Open Access

Original Article

Comparison of Use of Ligasure and Bipolar Diathermy Vs. Conventional Technique for Thyroidectomy

Sajjad Ahmad Ansari, Maria Bint Zafar, Muhammad Saeed Akhtar, Wasif Idris Ahmed, Shahum Khan, Muhammad Ahsan Mustafa

Department of General Surgery, Combined Military Hospital Bahawalpur/National University of Medical Sciences (NUMS) Pakistan

ABSTRACT

Objective: To compare the outcome of ligasure and bipolar diathermy versus conventional techniques among patients undergoing thyroidectomies.

Study Design: Quasi-experimental study.

Place and Duration of Study: Department of General Surgery, Combined Military Hospital, Bahawalpur Pakistan, from Mar to Oct 2024.

Methodology: Eighty patients undergoing thyroidectomy were equally divided into two Groups. Group-A patients underwent thyroidectomy using ligasure and bipolar diathermy, while Group-B was treated by conventional technique by the same surgeon. Duration of surgery, duration of hospitalization, and complication rate were noted in the proforma. All the data was entered on the proforma by the researcher.

Results: Out of eighty patients 27.5% (n=22) were male and 72.5% (n=58) were female. Of these, 68.8% (n=55) belonged to rural areas and 31.2% (n=25) were from urban areas. Twenty-eight (35.0%) had poor social backgrounds while 65.0% (n=52) were from middle-income families. Diabetics were 22.5% (n=18), hypertensive were 30.0% (n=24) and obese were 15.0% (n=12). Among Group-A and Group-B; complication rate, Mean duration of surgery, and duration of hospital stay were 7.5% (n=03), 91.93±8.43 minutes, 1.35±0.48 days, and, 37.5% (n=15), 122.00±6.86 minutes, 2.10±0.59, respectively, showing significant values of $p<0.001$.

Conclusion; The ligasure and bipolar diathermy method are safe, effective, and reliable with decreased post-operative complication rate, mean duration of surgery, and hospital stay as compared with the conventional technique employed for thyroidectomy.

Keywords; Bipolar, Conventional Techniques, Diathermy, Ligasure, Thyroidectomy.

How to Cite This Article: *Ansari SA, Zafar MB, Akhtar MS, Ahmed WI, Khan S, Mustafa MA. Comparison of Use of Ligasure and Bipolar Diathermy Vs. Conventional Technique for Thyroidectomy. Pak Armed Forces Med J 2026; 76(4): 574-578. DOI: https://doi.org/10.51253/pafmj.v76i4.12813*

INTRODUCTION

The incidence of thyroid disease in the general population is enormous. The literature search indicates a 2%–8% prevalence of thyroid dysfunction (hyper or hypothyroidism) in the general population.[1] The prevalence of hyperthyroidism in women is between 0.5% and 2% and it is 10 times less common in men.[2] Total thyroidectomy is a surgical procedure wherein the thyroid gland is removed. However, the use of a total thyroidectomy procedure is considered not to be safe for thyroid carcinomas because of the risks involved.[3] Total thyroidectomy provides the advantage of eliminating the risk of recurrence.[4] Knowledge about clinical profiles of thyroidectomy cases and understanding post-thyroidectomy complications are an important milestone in public health.[5]

Thyroidectomy can be approached using different surgical methods: the conventional technique, ligasure, and bipolar diathermy. Conventional Technique involves individually tying off or clipping blood vessels 6. This leads to longer surgeries and increased bleeding. Ligasure employs specialized technology, ligasure simultaneously cuts and seals blood vessels reducing surgery duration, minimizes blood loss, and faster recovery.[7] However, its use increases overall costs while bipolar diathermy uses electrical energy to coagulate and seal blood vessels.[4] The technique often hinges on factors such as the surgeon's expertise, patient-specific considerations, and the resources.[8] Recent research suggests that both Ligasure and bipolar diathermy can decrease operative time and blood loss compared to conventional methods.[9]

This proposed study was designed to document outcomes in terms of mean hospital stay, duration of operative time, and complications rate among Ligasure and bipolar diathermy versus conventional technique. A comparison of the combined use of two devices vs the conventional method is not seen in other studies. The results will help us to create awareness among surgeons to adopt more effective techniques

Correspondence: Dr Sajjad Ahmad Ansari, Department of General Surgery, Combined Military Hospital Bahawalpur Pakistan

Received: 27 Oct 2024; revision received: 09 Dec 2024; accepted: 13 Dec 2024

which will decrease prolonged hospital stay and excessive calcium carbonate therapy in these patients.

