

# Efficacy of Liga Sure in Total Thyroidectomy: A Tertiary Care Hospital Experience

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## Author's Contribution

<sup>1,2,3</sup>Substantial contributions to the conception or design of the work; or the acquisition, <sup>5,6</sup>analysis, or interpretation of data for the work, <sup>1,2,7</sup>Drafting the work or revising it critically for important intellectual content, <sup>1,4</sup>Final approval of the version to be published, <sup>8</sup>Literature review

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## ABSTRACT

**Objective:** To evaluate the effectiveness of the ligasure small jaw (LSW) device in achieving hemostasis during total thyroidectomy.

**Methodology:** This study is conducted as a retrospective observational study at Akbar Niazi Teaching Hospital, Islamabad. Eighty-six patients underwent thyroidectomy using LSW between April 2021 till April 2024 were studied. Liga Sure is an advanced bipolar vessel-sealing device that uses a combination of controlled pressure and radiofrequency energy to permanently seal blood vessels up to 7 mm in diameter, providing effective hemostasis with minimal thermal spread. Parameters including per operative findings of intraoperative bleeding and operative time and postoperative findings of voice change and hospital stay were assessed. After approval from the ethical board, data was collected as a qualitative research study and entered on standard SPSS sheet version 26.

**Results:** A total of 86 patients were observed during the study period. Per operative findings of intraoperative bleeding measured by the visual gauze method showed 6ml gauze blood in 39.5% and more than 6ml gauze blood in 26.8% and rest of the patients were having 3ml-6ml gauze blood. The mean surgery time noted was 92.07±6.34 minutes. 64% of the patients had hospital stay of 1-2 days. Only 1 patient had voice hoarseness which was improved after giving stat dose of steroid. The use of Liga Sure demonstrated effective hemostasis, acceptable operative time, short hospital stays, and a low complication rate in patients undergoing total thyroidectomy.

**Conclusion:** The results demonstrated that LSW effectively minimized intraoperative bleeding, reduced operative time, and preserved recurrent laryngeal nerve function, with minimal complications. Comparative analysis with traditional ligation techniques, diathermy or bipolar devices confirmed the efficiency and safety of LSW.

**Keywords:** Thyroidectomy, Liga sure small jaw, Hemorrhage

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## Introduction

Thyroid gland surgeries before 19<sup>th</sup> Century had hazardous complications due to the vascular nature of thyroid gland and adjacently situated vital structures like recurrent laryngeal nerve, trachea, parathyroid gland, carotid sheath and esophagus. From a pathophysiological perspective, the thyroid gland is one of the most vascular organs in the human body, receiving blood supply from the superior and inferior thyroid arteries and draining through a dense

venous plexus. Disruption of this extensive vascular network during surgery predisposes patients to significant intraoperative bleeding and postoperative cervical hematoma, a potentially life-threatening complication due to airway compromise.<sup>6</sup> Moreover, excessive bleeding can obscure the surgical field, increasing the risk of inadvertent injury to the recurrent laryngeal nerve and parathyroid glands, which may result in vocal cord palsy and hypocalcemia, respectively<sup>7</sup> with advent of significant

advancements, the complication rate after thyroid surgery has reduced to almost 1%.<sup>1</sup> In thyroid surgeries, the traditional ligation technique along with commonly used instruments like diathermy and bipolar is widely used for achieving precise hemostasis. However, this technique has some drawbacks, including the time-consuming process of ligating vessels, potential complications such as hematoma, and the risk of injuring the recurrent laryngeal nerve and causing hypocalcemia.<sup>2</sup> The thyroid gland's rich blood supply and the proximity of major blood vessels in the neck make effective hemostasis critical, but the conventional method of vessel ligation apart from being time taking there is fear of slip of ligation if not done properly.<sup>1</sup>

