

Original Article

Comparing the Outcome of Conventional Suture Ligation Technique *versus* Sutureless Technique Using Bipolar Diathermy in Thyroidectomy — a Randomized Controlled Trial

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Abstract

Background : Thyroidectomy is among the most commonly performed surgical procedures Worldwide for managing thyroid disorders. The Conventional Suture Ligation (CSL) technique, while effective, is associated with prolonged operative time, increased intraoperative blood loss, and a higher risk of complications such as knot slippage and foreign body reactions. The introduction of advanced electro-surgical devices has paved the way for sutureless techniques using bipolar diathermy, which offer precise vessel sealing with reduced thermal spread and minimal tissue trauma. This study aimed to compare the safety and effectiveness of a sutureless technique using bipolar diathermy versus the Conventional Suture Ligation technique in thyroidectomy.

Materials and Methods : An open-label randomized controlled trial was conducted at the Department of General Surgery, Aarupadai Veedu Medical College and Hospital, Puducherry, over an 18-month period. A total of 82 patients, aged 18-60 years and diagnosed with thyroid disorders, were randomly allocated into two equal groups (n = 41). Group 1 underwent thyroidectomy with the sutureless technique using bipolar diathermy, while Group 2 underwent the Conventional Suture Ligation technique. Baseline demographic and clinical parameters - including Age, Gender, BMI, and preoperative laboratory values - were comparable between the groups. Primary outcomes measured were intraoperative blood loss, operative time and postoperative haemoglobin levels, with secondary outcomes including drain volume, recurrent laryngeal nerve injury, hypocalcemia and duration of hospital stay.

Results : Despite similar baseline characteristics, Group 1 exhibited a significantly higher mean postoperative haemoglobin level (12.8 ± 0.9 g/dL) compared to Group 2 (11.7 ± 1.3 g/dL; $p < 0.05$). Additionally, the duration of hospital stay was significantly shorter in Group 1 (3.0 days) than in Group 2 (3.6 days; $p < 0.05$).

Conclusion : The sutureless technique using bipolar diathermy is a safe and efficient alternative to Conventional Suture Ligation in thyroidectomy, offering improved intraoperative hemostasis and reduced hospital stay.

Key words : Thyroidectomy, Bipolar Diathermy, Sutureless Technique, Suture Ligation, Intraoperative Blood Loss, Hospital Stay.

Thyroidectomy is one of the most commonly performed surgical procedures Worldwide for managing thyroid disorders¹. Thyroidectomy has undergone substantial advancements over the years, with refined surgical techniques leading to lower morbidity and better patient outcomes. The adoption of safer practices, including intracapsular vessel ligation and careful identification of the recurrent laryngeal nerve before ligating blood vessels, has greatly minimized the risk of complications, as evidenced by the work of pioneering surgeons^{2,3}.

Historically, thyroidectomy has been performed using the Conventional Suture Ligation (CSL) technique, which continues to be a commonly used and effective approach. However, CSL has several drawbacks, such as extended operative time, greater intraoperative blood loss, an increased risk of knot slippage, slower wound healing, a higher chance of postoperative infections, potential

Editor's Comment :

■ Sutureless techniques in thyroidectomy can provide outcomes comparable to conventional suture ligation with potential advantages such as reduced operative time and improved surgical efficiency. These techniques may be considered a safe and effective alternative in thyroid surgery when performed with appropriate expertise.

damage to surrounding structures, and foreign body reactions. These limitations have driven the search for alternative techniques to enhance surgical efficiency and improve patient safety^{4,5}.

The introduction of advanced electro-surgical devices has transformed Thyroid Surgery by enabling suture-free vessel sealing techniques that shorten operative time, reduce blood loss, and minimize tissue trauma and postoperative complications. Among these innovations, bipolar diathermy has emerged as a reliable tool in thyroidectomy due to its precision and safety. Unlike monopolar cautery, which poses a greater risk of lateral thermal spread and unintended tissue injury, bipolar cautery ensures focused hemostasis with minimal collateral damage. It functions through a straightforward electro-surgical unit controlled by a foot pedal, making it both widely available and cost-effective⁶. Additionally, the power required for bipolar cautery is significantly lower -

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approximately 5% of that used in monopolar electrocautery - reducing the risk of excessive thermal injury^{7,8}. Bipolar cautery operates by transmitting electrical energy between two closely positioned electrodes, allowing for precise coagulation of blood vessels while maintaining controlled thermal spread. During the process, negatively charged erythrocytes move toward the anode tip, promoting tissue adherence. This targeted mechanism enhances surgical accuracy, reduces excessive tissue charring, and optimizes intraoperative hemostasis⁹.

