Original Research Article

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A study of use of bipolar cautery in thyroidectomy

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ABSTRACT

Background: Thyroidectomy is one of the most commonly performed surgeries throughout the world which has an extremely low morbidity rate. Nowadays with the advent of newer techniques the duration of surgery and complications have decreased. Conventionally Thyroidectomy was done by suture knot tying technique which needs large number of surgical ties and also time consuming. It decreases healing as well as increases wound infection, injury to neighboring structures and foreign body reaction.

Methods: In this study, I selected 50 patients with thyroid swelling attending the surgery outpatient department from February 2015 to August 2015. Thyroid surgery was done using bipolar cautery. The results were analyzed.

Results: This study shows most of the patients belong to 30-40 years followed by 40-50 years. The male: female ratio is 1:25. Time duration varies from 50 minutes to 135 minutes. The longer duration of surgery compared to other studies is attributed to learning curve. We started using bipolar diathermy since 2013. The blood loss ranges from 25-50 ml. Complication rates are also less with bipolar thyroidectomy, 2% had postoperative hemorrhage, 2% developed temporary RLN palsy, 2% developed minor degree of wound infection, and 6% developed signs and symptoms of hypocalcemia. The mean duration of hospital stay was 4 days.

Conclusions: Thyroidectomy using bipolar cautery is safe and effective method and also less time consuming. The cost of the bipolar cautery is less compared to harmonic scalpel and LigaSure. Bipolar cautery is available in our government hospital. Blood loss using Bipolar Cautery is less compared to conventional Knot-tying technique. The post-operative complications are less with bipolar cautery.

Keywords: Bipolar cautery, Monopolar cautery, Thyroidectomy, Suter less thyroidectomy

INTRODUCTION

Thyroidectomy is one of the common surgeries performed in general surgery department and one of the most commonly performed surgeries throughout the world which has an extremely low morbidity rate. Now days with the advent of newer techniques the duration of surgery and complication have decreased. Conventionally Thyroidectomy was done by suture knot tying technique which decreases healing as well as increases wound infection, injury to neighboring structures and foreign body reaction.¹ Thyroidectomy using bipolar cautery is

suture less and less time consuming also blood loss during surgery is minimal. Wound healing is better and the post- operative complications are less with thyroidectomy done by bipolar cautery. Bipolar cautery has an advantage over monopolar cautery; it doesn't affect 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.^{2,3} There more chances of damage to the tip due to repeated cleaning to remove the charred particles in the tip.⁴ The power needed to coagulate a surface point depends on the impedance of the circuit (the cautery tip to ground plate in monopolar and in bipolar

from one cautery tip to the other). This impedance depends upon many factors; the important factors are the distance between the two electrodes, the conductance of the tissue. The power needed for using bipolar cautery is as low as 5% compared to monopolar cautery.⁵ The efficacy of bipolar cautery is increased while combining with saline irrigation for coagulation of tissues. In some papers isotonic mannitol also used for irrigation purpose during the operation.⁶ King et al and Dujovny et al explained the automatically irrigated bipolar cautery.^{3,4} Dujovny et al described a model using bipolar forceps with an inbuilt suction channel and an irrigating pump with a self-designed mechanism to couple it to the cautery unit to provide irrigation to the forceps tip.⁴

The first thyroid surgery was performed in 12th century; it was associated with high mortality and morbidity because of which it was not routinely performed. With the use of general anesthesia and antisepsis, mortality rates were reduced to 8% by 19th century. With the advent of new technologies like Ligasure, harmonic scalpel and bipolar surgical diathermy, rate of complications and morbidity have reduced. Many studies have been performed comparing ligasure and suture knot tying/ harmonic scalpel with conventional knot tying. In this study we chose the use of bipolar electrocautery for performing thyroid surgeries that is suture less thyroidectomy. The irrigation coupled bipolar cautery devices are costly, it is available in highly equipped hospitals. Although initially perceived by colleagues in our department to have decreased handling and to lack precision, all our surgical colleagues concluded otherwise after two or three session of use, as the tubing is tied on the external aspect, it does not, in any way, interfere with either the ease of handling or precision of cautery application. On the contrary, as mentioned above, a better precision was observed due to a thermal sink effect. Our modification, though not a path-breaking description, is an affordable version that can be used in most of the hospitals, which already have a standard electrocoagulation unit.

Thyroidectomy operations are done by surgeons of varying types and levels of training, and clinical practice settings. Differences exist based upon advanced training, experience, case load and practice setting.

The objective of this study was to study the effect of bipolar cautery during thyroid surgery with regards to Duration of surgery (in minutes). Blood loss at the time of surgery (No of Gauze piece soaked). Post-operative complications.