METHODOLOGY

This Qausi experimental study was conducted at the Department of General Surgery, Combined Military Hospital (CMH), Bahawalpur from March 2024 to October 2024. The study was conducted as per ethical guidelines and approved by the ethical committee of Combined Military Hospital, Bahawalpur (ERC Ltr No.000076, dated 05 March 2024). The sample size was calculated using WHO sample size calculator with the level of significance 5%, power of the test 90%, mean duration of surgery in the ligasure Group as 89.23±5.12 minutes and 114.16±7.51 minutes in conventional Group.[10] The sample size in each Group was calculated as minimum 30 which was increased to 40 in each Group for better results.

Inclusion Criteria: Patients undergoing thyroidectomy of either sex aged 18–70 years were included in our study. Patients with multinodular and solitary nodule goiter were included. All patients having normal thyroid profiles and calcium levels were included. The patient has no retrosternal extension of the thyroid.

Exclusion Criteria: Patients with a previous history of thyroid surgeries, preoperative hypocalcemia, tumors, heart diseases, CRF, CLD, Hepatitis B and C positive cases, alcoholic abuse and pregnant ladies were excluded from our study.

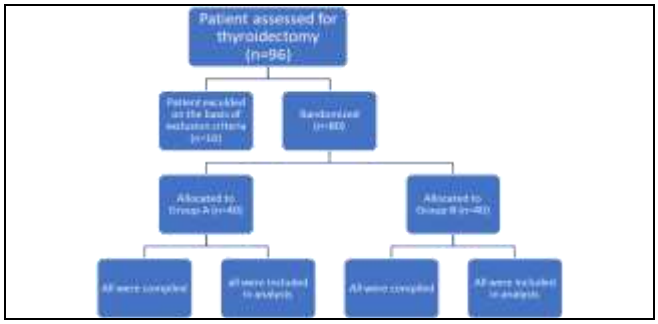

Figure: Patient Flow Diagram

A total of ninety-six patients presented in the Department of Surgery of CMH Bahawalpur for thyroidectomy sixteen patients were excluded on the basis of exclusion criteria. The remaining eighty patients meeting the inclusion criteria were enrolled in this study (Figure). Informed consent was taken from each patient and these patients were divided into 2 Groups by draws method using sealed envelopes containing marked letters with A and B. Those who picked envelop marked with A were placed in Group A and was treated using ligasure and bipolar diathermy technique while those who pick B were treated by a conventional technique by the same surgeon, as per hospital protocols. Complication rate (hemorrhage, recurrent laryngeal nerve damage, hematoma formation, or hypocalcemia), duration of surgery, and duration of hospitalization were noted in the proforma. All the data was entered on the proforma by the researcher.

All the data was entered and analyzed using Statistical Package for the Social Sciences (SPSS) version 25. Mean and standard deviation for the age, operative time, and postoperative hospital stay were calculated. Frequencies and percentages were calculated for the categorical variables like gender, age Groups, obesity, diabetes, and hypertension. Mean operative time and duration of postoperative hospital stay were compared using an independent sample t-test at a level of significance of 0.05. Complications (Yes/No) in both Groups were compared using a chi-square test.

RESULTS

Eighty patients undergoing thyroidectomy were included in this study, having 22(27.5%) male patients versus 58(72.5%) female patients. Mean ages were 39.25±10.12 years while 68(85.0%) were aged up to 50 years. Baseline parameters like gender, age Groups, residential status, socioeconomic status, and comorbidities like hypertension, diabetes, and obesity of both Groups were comparable, as shown in Table-I.

A significant difference was found between the Group-A and Group-B patients for post-operative parameters as shown in Table-II.

A large number of complication rates were found in patients operated with the conventional method as compared to the ligasure and bipolar method as shown in Table-III.

