

Original Research Article

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Bipolar cautery versus conventional suture ligation of vascular pedicles in thyroidectomy: a comparative clinical study

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ABSTRACT

Background: Thyroidectomies are commonly performed surgeries worldwide. With better knowledge of anatomy and major advent of energy devices, morbidity of thyroidectomy has drastically declined. Two main globally followed procedures to deal with vascular pedicles are conventional suture ligation and electro cautery devices. The objectives of the present study are to compare classical suture ligation and bipolar cautery of vascular pedicles in thyroidectomy, in terms of duration of procedure, hospitalization and operative complications.

Methods: Retrospective observational comparative study was conducted in 100 patients who underwent total thyroidectomy in our institution for a period of 3 years from 4 September 2017. Non random sampling techniques applied on all consecutive patients who are eligible according to the inclusion criteria. Patients divided into two groups used: suture ligation (n=50), bipolar cauterization (n=50). The main outcomes measured were surgical and hospitalization time; duration of wound drain and post-operative complications (hoarseness, hypocalcemia and seroma). Student t test (for quantitative) and Chi Square test (for qualitative) applied for analysis.

Results: Post-operative complications are present more in the suture ligation group (66%) compared to bipolar cautery (24%). The procedure time in ligation is a 131.6 ± 17.7 minutes which is, significantly higher compared to bipolar cautery (97 ± 7.5 minutes). Duration of hospital stay is more in suture ligation (6 ± 0.8 days) compared to bipolar cautery (4.9 ± 1.3 days).

Conclusions: As per our study, bipolar cauterization has significant reduction of surgery time, duration of hospital stay and postoperative complications viz seroma, hoarseness of voice, hypocalcemia compared to conventional suture ligation.

Keywords: Bipolar cautery, Thyroidectomy, Sutureless thyroidectomy

INTRODUCTION

Thyroidectomy is frequently done for the patients with thyroid diseases all over the world, which has extremely low morbidity rate due to the advent of safe thyroidectomy techniques like intra capsular ligation of vessels and tracing recurrent laryngeal nerve before vessel ligation as shown by our pioneers. Conventionally,

the procedure was done by suture ligation technique which is a good method and followed all over the world but, it has the disadvantage of prolonged procedure time, risk of knot slipping, delayed healing, increased chance of wound infection, injury to neighbouring structures and foreign body reaction.¹ The advanced electrosurgery devices have been helpful in significant reduction in duration of surgery, it is suture free and has lesser tissue

reaction and complications. The first generation electrocautery device such as bipolar cautery, that has been part of thyroidectomy armamentarium in all centers, is a simple device and will work on any conventional electrosurgical unit with monopolar cautery and a foot switch.²

However, bipolar cautery has an advantage over simpler monopolar cautery; it has less thermal spread to the adjacent tissues. In bipolar cautery, tissues adhere to the anode tip, this is due to migration of negatively charged erythrocytes to the positive pole during coagulation.³ The power needed for using bipolar cautery is as low as 5% compared to monopolar cautery and also, very much cost effective compared to the advanced devices like harmonic scalpel and ligasure vessel sealing devices which are available in higher centres only.^{4,5}

Current study is among the very few, limited studies conducted to compare the outcome of thyroidectomy using the electrothermal bipolar cautery and conventional suture ligation technique, which is relevant in the scenario of demanding low cost health care in our country where most of the surgeons facing difficulty in procuring costly energy devices.

Objectives

The objectives of the present study are to compare classical suture ligation and bipolar cautery of vascular pedicles in thyroidectomy, in terms of duration of procedure, hospitalization and operative complications.

METHODS

Study type, location and duration

Current study is a retrospective cohort study (cohort A: patients who underwent conventional thyroidectomy, cohort B: patients who underwent thyroidectomy with diathermy) conducted at department of general surgery, Pushpagiri institute of medical sciences, India from 4 September 2017 to 4 September 2020.

Study population

Patients admitted in general surgery wards who underwent thyroidectomy during the period of study.

Inclusion and exclusion criteria

All adult patients who underwent thyroidectomy were included in the study. Patients previously operated for any neck pathology or with previous neck irradiation were excluded from the study.

Follow up and data collection

Patients were followed up from the start of surgery till the discharge from the hospital. data was collected from the

case files of the patients from the medical records department of the institution, data collected in proforma later entered into the excel spread sheet for analysis.