METHODS

This clinical observational study was conducted on 50 patients undergoing thyroidectomy at Government Kilpauk Medical College and Hospital, Chennai, from February 2015 to August 2015. This study was conducted over a period of 7 months.

Inclusion criteria

- Patient with benign, malignant thyroid diseases are selected after anesthetic fitness
- Patient of both sexes. Age from >18 years
- Patient who are willing to give consent for study.

Exclusion criteria

- Patient not given consent for study
- Pregnant patients.

Method of collection of data

- Patients who need hemi thyroidectomy, total thyroidectomy are included after anesthetic assessment
- Measuring duration of surgery in minutes
- Measuring the blood loss during surgery by counting the Gauze piece soaked with blood
- Examine the patient postoperatively in 1st POD, 3rd POD and after 2 week.

Preoperative instructions

- Nil per oral from 10 pm from previous night
- Informed written consent for surgery
- Preparation of surgical parts
- Injection TT 0.5 cc i.m stat
- Tablet Rantac 150 mg 1 HS
- Tablet diazepam 5 mg 2 HS
- Hypothyroid patient on tablet Eltroxin should take morning dose of tablet at 6 am with sips of water.
- Diabetic patients should skip morning dose of insulin injection
- Hypertensive patient should take antihypertensive medication on the day of surgery at 6am with sips of water.
- Hyperthyroid patients should be started on antithyroid drugs prior to surgery. Surgery planned only after euthyroid state.

Anesthesia

General anesthesia with endotracheal intubation

Position of the patient

Supine position with neck extended with sandbag under the shoulders. Head end elevated to 15 degree up to prevent venous congestion (Reverse Trendelenburg position) with both arms tucked by side.

Method of surgery

- Painting and draping of the surgical site
- Skin crease incision made in between thyroid notch, suprasternal notch (2 cm above the suprasternal notch)

- Incision deepened in layers till the platysma, bleeding vessels are cauterized
- Sub platysmal flap raised superiorly up to thyroid notch and inferiorly up to medial end of clavicle
- Anterior jugular veins are identified
- Investing layer of deep cervical fascia opened in the midline
- Strap muscles retracted laterally to expose the thyroid gland
- Middle thyroid vein identified and cauterized close to the gland
- Superior vascular pedicle cauterized with bipolar diathermy close to the gland to avoid injury to the external laryngeal nerve
- Parathyroid glands identified, preserved
- Recurrent laryngeal nerve (RLN), external laryngeal nerve identified and preserved
- Thyroid gland dissected all around using bipolar cautery
- Vascular pedicles are cauterized with bipolar cautery
- Thyroid gland removed after dissecting and cauterizing the Berrys" ligament
- Perfect hemostasis achieved using bipolar cautery
- Corrugated rubber drain (CRD) placed
- Strap muscles closed with 2 -0 vicryl
- Plastsmal layer closed with 2-0 vicryl
- Skin closed with 3-0 ethilon
- Sterile dressing applied and the specimen sent for histopathological examination.

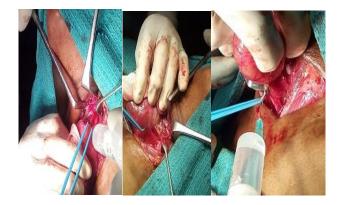


Figure 1: Dissection through bipolar diathermy.



Figure 2: Dissection completed, hemostasis secured and drain kept.



Figure 3: Specimen sent for HPE

Post-operative examination

- Patient examined immediately after surgery for soakage of dressing, hoarseness of voice, vitals
- First post-operative day patient examined for soakage of dressing, wound status
- Tablet Eltroxin 0.1 mg 1 OD started for all total thyroidectomy patients in 1st POD
- If no undue soakage, the drain usually removed after 24 hours
- Patient examined on 3rd POD for development of features of hypocalcemia
- Patient discharge on 3rd POD if no other complications
- Suture removal done on 6th POD.

Follow up

- Patient advised to follow-up after two weeks of surgery at surgical OPD
- All total thyroidectomy patients are advised to continue Tablet eltroxin lifelong
- Advised to review with histopathological examination in surgical OPD.

RESULTS

The Study conducted from February 2015 to August 2015. The study showed following results.

This study shows most of the patients belong to 30-40 years followed by 40-50 years. Only 2 cases presented after 60 years. The mean age for thyroid diseases is 41-50 years (Table 1). Total of 50 patients studied, 48 were female patients, and 2 patients were male patients. The Male: Female Ratio is 1:25. Thyroid disorders are more common in females (Table 2).

Table 1: Age distribution of patients studied.

Age groups (years)	Frequency	Percentage
21-30	10	20
31-40	23	46
41-50	12	24
51-60	3	6
61-70	2	4

Table 2: Sex distribution of patients studied.