The primary objective of this study is to evaluate the effectiveness of bipolar cautery in Thyroid Surgery compared to the Conventional Suture Ligation technique. The study aims to assess key intraoperative and postoperative parameters, including operative time (measured in minutes), intraoperative blood loss (quantified by the number of gauze pieces soaked), and postoperative complications. By comparing these outcomes, we seek to determine whether bipolar diathermy offers a safer, faster and more efficient alternative to the traditional suture ligation method in thyroidectomy. The aim of this study is to compare the safeness and effectiveness of sutureless technique using bipolar diathermy with Conventional Suture Ligation technique in thyroidectomy

MATERIALS AND METHODS

This open-label, randomized controlled trial was conducted in the Department of General Surgery at Aarupadai Veedu Medical College and Hospital, Puducherry, over 18 months. The study included patients presenting with thyroid diseases who were scheduled for thyroidectomy, aged between 18 and 60 years, and willing to provide informed consent. Patients with toxic nodular goiter, those undergoing re-surgery, and those who declined participation were excluded to ensure homogeneity. A total of 82 patients were enrolled and randomly assigned to two groups using a computer-generated sequence: Group A (41 patients) underwent a sutureless thyroidectomy using bipolar diathermy, while Group B (41 patients) underwent a Conventional Suture Ligation technique. Convenience sampling was used for patient selection.

All participants underwent a standardized preoperative evaluation, including blood tests, thyroid profile, fine-needle aspiration cytology, Ultrasound and indirect laryngoscopy, along with anesthetic fitness clearance. The surgical procedure was performed under General Anesthesia with endotracheal intubation. The operative site was prepared with aseptic precautions, and the thyroidectomy was performed following established techniques for each group. Group A employed bipolar diathermy for hemostasis, while Group B utilized

Conventional Suture Ligation for vascular control. Postoperative care included broad-spectrum antibiotics for two days, with most patients being discharged on the third postoperative day.

Patients were followed up at 10 days, 6 weeks, and 12 weeks post-surgery to assess complications such as recurrent laryngeal nerve injury, hypocalcemia, hematoma formation, and changes in voice. Blood loss was measured using a standardized method, calculating intraoperative blood loss through gauze weight differences. Hypocalcemia was assessed clinically and confirmed through serum calcium tests when necessary. Hematoma formation and voice changes were monitored throughout the follow-up period.

The study analyzed multiple variables, including patient demographics, pre- and postoperative haemoglobin levels, intraoperative blood loss, operative duration, drain volume, and postoperative complications. Data were entered into an Excel sheet and analyzed using SPSS v26.0. Continuous variables were compared using an unpaired t-test, while categorical variables were analyzed using the chi-square test. A p-value of <0.05 was considered statistically significant.

RESULT

Present study included total of 82 cases with 41 in each group as group 1 and group 2. Group 1 underwent sutureless technique using bipolar diathermy and group 2 underwent Conventional Suture Ligation technique (Table 1).

The mean age between the group were comparable with mean age of 44.3 in group 1 and 43.1 years in group 2 patients. The physical parameters such as Height, Weight and BMI between the group were comparable with no significant difference. There is no significant difference in mean level of pre-hemoglobin, TLC and PCV between the groups. The mean postoperative calcium level were comparable between the groups. The mean duration of hospital stay was significantly lower in group 1 (3.0 days) compared to group 2 patients (3.6days)(p<0.05). The

Table 1 — Showing mean parameters of patients between the groups

	Group 1		Group 2		p-value
	Mean	SD	Mean	SD	
Age	44.3	9.1	43.1	9.1	0.65
Height in cm	155.7	7.1	161.9	7.5	0.34
Weight in kg	53.6	11.1	58.3	8.6	0.55
BMI	21.95	3.25	22.09	1.56	0.21
Pre- Hemoglobin mg/dl	13.2	1.0	12.6	1.4	0.31
TLC 10 µL	6.94	1.80	6.41	1.69	0.22
PCV	38.8	1.7	38.8	2.0	0.28
Post-op Haemoglobin mg/dl	12.8	.9	11.7	1.3	0.01*
RBS mg/dl	112.4	12.3	110.8	13.5	0.21
Post-op calcium level	9.0	.8	8.9	.8	0.32
Duration of hospital stay	3.0	.2	3.6	.7	0.05*

mean Postoperative hemoglobin was significantly higher in group 1 (12.8 ± 0.9) compared to group 2 patients (11.7 ± 1.3) ($p < 0.05$). The RBS was found to be similar between the group with no significant difference (Table 2).

Gender distribution between the groups were comparable, with female pre-ponderance in both the group in study. The type of thyroid disorder were comparable between both the groups, with majority of single nodular goiter in both the groups.

DISCUSSION

Present study included total of 82 cases with 41 in each group as group 1 and group 2. Group 1 underwent sutureless technique using bipolar diathermy and group 2 underwent Conventional Suture Ligation technique. The mean age between the group were comparable with mean age of 44.3 in group 1 and 43.1 years in group 2 patients. Gender distribution between the groups were comparable, with female pre-ponderance in both the group in study. The physical parameters such as Height, Weight and BMI between the group were comparable with no significant difference. In concordance to present study Aljuraibi W, *et al*, documented with no significant differences between the two groups in terms of Age, Sex, Body Mass Index, or Operative Mortality¹⁰. Another study by Kumar R, *et al*, among the 116 patients, 52 cases were diagnosed with solitary thyroid nodule, 30 cases were diagnosed with multinodular goitre, 17 cases were diagnosed with carcinoma thyroid and 17 cases were diagnosed with Grave's disease¹¹. Vasuki R, *et al*, documented majority of patients were aged 30-40 years, followed by those aged 40-50 years, with a male-to-female ratio of 1:25¹².