Moreover, cauterization can cause adjacent tissue injury thus always a chance of injuring the recurrent laryngeal nerve. The thyroidectomy needs meticulous attention to achieving effective hemostasis to prevent potential complications like hematoma pre and postoperatively. Traditional techniques involving clamps and ties, previously considered the gold standard, have been largely abandoned by surgeons with large case load.<sup>3</sup> Rather, healthcare using current and advance methodology has developed a range of devices which enables quicker and safer hemostasis.<sup>2</sup> The choice of which energy-based device to use depends on a combination of the surgeon's personal preference and feasibility and readily availability of the instrument.<sup>8</sup> In everyday medical practice, there are 3 main hemostatic devices: the Focus Harmonic Scalpel, Liga sure Small Jaw, and Thunder beat. The Focus Harmonic Scalpel uses ultrasound vibration of a blade at 55 Hz. This vibration transfers mechanical energy to tissue proteins, causing their denaturation. When proteins denature, they form a coagulum that seals the vessels and ensures hemostasis at low temperatures.<sup>9</sup> The Liga sure Small Jaw is a remarkable device that utilizes bipolar coagulation to denature the collagen and elastin of the vascular wall, while also employing ultrasonic technology for rapid cutting and precise dissection, thus offering dual benefits.<sup>8</sup> This creative fusion permit for definitive vessel sealing and provides the advantage of achieving a swift upswing in temperature with least heat dissipation to adjacent structures.<sup>4</sup> The present study aimed to evaluate intra- and postoperative complications using LSJ in a cohort of patients undergoing total thyroidectomy.

Despite the increasing adoption of LSW in thyroid surgery, limited local data are available evaluating its intraoperative and postoperative outcomes in tertiary care hospitals. Given the high patient burden and resource constraints in such settings, it is essential to assess whether

the routine use of LSW translates into measurable clinical benefits, including effective hemostasis, reduced operative time, shorter hospital stay, and minimal complications.

Therefore, the present study was undertaken to evaluate the intraoperative and postoperative outcomes associated with the use of Liga Sure Small Jaw in patients undergoing total thyroidectomy at a tertiary care hospital.

## Methodology

This study was designed as a retrospective observational study conducted at Akbar Niazi Teaching Hospital over a three-year period from April 2021 to April 2024. The study protocol was reviewed and approved by the Institutional Review Board/Ethical Review Committee of Akbar Niazi Teaching Hospital ref no 160/IMDC/IRB-2024. As the study involved retrospective analysis of existing medical records, the requirement for written informed consent was waived, and patient confidentiality was strictly maintained throughout the study.

A total of 86 patients were included using a non-probability consecutive sampling technique. Medical records of patients aged 18 to 70 years who underwent total thyroidectomy for benign goiter in a euthyroid state were reviewed and Data were collected through review of the hospital's electronic medical records and physical patient files in the record room. Intraoperative blood loss was obtained from the anesthesia records, while postoperative outcomes were extracted from daily progress notes documented by the surgical and nursing teams.

Patients with known coagulation disorders, those on anticoagulant therapy, pregnant women, patients with retrosternal goiters, those undergoing concomitant lymph node dissection or parathyroidectomy, and patients with a history of neck reoperation were excluded from the study.

All procedures were performed by the same surgical team to minimize inter-operator variability. Total thyroidectomy was carried out using the Liga Sure Small Jaw (LSW) energy-based vessel sealing device for vascular control and tissue dissection. Conventional ligation techniques were not used. Patients with goiter after making them euthyroid and confirming through normal TSH levels. All patients underwent preoperative laboratory tests and were admitted to the hospital one night prior to the surgery. Prior to the surgical procedure, the patients received appropriate morning antibiotics. The procedures were conducted with endotracheal intubation under general anesthesia. An upper and lower flap under

the platysma was created through a collar incision, followed by identifying the middle thyroid vein to be managed using a Liga Sure vessel. The closure and division of the vessels were achieved simultaneously through the application of high current and low voltage. After securing hemostasis and removing thyroid gland, two redivic drains were placed and closure done in layers. The sealing process resulted from the denaturation of collagen and elastin in the vessel wall. Following the procedure, the skin was closed using subcuticular suturing with prolene 2/0. Upon extubation in the operating room, patients underwent direct laryngoscopy to evaluate the integrity of the RLN.

The effectiveness of the Liga Sure Small Jaw device was assessed using predefined intraoperative and postoperative outcome measures, including:

- Intraoperative blood loss, assessed using the visual gauze method, data collected from reviewing anesthesia
- Total operative time, measured from skin incision to skin closure
- Postoperative complications, including cervical hematoma, recurrent laryngeal nerve injury (assessed clinically), and hypocalcemia (assessed clinically and post operative calcium levels sent at 24hrs
- Duration of hospital stay

Effective use of the device was defined as achieving satisfactory hemostasis with acceptable operative time, minimal blood loss, absence of major postoperative complications, and early postoperative recovery.