Sex	Frequency	Percentage
Female	48	96%
Male	2	4%

Of the total 50 patients studied 13 patients with solitary nodular goiter (SNG) underwent hemi-thyroidectomy and 37 patients underwent total thyroidectomy (Table 3), of which, 30 patients presented with multi nodular goiter, 7 patients presented with Hashimoto's thyroiditis (Figure 4).

Table 3: Type of surgery.

Surgery	Frequency	Percentage
Total thyroidectomy	37	74 %
Hemi thyroidectomy	13	26 %

Of the total 50 patients studied, 37 underwent total thyroidectomy and 13 underwent hemi thyroidectomy.

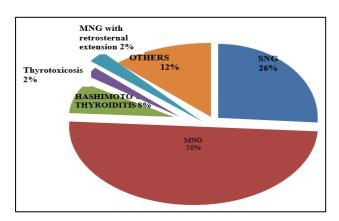


Figure 4: Indications of surgery.

Surgery was performed in euthyroid patients (86%) and on hypo/hyperthyroid patients after making them euthyroid with medications (14%) (Table 4).

Of total 13 hemi-thyroidectomies with bipolar surgical cautery in 8 patients the duration of surgery time was 45-60 minutes (n=8), in 1patient, the duration of surgery was 30-35 minutes and in 4 patients' the duration of surgery was 60-75 minutes. Hence the mean duration of surgery was 45-57 minutes (Table 5). Of total 13 hemi thyroidectomies, 3 were done by postgraduates, 8 were done by assistants, and 2 were done by the chief. We are using bipolar diathermy for the past 2 years and the longer duration of surgery is attributed to learning curve.

37 patients who underwent total thyroidectomy with bipolar surgical cautery, the total time duration varies from 50 minutes to 135 minutes. In 13 patients, it took 75-90 minutes (n = 13), in 2 patients it took up to 120-135 minutes, in 2 patients 45-60 minutes, in 2 patients it took 60-75 minutes, in 10 patients 90-105 minutes and in

8 patients 105-120 minutes. The mean time duration for total thyroidectomy was 82.5-97.5 minutes (Figure 5). Of 37 total thyroidectomies, 10 were done by postgraduates, 20 were done by assistants, and 7 were done by the chief.

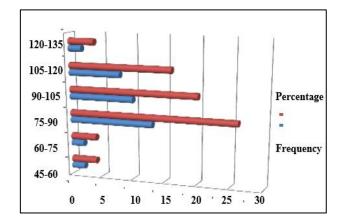


Figure 5: Duration of total thyroidectomy (in minutes).

Table 4: Thyroid status at the time of presentation.

Thyroid status	Frequency	Percentage
Euthyroid	43	86%
Hypothyroid	6	12%
Hyperthyroid	1	2%

Of the total 50 patients studied 43 patients presented with euthyroid state, 6 patients presented with hypothyroid, 1 patient presented with hyperthyroid state.

Table 5: Duration of hemi thyroidectomy.

Time (minutes)	Frequency	Percentage
30-45	1	7.69%
45-60	8	61.5%
60-75	4	30.76%

Of total 13 patients underwent hemi thyroidectomy duration of surgery 45-60 minutes commonly.

A total 13 patients who underwent Hemi thyroidectomy, the blood loss varies from 20-40 ml. In 5 patients the blood loss during surgery is 25 ml (n = 5), in one patient 40 ml another 1 patient had 35 ml and 2 patients had 30 ml, 4 patients had 20 ml of blood loss. Mean blood loss in hemi thyroidectomy patients is 30 ml (Figure 6). 37 patients underwent total thyroidectomy, the blood loss ranges from 25-50 ml, of them 10 patients have 30 ml of blood loss (n = 10), in 3 patients it was 25 ml and 50 ml in another three patients (Figure 7).

Of the 50 patients who underwent thyroidectomy, 1 patient developed postoperative excessive wound soakage (2%). It is mild and does not need re-exploration and patient recovered with conservative treatment. One patient developed temporary RLN palsy (2%). Patient

recovered fully after 6 weeks. One patient developed minor degree of wound infection which subsided with treatment. 3 patients (6%) developed signs and symptoms of hypocalcemia which subsided with intravenous calcium gluconate and oral calcium (Figure 8).

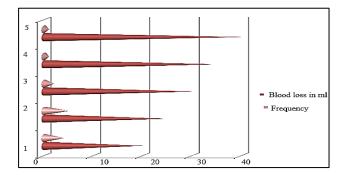


Figure 6: Blood loss in hemithyroidectomy.

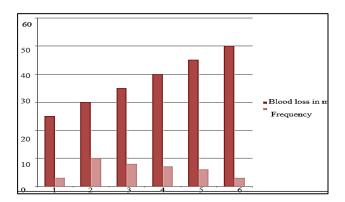


Figure 7: Blood loss in total thyroidectomy.