Another study by Abdulmageed MU, *et al*, the mean age was comparable between groups, with 40.0 ± 9.7 years in the conventional suture ligation group and 40.5 ± 11.7 years in the harmonic scalpel group¹³. Another study by Parveen K, *et al*, the mean age and BMI were similar between both groups, with Group I having a mean age of 35.34 ± 6.55 years and BMI of 25.15 ± 7.21 kg/m², while Group II had a mean age of 36.23 ± 4.31 years and BMI of 25.15 ± 8.15 kg/m². The gender distribution was comparable, with a majority being female in both groups. Multinodular goiter was the most common condition, affecting 80% in Group I and 75% in Group II¹⁴.

The mean Post Operative haemoglobin was significantly higher in group 1 (12.8 ± 0.9) compared to group 2 patients (11.7 ± 1.3) ($p < 0.05$). The RBS was found to be similar between the group with no significant difference. The mean duration of hospital stay was significantly lower in group 1 (3.0 days) compared to group 2 patients (3.6 days) ($p < 0.05$). Similarly, Aljuraibi W *et al*. reported that the Ligasure technique significantly outperformed the suture-ligation method in total thyroidectomy. Patients in

Table 2 — Comparison of distribution between the groups

	Group 1		Group 2		Chi-square (p-value)
	Count	N %	Count	N %	
Gender :					
Female	35	85.4%	27	65.9%	2.32 (0.32)
Male	6	14.6%	14	34.1%	
Thyroid Disorder Type :					
MNG	17	41.5%	16	39.0%	0.05 (0.92)
SNG	24	58.5%	25	61.0%	

the Ligasure group experienced a notably shorter surgery duration (115.54 ± 15.35 minutes) compared to those undergoing suture ligation (127.1 ± 7.95 minutes). Additionally, intraoperative blood loss was substantially lower with Ligasure (62.06 ± 7.34 ml) than with suture ligation (75.84 ± 9.21 ml). Postoperative fluid drainage also showed a marked reduction in the Ligasure group (54.16 ± 9.21 ml) compared to the suture-ligation group (66.28 ± 8.99 ml). The study ultimately affirmed that the Ligasure sealing system offers a safe and efficient alternative for total thyroidectomy, minimizing surgical time, blood loss, and postoperative drainage while ensuring the preservation of laryngeal nerve and parathyroid function¹⁰. Another study by Prakash O, *et al*, found the average procedure time for suture ligation was significantly longer at 131.6 ± 17.7 minutes, whereas bipolar cautery required only 97 ± 7.5 minutes. Additionally, hospital stays were prolonged in the suture ligation group (6 ± 0.8 days) compared to the bipolar cautery group (4.9 ± 1.3 days). This study concludes that bipolar cauterization offers a significant advantage over conventional suture ligation by reducing surgery time, hospital stay and postoperative complications such as seroma, hoarseness of voice, and hypocalcemia, making it a more efficient and safer technique¹⁵.

The sutureless technique resulted in significantly lower intraoperative and postoperative blood loss, drain volume, transient hypocalcemia, general postoperative complications, and hospital stay in study by Amer I, *et al*¹⁶. Hegab AM, *et al*, group A (knot-tying) had a mean operative time of 124.7 ± 5.2 minutes and an estimated blood loss of 101 ± 15.9 ml, while group B (bipolar) showed a significantly lower mean operative time of 103.9 ± 7.8 minutes and blood loss of 80 ± 16.2 ml. Postoperative pain was significantly lower in the bipolar group, but there was no significant difference in operative and postoperative complications between the two groups. The study concluded that bipolar electro-cautery is a simple and effective technique for thyroidectomy, offering reduced operative time and blood loss without increasing the risk of complications¹⁷. Prathap R, *et al*, concluded that using a bipolar thermal device is a cost-effective method for achieving hemostasis in thyroid surgery, offering reduced operative time and lowering perioperative and postoperative morbidity and mortality, making it a promising alternative to standard ligation techniques¹⁸.

CONCLUSION

The findings underscore the potential benefits of employing bipolar diathermy in Thyroid Surgery, as it not only enhances surgical efficiency but also improves patient recovery without compromising safety. Overall, the results of this study support the adoption of the sutureless technique using bipolar diathermy as a viable alternative to traditional suture ligation in thyroidectomy, while also highlighting the need for further research with larger sample sizes and extended follow-up periods to validate these outcomes and assess long-term efficacy.

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Conflict of Interest : Nil

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