DISCUSSION

Eighty patients undergoing thyroidectomy were included in this study, having 27.5% (n=22) male patients versus 72.5% (n=58) female patients. Youssef *et al.*,[11] from Egypt has also reported 76 % of female patients and 24% of male patients undergoing thyroidectomy, similar to our results. Most of the patients were below 50 years about 85.0% (n=68). The mean age of male patients was 40.09±12.64 years while that of female patients was 38.93±9.10 years (p=0.650). A Turkish study by Demiral *et al.*,[12] have also

documented 38.1 years mean age of the patients undergoing thyroidectomies, similar to our results. Of these 80 patients undergoing thyroidectomy, 68.8% (n=55) belonged to rural areas and 31.2% (n=25) were from urban areas. Twenty-eight (35.0%) had poor social backgrounds while 65.0% (n=52) were from middle-income families. Of these 80 patients, 22.5% (n=18) were diabetic, 30.0% (n=24) were hypertensive and 15.0% (n=12) were obese (Mean BMI was 24.21±2.02 kg/m2). All these parameters showed no significant difference among the two Groups. This means that the outcome of the surgery does not depend on these baseline parameters.

Table-I: Baseline characteristics in both Groups (n=80)

Characteristics	Groups		*p*-value
	Group A (n=40)	Group B (n=40)	
Gender			
Male (n=22)	12(30.0 %)	10(25.0 %)	0.617
Female (n=58)	28(70.0 %)	30(75.0 %)	
Age Groups			
Up to 50 Years (n= 68)	32(80.0 %)	36(90.0 %)	0.210
>50 Years (n=12)	08(20.0 %)	04(10.0 %)	
Residential status			
Rural (n=55)	27(67.5 %)	28(70.0 %)	0.809
Urban (n=25)	13(32.5 %)	12(30.0 %)	
Socioeconomic status			
Poor (n=28)	14(35.0 %)	14(35.0 %)	0.998
Middle Income (n=52)	26(65.0 %)	26(65.0 %)	
Diabetes			
Yes (n=18)	08(20.0 %)	10(25.0 %)	0.592
No (n=62)	32(80.0 %)	30(75.0 %)	
Hypertension			
Yes (n=24)	14(35.0 %)	10(25.0 %)	0.329
No (n=56)	26(65.0 %)	30(75.0 %)	
Obesity			
Yes (n=12)	04(10.0 %)	08(20.0 %)	0.210
No (n=68)	36(90.0 %)	32(80.0 %)	

Table-II: postoperative comparison of two Groups (n=80)

Parameters		Group A	Group B	*p*-value
Duration of surgery	Mean±SD, minutes	91.93±8.43	122.00±6.86	<0.001
Duration of postoperative hospital stay	Mean±SD, days	1.35±0.48	2.10±0.59	<0.001

Table-III: Comparison of complication rate of the two Groups (n=80)

Complication	Group A, n=40	Group B, n=40	*p*-value
Yes n(%)	3(7.5%)	15(37.5%)	<0.001
No n(%)	37(92.5%)	25(62.5%)	

Complications like hemorrhage, recurrent laryngeal nerve damage, hematoma formation, or hypocalcemia in Group A were noted in 7.5% (n=03) versus 37.5% (n=15) in Group B which was statistically significant (p<0.001). As the device seals large as well as small vessels it decreases the chance of hematoma formation or bleeding in the postoperative period. The mean duration of surgery in Group A was noted to be 91.93±8.43 minutes versus 122.00±6.86 minutes in Group B, (p<0.001). as most of the time is wasted on the ligation of small vessels. The mean duration of postoperative hospital stay was noted to be 1.35±0.48 days in Group A compared with 2.10±0.59 days in Group B, (p<0.001). This might be due to less manipulation of the tissue and less intraoperative bleeding with the bipolar and ligasure method.

These results were comparable to the results of a study done by Dias *et al.*,[13] His study comprised 59 patients and results showed that the suture-less technique was superior to the conventional suture ligation technique as the former had shorter operative time, reduced amount of intraoperative bleeding, low incidence of the postoperative drain, decreased postoperative changes of voice, and a smaller number of days of hospital stay following the surgery. Hegab *et al.*,[14] from Al – Azhar University Hospital, Cairo Egypt has also reported 103.9±7.8 minutes mean duration of surgery in the ligasure Group versus 124.7±5 minutes in the conventional Group (p<0.001) among patients undergoing thyroidectomies while the postoperative duration of hospitalization was also shorter. Prakash *et al.*,[15] has also documented that the complication rate was significantly less in ligasure and bipolar diathermy versus conventional techniques and the duration of surgery was also 97±7.5 minutes versus 131.6±17.7 minutes, respectively. A study conducted by Su *et al.*,[16] on 527 patients. He compares bipolar devices, harmonic scalpels, and conventional methods for thyroidectomy. He showed the effects of bipolar coagulation forceps on open thyroid surgery exceeded those of the harmonic scalpel and conventional thyroidectomy.