Variables

Quantitative variables were: duration of surgery (minutes), duration of wound drain kept (days), duration of hospital stay (days). Qualitative variables were: immediate post-operative complications (hemorrhage, hypocalcemia and recurrent laryngeal nerve injury). Data sources/measurement: institutional medical record department for patient data, PubMed and Google scholar for previous research article and measured using recent SPSS software. Bias; If any possible bias was observed while conducting the study it was reported in limitations of the study. Sample size; considering mean (SD) of hospital stay after surgery among bipolar diathermy and conventional thyroidectomy as 4.3 (1) and 3.5 (0.7) respectively, with 95% CI and 95% power sample size calculated to be 31 in each group. Considering, 20% loss to follow up we will include 37 individuals in each group, according to Ahmed et al study.⁶ Statistical methods; data will be entered in MS Excel and analyzed using SPSS. Continuous variables will be expressed with mean with standard deviation or median with IQR on the basis of distribution. Categorical variables will be expressed as proportion. T test or appropriate non parametric test will be used to assess the statistical significance if, association when outcome is continuous variable and chi square test will be used when outcome is categorical variable. Multivariable analysis will be done including variable which shown p value <0.2 in univariate analysis.

RESULTS

In current study of 100 cases, there were 13 males (13%) and 87 female (87%) patients with male:female ratio of 1:6.7 with a high female preponderance. Post operative complications include hoarseness, hypocalcemia and seroma. Post operative complications are present more in the suture ligation group compared to bipolar cautery (66% vs. 24%). The average time taken for surgery in Suture ligation is 131.6 ± 17.7 is significantly higher compared to bipolar cautery. The duration for wound drain kept is significantly higher in suture ligation compared to bipolar cautery. The duration of hospital stay is more in suture ligation surgery group compared to bipolar cautery surgery group.

DISCUSSION

In current study of 100 cases, there were 13 males (13%) and 87 female (87%) patients with male:female ratio of 1:6.7 with a high female preponderance, which is in accordance with most of the studies 69% of patients are in the age group of 50-69 years. Mean age for bipolar cautery group is 48.5 ± 10.9 and for suture ligation group is 51.2 ± 9.3 . All cases were clinically diagnosed as multi nodular goiter.

The average time taken in conventional suture ligation is 131.6 ± 17.7 minutes which is significantly higher compared to bipolar cautery group taking 97 ± 7.5 minutes.

Table 1: Post operative complications in two surgery groups.

Post operative Complications	Group		Total	P value
	Suture ligation N (%)	Bipolar cautery N (%)		
Yes	33 (66)	12 (24)	45 (45)	
No	17 (34)	38 (76)	55 (55)	<0.001
Total	50 (100)	50 (100)	100	

Table 2: Duration of surgery (minutes) in two surgery groups.

Surgery group (n=50)	Duration of surgery (minutes)		P value
	Mean \pm SD	Median (IQR)	
Suture ligation	131.6 ± 17.7	129 (20)	
Bipolar cautery	97 ± 7.5	95 (12)	<0.001

Table 3: Duration of wound drain kept (days) in two surgery groups.

Surgery group (n=50)	Duration of wound drain (days)		P value
	Mean \pm SD	Median (IQR)	
Suture ligation	3.2 ± 0.8	3 (1)	
Bipolar cautery	2.7 ± 0.7	3 (1)	0.002

Table 4: Duration of hospital stay (days) in two surgery groups.

Surgery group (n=50)	Duration of wound drain (days)		P value
	Mean \pm SD	Median (IQR)	
Suture ligation	6 ± 0.8	6 (2)	
Bipolar cautery	4.9 ± 1.3	5 (2)	<0.001

Govindaraj et al studies shows "mean operating time for lobectomy was 20 minutes, total thyroidectomy 45 minutes and total thyroidectomy with neck dissection 180 minutes.⁷ Manouras et al found that compared with the classic technique, surgical time was reduced significantly by about 20% when the bipolar vessel sealer or harmonic scalpel was used (93.3 ± 12.5 vs. 74.3 ± 14.2 and 73.8 ± 13.8

minutes, $p=0.001$, and $p=0.001$, respectively.⁸ Sandonato et al experimented use of electro thermal cautery in thyroid surgery, evaluating its efficacy in hemostasis and reducing the post-operative complications like hypoparathyroidism and recurrent laryngeal nerve palsy.⁹

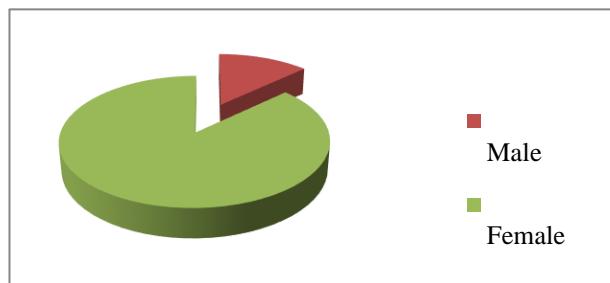


Figure 1: Gender distribution.