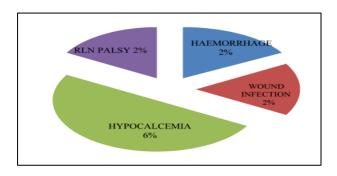


Figure 8: Complication rate of thyroidectomy in patients studied.

50 patients who underwent thyroidectomy, of them 6 patients developed complications (12%) i.e. 1patient developed postoperative wound soakage (2%), 1 patient developed voice change (2%), 1 patient developed seroma (2%), 3 patients developed symptoms and signs of hypocalcemia (6%) and 44 patients didn't develop any complications (Figure 9). A total of 50 patients studied, the length of hospital stay for 30 patients is 3 days (n = 30), 5 patients 2 days, 6 patients 4 days, 6 patients 5 days and 3 patients 6 days. The mean duration of hospital stay is 4 days.

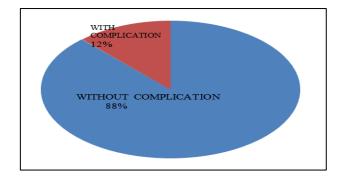


Figure 9: Complications of thyroidectomy in studied patients.

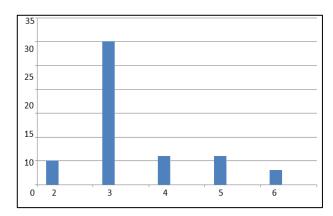


Figure 10: Length of hospital stay.

Table 6: Histopathology report of patients studied.

HPE report	No. of patient	Percentage
Nodular colloid goitre (micro follicular)	22	44
Follicular adenoma (micro follicular)	10	20
Follicularadenoma (macro follicular)	4	8
Hashimotos thyroiditis	7	14
Mng with adenomatous hyperplasia	7	14

DISCUSSION

Thyroidectomy is a most common surgical procedure worldwide but still presents as a challenge to surgeons. The operation is not only difficult but carry high morbidity if complications not kept in mind. Our study reports the use of bipolar surgical cautery for thyroidectomy, which makes the operation easy with less complications and also reduces the duration of surgery. Manouras et al found that compared with the classic technique, surgical time was reduced significantly by about 20% when the bipolar /vessel sealer was used. The longer duration of surgery compared to other studies is attributed to learning curve. We started using bipolar diathermy since 2013. In our study the mean operating time for hemi thyroidectomy and total thyroidectomy is

45-57 minutes and 82.5-97.5 minutes respectively. Govindaraj et al studies shows "mean operating time for Lobectomy was 20 minutes, total Thyroidectomy 45 minutes, total Thyroidectomy with neck dissection is 180 minutes.⁷

Sandonato L et al experimented use of electro thermal cautery in thyroid surgery, evaluating its efficacy in hemostasis and reducing the postoperative complications like hypoparathyroidism, recurrent laryngeal nerve palsy". 9 Bipolar cautery reduces the blood loss in the surgical field, it makes the surgical field clear, and so the operating surgeon can do better than conventional knot tying method. Govindaraj et al study shows complication rate of 10.18% in which 1.85% is due to surgical site infections, 1.85% is due to unilateral recurrent laryngeal nerve injuries. 7 3.7% is due to hypoparathyroidism (75% transient, 25% permanent). Challa et al study shows Out of 40 patients who underwent suture less thyroidectomy no one had any primary, secondary/reactionary hemorrhage. 10 One patient underwent total thyroidectomy for follicular carcinoma developed transient hypocalcaemia. Bove et al study showed the incidence of transient hypocalcemia 24.5%.11 In our study of 50 patients who underwent thyroidectomy, of them 6 patients developed complications (12%)1patient developed i.e. postoperative wound soakage (2%), 1 patient developed voice change (2%), 1 patient developed seroma (2%), 3 patients developed symptoms and signs of hypocalcemia (6%).

A study by Challa S, Surapaneni S 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.¹⁰

CONCLUSION

Thyroidectomy using bipolar cautery is safe and effective method and also less time consuming. The cost of the bipolar cautery is less compared to harmonic scalpel, LigaSure.

Bipolar cautery is available in our government hospital. Thyroidectomy using Bipolar Cautery is less time consuming, the blood loss at the time of surgery is less compared to conventional Knot tying technique. The post-operative complications are less with bipolar cautery. The equipment used for monopolar supports the bipolar diathermy without any modifications. There is no risk of burn injury unlike monopolar. It is safe to use near vital structures. Only the tissue held in between the two limbs gets cauterized. Bipolar cautery is used with saline irrigation to prevent charring thereby increasing the efficacy and efficiency. Bipolar cautery is safe, effective

method available at lower cost. It produces less complication than conventional methods.

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Ethical approval: The study was approved by the

institutional ethics committee

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