaSure thyroidectomy was easier and faster with no learning curve.⁷ The previous study indicated less operative time using

LSJ.³ Different surgeons have compared the efficacy of LSJ and Harmonic Scalpel techniques worldwide to ascertain a better technique.⁸

Several studies have established the superiority of these devices over conventional vascular ligation techniques.^{9,10} In Pakistan, conventional suture ligation of blood vessels and LSJ were recently compared in a study at Pak Emirates Military Hospital, Rawalpindi Pakistan, in which LSJ was preferred. However, LSJ and Harmonic Scalpel have yet to be compared in Pakistan. This study aims to share our experience with LSJ and Harmonic Scalpel with thyroid surgery regarding operation time and major complications associated with surgery.

METHODOLOGY

The prospective comparative study was conducted at the Department of General Surgery, Pak Emirates Military Hospital Rawalpindi, along with Combined Military Hospital Kohat Pakistan, from October 2017 to April 2020. Permission was taken from the Institutional Review Board and Ethical Committee (Certificate Ser. No. 30/04/20). The sample size of this study was taken as 150 patients. The sample size was calculated using the WHO sample size calculator, taking mean postoperative pain of more than 3 in 8.1%

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of patients of the harmonic scalpel Group vs 2.0% of patients of ligasure small jaw device.⁷ The sampling technique was consecutive non-probability samplings.

Inclusion Criteria: Patients with diagnosed with simple/toxic multinodular goitre, thyroid carcinoma, and diffuse thyroid enlargement were included.

Exclusion Criteria: Patients with retrosternal extension and redo thyroid surgeries were excluded.

Eighty-one patients were randomly assigned to the LigaSure Group and 69 to the Harmonic Group who underwent total thyroidectomy. Mean operative time and major complications like blood loss, hematoma, hypocalcemia, recurrent laryngeal injury, and surgical site infection were compared.

One consultant surgeon performed all the surgical procedures. Standard thyroidectomy technique was implied in both Groups for thyroidectomy. A 5-6 cm suprasternal transverse neck incision was made. The subcutaneous layer was separated. Platysmal flaps were raised. In the LSJ Group, the LigaSure Small Jaw device was applied to ligate thyroid vessels and dissect the berry ligament. In the HS Group, the Harmonic Scalpel device was applied for ligating vessels and separating the thyroid gland. Recurrent Laryngeal nerve and parathyroid were preserved in each Group. Blood loss during surgery was measured by the increase in weight of surgical gauze soaked with blood. Each gram rises in weight accounted for 1ml of blood loss. The blood loss from suction drains was also counted.

Statistical Package for Social Sciences (SPSS) version 23.0 was used for the data analysis Descriptive statistics were calculated. The chi-square test was applied for qualitative variables. Mann-Whitney U tests were applied to compare both Groups. The *p*-value of <0.05 was considered significant.

RESULTS

This study included 150 patients diagnosed with simple/toxic multinodular goitre, thyroid carcinoma, and diffuse thyroid enlargement.

The median (IQR) operative time of the LigaSure small jaw device Group was 55.00(11)mins, and that of the Harmonic scalpel Group was 60.00(11)mins which were significant (*p*<0.001). This was different in our study from international studies and maybe because of a learning curve. The median (IQR) amount of blood loss during surgery in the LSJ Group was 40.00(17)ml, & that in the Harmonic Scalpel Group was 40.00(13)ml.

Postoperative hematoma formation in LigaSure small jaw device was seen in 1(1.2%) patient, and that in the Harmonic scalpel Group was 0(0%) with *p*=0.35. The unilateral recurrent laryngeal nerve injury in the LigaSure small jaw device was 3(3.7%), and that in the Harmonic scalpel Group was 1(1.5%) with a *p*-value of 0.9. The percentage of hypocalcemia in the LigaSure small jaw device was 2(2.5%), and that in the Harmonic scalpel Group was 2(2.9%). The surgical site infections in the LigaSure small jaw device was 2(2.5%), and that in the Harmonic scalpel Group was 2(2.9%) with *p*=0.87 (Table).

Table: Comparison of Results of Variables LigaSure Group and Harmonic Scalpel Group (n= 150)

Variables	LigaSure Device Group (n=81)	Harmonic Scalpel Group (n=69)	<i>p</i> -value
Median Operative Time (mins)	55.00(11)	60.00(11)	<0.001
Median Intraoperative Blood Loss (ml)	40.00(17)	40.00(13)	0.98
Postoperative Hematoma	1(1.2%)	0(0%)	0.35
Recurrent Laryngeal Nerve Injury	3(3.7%)	1(1.5%)	0.9
Postoperative Hypocalcemia	2(2.5%)	2(2.9%)	0.9
Surgical Site Infection	2(2.5%)	2(2.9%)	0.87

DISCUSSION

The commencement of HS and LSJ devices in surgical practice now means a decreased surgical time.¹¹ These devices take less time to achieve haemorrhage control compared to suture ligation. The surgeons who use these devices regularly further reduce operative time due to the easy handling of these devices. The HS has the functions of achieving haemostasis and cutting the required area.¹² Contrary to this, the LSJ device only delivers haemostasis while implying a scissor for cutting purposes. Studies have shown that the HS has decreased operative time compared to LSJ as HS cuts the vessels at the same coagulation time. However, LSJ only functions by coagulation.^{13,14}

Moreover, new versions of HS and LSJ devices have been introduced into the surgical practice. The new LSJ device has a blade to cut the tissues after coagulating them. It considerably has improved the surgical time even to match of HS device or even exceed it if the surgeon is more used to handling the

LSJ device.¹⁵ The same happened in this study in which new versions of the LSJ device known as LS Precise were implied, which cut the tissues with the blade and decreased the operative time compared to the HS Group, which is different from international studies.^{16,17} However, the variations in surgeons' experience with each device can change the results, as happened with us. For example, the surgeon who performed the surgeries in our study was comparatively more experienced and handy with the LSJ device. In addition, the LSJ device was a new version with a blade used for cutting purposes, thereby decreasing operative time with the LSJ Group.¹⁸

No difference has been noted in the intraoperative blood loss in both the LSJ and HS Groups in our study. Since the operations have been performed by a single consultant surgeon over a prospective time, we can assume with certainty that the lack of difference between the intraoperative blood losses may be attributed to the coagulative properties of both the LSJ and HS devices being comparable. No statistical difference has been noted in other postoperative complications in both Groups. However, a non-statistical difference was noted in postoperative hematoma and recurrent laryngeal injury, slightly higher in the LSJ Group. This change could be because the LSJ Group patients were operated on mostly before those of the HS Group in our study. So it can be attributed to the operating surgeon's expertise curve, which got more refined at the end of the study in the HS Group.

CONCLUSION

The mean operative time of Thyroid surgery with LigaSure small jaw device is less than that with a Harmonic scalpel in our experience. In both Groups, there is no statistical difference in complications like intraoperative blood loss, Postoperative Hematoma, Recurrent laryngeal nerve injury and hypocalcemia.

Conflict of Interest: None.

Authors Contribution

Following authors have made substantial contributions to the manuscript as under:

ZHS & MM: Conception, study design, drafting the manuscript, approval of the final version to be published.

LA & HAA: Data acquisition, data analysis, data interpretation, critical review, approval of the final version to be published.

TY: Critical review, interpretation of data, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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