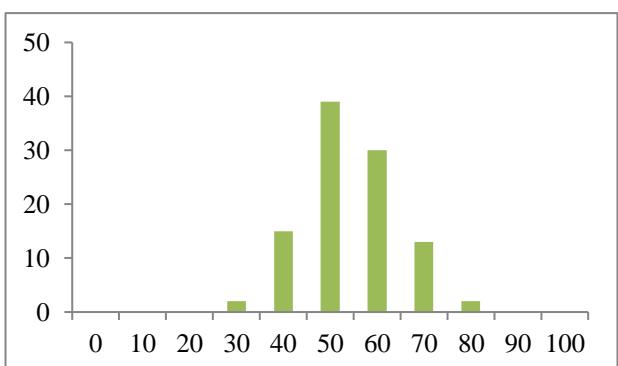


Figure 2: Age distribution.

Bipolar cautery reduces the blood loss in the surgical field making it more visible, and hence, the surgeon can do better and faster than conventional knot tying method. In current study, hypocalcaemia was seen in 2 (4%) cases in thyroidectomies using bipolar cautery and in 10 (20%) cases in conventional suture ligation method which, were transient and resolved with conservative treatment. Bove et al found that the incidence of transient hypocalcemia was of 24.5%.¹⁰ Rajendran et al study shown that no clinically relevant difference in incidence of transient hypocalcaemia in both the groups ($p=0.238$).¹¹ There was no case of permanent recurrent laryngeal nerve (RLN) palsy. However, transient post operative voice disturbances (hoarseness) were seen in 10 (20%) cases for conventional group and 3 (6%) cases for bipolar cautery group. Saint Marc et al in their study, found the postoperative complication rate of 35% overall, including all transient postoperative disturbances.¹² In current study, the incidence of postoperative wound seroma was seen in 13 cases (26%) for conventional and 7 cases (14%) in bipolar cautery group. Vasuki et al, in the study of 50 patients who underwent thyroidectomy, of them 6 patients developed complications (12%) i.e. 1 patient developed postoperative wound soakage (2%), 1 patient developed voice change (2%), 1 patient developed seroma (2%) and, 3 patients developed symptoms and signs of hypocalcaemia (6%).¹³

In current study, the duration for wound drain kept is significantly higher in suture ligation 3.2 ± 0.8 days compared to bipolar cautery 2.7 ± 0.7 days ($p=0.002$). Ahmed et al, found mean duration of wound drainage was 68.8 ± 20 hours in conventional suture tie ligation and 50.4 ± 6.7 hours in bipolar vessel sealing group which, is a statistically significant reduction in bipolar group with a $p=0.012$ value.⁷ The duration of hospital stay, in our study is found to be more in suture ligation surgery group 6 ± 0.8 days compared to bipolar cautery surgery group 4.9 ± 1.3 day, which was similar to the study done by Vasuki et al, a total of 50 patients studied in bipolar cautery group, the mean duration of hospital stay is 4 days.¹³ Ahamed et al got 4.3 ± 1 days in conventional group and 3.5 ± 0.7 days ($p=0.003$) in bipolar group.⁶

Our study, is one among the few limited studies in literature, comparing conventional suture ligation of vascular pedicles and commonly available bipolar diathermy machine. Bipolar cautery is a safe, an effective and easily method available at lower cost which, can also, be reciprocated even in rural areas. It produces less complication than conventional methods. A study by Challa, Surapaneni et al shows that bipolar surgical diathermy for thyroidectomy is better instead of ligasure and Harmonic scalpel which are costly and available in higher centers only.⁵ Barbaros et al in 2006 used ligasure in patients with hyperthyroidism and found the complication rates of the ligasure and conventional thyroidectomy groups were 4 and 6%, respectively ($p>0.05$).¹⁴

CONCLUSION

Current study shows that any type of thyroidectomy using bipolar cautery for addressing vascular pedicles is a safe and an effective method with fewer incidences of post-operative complications including reduced duration of surgery. Thyroidectomies using simple bipolar cautery is less time consuming compared to conventional knot tying technique.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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