Intraoperative blood loss was documented in operative notes and anesthesia notes and categorized based on gauze saturation. Patients were observed postoperatively for neck swelling or hematoma formation and documented in file and progress notes.

Assessment of vocal cord mobility was assessed postoperatively at the operating table. Any postoperative voice change or hoarseness was recorded.

Serum calcium levels were measured at 24 hours postoperatively, and patients were clinically evaluated for signs and symptoms of hypocalcemia, including Chvostek's sign and paresthesia.

Data were extracted from hospital medical records (electronic and file record with anesthesia notes and postoperative progress notes) entered into a secure

database. Descriptive statistical analysis was performed, and results were expressed as means  $\pm$  standard deviations for continuous variables and frequencies with percentages for categorical variables using SPSS software.

## Results

A total of 86 patients were included in the study. The mean age was  $41.71 \pm 6.4$  years. There were 18 males (20.9%) and 68 females (79.1%). Table I

**Table 1: Patient Demographics and Clinical Outcomes.**

Variable	Statistic
Mean Age (years)	$41.71 \pm 6.4$
Sex (M/F)	18 (20.9%) / 68 (79.1%)
Mean Operative Time (minutes)	$92.07 \pm 6.34$
Mean Postoperative Calcium (mg/dL)	$9.4 \pm 0.7$
Voice change	1 (1.16%)

The mean operative time was  $92.07 \pm 6.34$  minutes. Intraoperative bleeding, assessed using the visual gauze method, was categorized as follows and illustrated in figure 1.

- 3 ml blood loss in 31.4% (n=27) of patients
- 6 ml blood loss in 39.5% (n=34)
- 6 to 8 ml blood loss in 26.7% (n=23)
- More than 8 ml blood loss in 2.4% (n=2)

The mean postoperative serum calcium level was  $9.4 \pm 0.7$  mg/dL. Regarding hospital stay, the majority of patients (64%, n=55) had a hospital stay of 1–2 days. Only 1–2% of patients had a prolonged stay of 3–4 days, primarily due to high seroma output. This distribution is illustrated in figure 2.

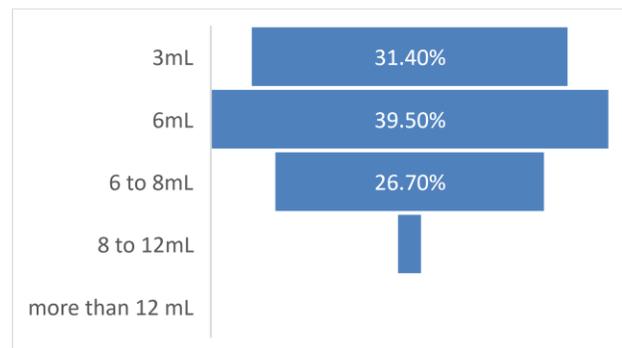


Figure 1. Showing the percentage of the patients and amount of intraoperative bleeding.

Only 1 patient (1.16%) exhibited postoperative voice change, as documented in postoperative progress notes, patient received steroids for the complaint and speech

therapy. No other cases of recurrent laryngeal nerve injury were documented.

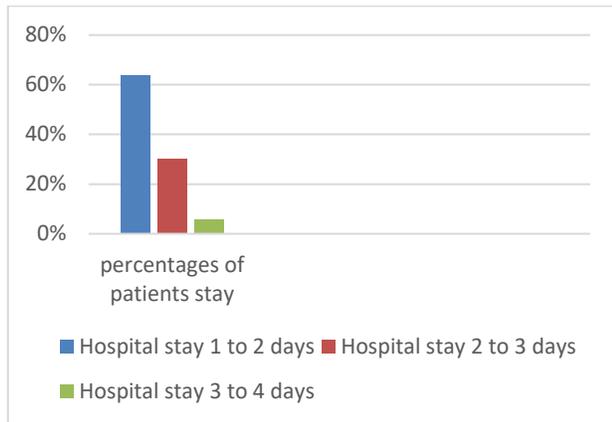


Figure 2. Showing the percentage of patients who stay in the hospital post-operatively.