The combination of Ligasure and bipolar diathermy in thyroidectomy procedures has proven to be effective and advantageous compared to conventional techniques. This technology allows simultaneous cutting and sealing of blood vessels using advanced energy. It reduces surgical time and the risk of excessive bleeding, aiding in faster recovery and lowering the chance of complications related to bleeding in thyroid surgeries. Using electrical energy to seal blood vessels, this method complements Ligasure by further minimizing bleeding during thyroidectomy, especially in delicate tissues.[17] The

combined use of Ligasure and bipolar diathermy in thyroid surgeries offers several benefits such as; Shorter Surgery Time**:** Conducting cutting, coagulation, and sealing simultaneously speeds up the surgery, leading to quicker completion.[18] Reduced Bleeding: Efficiently sealing blood vessels lowers the risk of excessive bleeding, ensuring a safer procedure. Quicker Recovery: With minimized trauma and reduced blood loss, patients may recover faster, allowing an earlier return to regular activities. Potential for Fewer Complications: Compared to traditional methods, using both technologies has shown promising outcomes in reducing postoperative complications associated with thyroidectomy.[19] This will decrease extra healthcare expenditures in terms of short operative time will help to save time for the surgical team and shorter post-operative hospital stays will ensure the availability of more beds to other patients with less risk of surgical site infections.

LIMITATION OF STUDY

The study was done in a single setup and had a small sample size which should be increased. As it is operative dependent and depends on the skills of the surgeon; also, the perioperative findings differ from patient to patient, these all increase the bias of the study. The patients with thyroid tumors were excluded, such patient has a higher chance of complication and should be studied. Although there was a reduction in surgical time but with higher cost-effectiveness.

CONCLUSION

Our study results support ligasure and bipolar diathermy as it was found to be safe, effective, and reliable as compared with conventional techniques employed for thyroidectomy. Postoperative complication rate, mean duration of surgery, and hospital stay were significantly shorter in the ligasure and bipolar diathermy Group and hence all Surgeons treating such patients can effectively employ this technique for desired clinical outcomes.

Conflict of Interest: None.

Funding Source: None.

Authors' Contribution

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

SAA & MBZ: Data acquisition, data analysis, critical review, approval of the final version to be published.

MSA & WIA: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

SK & MAM: Conception, data acquisition, 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.

REFERENCES

1. Aydin I, Sengul I, Sengul D. Sutureless total thyroidectomy for substernal goiter: amending versus unnecessary. Cureus 2021; 13(1): e12720. https://doi.org/10.7759/cureus.12720
2. Hanson MA, Shaha AR, Wu JX. Surgical approach to the substernal goiter. Best Pract Res Clin Endocrinol Metabol 2016; 33(4): 101312. https://doi.org/10.1016/j.beem.2019.101312
3. Pacilli M, Tartaglia N, Gerundo A, Pavone G, Fersini A, Ambrosi A. Energy based vessel sealing devices in thyroid surgery: a systematic review to clarify the relationship with recurrent laryngeal nerve injuries. Medicina 2020; 56(12): 651. https://doi.org/10.3390/medicina56120651
4. Lee E, Tong JY, Pasick LJ, Benito DA, Joshi A, Thakkar PG, et al. Complications associated with energy-based devices during thyroidectomy from 2010–2020. World J Otorhinolaryngol Head Neck Surg 2023; 9(01): 35-44. https://doi.org/10.1016/j.wjorl.2021.04.008
5. Wang JJ, Huang TY, Wu CW, Lin YC, Tseng HY, Liu CH, et al. Improving voice outcomes after thyroid surgery–review of safety parameters for using energy-based devices near the recurrent laryngeal nerve. Front Endocrinol 2021; 12: 793431. https://doi.org/10.3389/fendo.2021.793431
6. Spartalis E, Giannakodimos A, Giannakodimos I, Ziogou A, Papasilekas T, Patelis N, et al. The role of LigaSure™ and Harmonic Scalpel in the preservation of recurrent laryngeal nerve during thyroidectomy. Ann Royal Coll Surg Eng 2022; 104(5): 324-329. https://doi.org/10.1308/rcsann.2021.0125
7. Hirunwiwatkul P, Tungkavivachagul S. A multicenter, randomized, controlled clinical trial of LigaSure small jaw vessel sealing system versus conventional technique in thyroidectomy. Eur Arch Oto-Rhino-Laryngol 2013; 270: 2109-2114. https://doi.org/10.1007/s00405-012-2289-8
8. Mao XC, Chen C, Wang KJ. Efficacy and safety of LigaSure™ small jaw instrument in thyroidectomy: a 1-year prospective observational study. Eur Arch Oto-Rhino-Laryngol 2018; 275: 1257-1263. https://doi.org/10.1007/s00405-018-4912-9
9. Grøndal AY, Høgsbro M, Pryds K, Pedersen HB, Jacobsen H. Intra-and postoperative complications using ligasure™ small jaw in patients undergoing thyroidectomy: A register-based study. Eur Arch Oto-Rhino-Laryngol 2021: 6685. https://doi.org/10.1007/s00405-021-06685-w
10. Habash M, Sultan A, Ghareeb O. Surgical outcomes of ligasure bipolar device versus conventional technique in total thyroidectomy. J Natural Sci Biol Med 2022; 13(2): 119-123. https://jnsbm.org/article-view/?id=146
11. Youssef T, Mahdy T, Farid M, Latif AA. Thyroid surgery: use of the LigaSure Vessel Sealing System versus conventional knot tying. Int J Surg 2008; 6(4): 323-327. https://doi.org/10.1016/j.ijsu.2008.05.005
12. Demiral G, Aksoy F. Comparison of LigaSure and the Conventional Method in Total Thyroidectomy: A Single Surgeon s Experience and Review of the Literature that LigaSure is not superior to Suture Ligation in Total Thyroidectomy. Ulutas Med J 2019; 5(1): 77-83. https://doi.org/10.5455/umj.20191022104415
13. Dias SJ, Gobishangar S, Priyatharsan K, Praramanathan S. Outcome Analysis of Total Thyroidectomy: Conventional Suture Ligation Technique vs Sutureless Technique. Cureus 2023; 15(10): 48005. https://doi.org/10.7759/cureus.48005

14. Hegab AM. Comparative study between bipolar electro-cautery and knot-tying technique in total thyroidectomy. Al-Azhar Int Med J 2021; 2(10): 7-11. https://doi.org/10.21608/aimj.2021.91331.1553
15. Prakash O, Chandrashekar S, Mattews J, George R, Suprej K, Mattew J, et al. Bipolar cautery versus conventional suture ligation of vascular pedicles in thyroidectomy: a comparative clinical study. Int Surg J 2021; 8(4): 1181-1184. http://doi.org/10.18203/2349-2902.isj20211294
16. Su L, Li J, Tang X, Sang J. Therapeutic effects of bipolar coagulation forceps on open thyroid surgery. Revista de Invest Clín 2017; 68(5): 256-261.
17. Hameed AR, Ammar AS, Saleem M, Naeem H, Hameed U, Khattak SB, et al. Comparison of outcome of conventional suture ligation versus ligasure vessel sealing in patients undergoing total thyroidectomy for multinodular goiter. Profes Med J 2023; 30(10): 1219-1224. https://doi.org/10.29309/TPMJ/2023.30.10.7625
18. Chavez KV, Barajas EM, Ramírez J, Pantoja JP, Sierra M, Velázquez-Fernandez D, et al. Comparative analysis between a bipolar vessel sealing and cutting device and the tie and suture technique in thyroidectomy: A randomized clinical trial. Surgery 2017; 161(2): 477-484. https://doi.org/10.1016/j.surg.2016.07.036
19. Vasuki R, Thanmaran NB, Malathi V, Kujur L. A study of use of bipolar cautery in thyroidectomy. Int Surg J 2017; 4(3): 1059-1064. http://dx.doi.org/10.18203/2349-2902.isj20170862