To assess the effectiveness of Liga Sure™ Small Jaw, the association between intraoperative blood loss and operative time was examined using Pearson’s correlation coefficient, which showed a moderate positive correlation ( $r = 0.42$ ,  $p < 0.01$ ), indicating that increased blood loss was associated with longer operative times. Table II

Category	Intraoperative Bleeding (%)	Hospital Stay (%)
3 ml	31.4	
6 ml	39.5	
6-8 ml	26.7	
>8 ml	2.4	
1-2 days		64
3-4 days		1.5
>4 days		0.5

A one-way ANOVA test was performed to compare mean hospital stay across categories of intraoperative bleeding. Patients with bleeding >6 ml had a significantly longer hospital stay compared to those with ≤6 ml ( $p = 0.03$ ). One-way ANOVA showed that higher intraoperative bleeding (>6 ml) is significantly associated with longer hospital stay ( $p = 0.03$ ), confirming the clinical relevance of blood loss control. No significant differences in postoperative serum calcium levels were observed across bleeding categories ( $p = 0.28$ ).

## Discussion

The best option of treatment for a number of thyroid conditions, for instance thyroid goiters, Grave's disease and malignancy is thyroidectomy, either whole or partial, which normally has low rates of morbidity and death. Thyroid gland surgical resection is a challenging

procedure for the surgeon, requiring both an effective hemostasis and dry anatomical area<sup>7</sup> The vast vascular system of the thyroid gland necessitates accurate hemostasis to reduce the chances of intraoperative bleeding. Damage to the adjacent tissues is frequently the reason of high morbidity; the most severe postoperative consequences include RLN paralysis and hypocalcemia.<sup>8</sup>

A substitute to these old techniques is the development of diathermy systems and ultrasonic, which allow good control over bleeding and a reduction of typical postoperative complications. As compared to electrocautery procedures, the LSW device seeks to decrease heat injury by tissue clusters and sealing arteries.<sup>9</sup>

As compared to old methods, a meta-analysis indicated that the Liga sure use was significantly related with less intraoperative bleeding, shorter operating times and less postoperative hemorrhages. Hence, energy-based device performance help to decrease the chances of RLN palsy.<sup>10</sup> It was consistent by our study which showed that Liga sure usage preserved RLN and voice.

In most of the studies, decrease in the operative time was also seen secondary to use of Liga sure energy devices in thyroidectomy.<sup>11, 12</sup> It was the same as mentioned in our study. Another study showed that using Liga Sure device resulted in significant less bleeding intraoperatively and decrease operation time as compared to other traditional hemostasis.<sup>13</sup> Likewise, one more retrospective research found that the Liga Sure diathermic system usage reduced the duration of the surgery, the amount of blood lost and the risk of complications.<sup>14</sup> As the LS technique is more efficient and quicker as compared to conventional methods at attaining hemostasis during thyroidectomies; it also decreases overall surgical time and intraoperative blood loss.

The Liga Sure device not only increases sealing efficacy but also significantly decrease the chance of postoperative bleeding by allowing for overlapping closing of target tissues.<sup>15</sup>

Studies have demonstrated that bleeding during surgery is reduced when using the LSJ method. It's due to LSJ's better vascular sealing method, in which blood vessel lumen is restricted by sealing actions. One other study found a relation between the LS regimen and decrease intraoperative bleeding, reduce operating time and drainage following techniques.<sup>16</sup> These studies show same results as our study in which Liga sure usage has very less bleeding intraoperative. Likewise, there have been no postoperative problems like hematoma, etc.

Another similar study showed that, as comparison to the traditional methods, the LS system was able to do a fully non-suture thyroidectomy with better outcomes in terms of RLN palsy and postoperative hematoma.<sup>17</sup> Another study found a relationship between the LS regimen and reduces intraoperative bleeding, a small decrease in operating duration and drainage following procedures.<sup>18</sup>

## Conclusion

For thyroidectomy, the sealing device offers a secure and reliable substitute for the conventional suture and tie approach. It shortens the duration of surgery, lowers intraoperative and postoperative bleeding, lowers the risk of both temporary and permanent hypocalcemia following surgery, and lowers the risk of both temporary and permanent paralysis of the superior and RLNs. Based on the findings of the numerous studies mentioned above, it can be concluded that the suture-less approach of thyroid surgery is preferable since it would shorten the duration of the operation, minimize related problems, and shorten hospital stays.

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