

## ASSESSMENT OF SAFETY OF BIPOLAR DIATHERMY REGARDING RECURRENT LARYNGEAL NERVE (RLN) DAMAGE IN THYROID SURGERY

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### ABSTRACT

**Background:** Thyroidectomy is one of the most frequently performed surgical procedures all over the world with an encouragingly low morbidity rate. The advent of new biomedical equipment has increased the precision of this procedure and has further reduced the incidence of complications. Classically thyroidectomy, like other surgical procedures was performed by conventional knife and scissor dissection techniques with excessive use of sutures for control of bleeding.

**Objective:** To present our experience regarding the safety of bipolar diathermy in relation to recurrent laryngeal nerve (RLN) damage during thyroidectomy.

**Methods:** This is an observational clinical study. In this study, we shared our experience regarding 52 patients with thyroid gland enlargement who underwent thyroidectomy with the help of bipolar cautery from February 2015 to February 2017 at Islam Teaching Hospital Sialkot.

**Results:** Our study shows that most of the patients (n= 30, 57.7%) belonged to the age group of 18 to 30 years. There was no patient above 50 years of age. The majority of the patients (84.6%) were female. Twenty-eight (53.8%) patients underwent hemithyroidectomy, Twenty (38.5%) patients underwent a near total thyroidectomy whereas four (7.7%) patients underwent a total thyroidectomy. Of the 52 patients, none developed any vocal cord palsy or weakness immediately after the completion of the surgery, seen after extubation at the operating table.

**Conclusion:** Cautious use of bipolar cautery in the Beahrs triangle is perfectly safe regarding nerve injury as the current stays confined between the two prongs of the bipolar forceps and because it keeps the operating field clear of blood.

**Keywords:** Thyroidectomy, vocal cord palsy, bipolar diathermy.

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### INTRODUCTION:

Thyroidectomy is one of the most commonly performed surgical procedures throughout the world with a very low complication rate. Surgical anatomy, like in any

other surgical procedure, is extremely important in thyroidectomy. To avoid Recurrent laryngeal (RLN) palsy, various methods of RLN identification have been defined, one of which is called as defining Beahrs' triangle. Beahrs' triangle is bounded by common carotid artery as base, inferior thyroid artery superiorly and RLN as lower arm of triangle. Recognizing the boundaries of triangle posterior to thyroid after retracting the ipsilateral thyroid lobe medially, helps in avoiding injury to RLN<sup>1</sup>. The advent of newer biomedical equipment has greatly helped the operating surgeon in precise excision of tissues with minimal damage to the surrounding structures. It has considerably reduced the operating time as well. Like

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other surgical procedures, conventional thyroidectomy was performed with the classical scissors and knife technique and sutures knot tying for control of bleeding. This technique in addition to be more time consuming had increased risk of damage to the surrounding structures as well as infections secondary to the foreign body reaction against the suture material<sup>2</sup>. Thyroidectomy with the help of monopolar and bipolar cautery is a relatively bloodless procedure with much less time consumption when compared to the classical knife and scissor technique.

When compared, bipolar cautery has certain advantages over monopolar cautery; electrical current which is responsible for tissue coagulation passes only between the two tips of the bipolar cautery forceps, whereas in case of monopolar cautery, the coagulating current passes between the monopolar tip and the neutral electrode which is placed in contact with the body at another place like under the legs or buttocks. There are reported cases of damaging burns to the body with the use of monopolar cautery<sup>3-5</sup>. There is also a risk of damage to those body parts which accidentally come in contact with a conductor material like the operating table and other surrounding equipment. As the negatively charged erythrocytes come to adhere at the positively charged forceps tip of the bipolar cautery, repeated cleaning of the tip to remove this charred tissue off results in damage to the tip and might affect its ability to conduct current properly and hence effective cauterization.<sup>6-8</sup>

The electrical power required to coagulate a tissue is a function of its impedance or resistance. This impedance depends on a multitude of factors among which conduction of the tissues and the distance between the two poles of the bipolar cautery are important factors to consider. The power required for tissue coagulation by a bipolar cautery is as low as 5% of monopolar cautery<sup>9</sup>. As tissue conduction decreases its impedance, saline irrigations of the operating field is beneficial in optimum functioning of bipolar cauterization. Isotonic mannitol has also been used for irrigation of the tissues<sup>10</sup>. King et al and Dujovny et al have described a setup where the bipolar cautery is coupled with an irrigation system saving the surgeon or assistant from a separate chore of frequent irrigations of the surgical field.<sup>7,8</sup>

The objective of our study was to assess the safety of bipolar cautery in relation to complications, particularly in the Behr's triangle, with RLN damage as the main parameter.

## METHODS:

This observational clinical study was performed on 52 patients who underwent thyroidectomy (lobectomy as well as total thyroidectomy) from February 2015 to February 2017 in the department of ENT at Islam Medical College/Islam Teaching Hospital Pasrur Road Sialkot. Patients with thyroid gland enlargement and biochemically euthyroid patients were included in study and following patients were excluded from study

1. Patients unfit for General Anesthesia.
2. Patients not giving consent for surgery.
3. Patients with vocal cord palsy preoperatively on Fiberoptic laryngoscopy (FOL).

Following procedures were done

1. Preoperative Fiberoptic laryngoscopy was done in all patients who underwent the procedure.
2. Examination of the vocal cords after completion of the procedure with direct macintosh laryngoscopy, while the patient is semiconscious, with the help of the anesthetist.
3. Follow up fiberoptic laryngoscopy at 4 weeks in case of any weakness immediately postoperatively.
4. Repeat FOL at 6 months, in case at 4 weeks there was vocal cord palsy.
5. Label the case as RLN damage if at 6 months there is still vocal cord palsy.
6. Preoperative FNAC of the thyroid swelling.

The data was entered and analyzed using SPSS Ver. 23.0. The relevant statistical analysis was performed.

## RESULTS

The study included 52 patients that underwent thyroidectomy from February 2015 to February 2017 at Islam Teaching Hospital Sialkot and showed the following results.

The study shows that most of the patients (n=30, 57.7%) belonged to the age group of 18 to 30 years. There was no patient above 50 years of age.

Table 1: Age distribution

Age groups	Frequency	Percentage
18 to 30	30	57.7
30 to 40	11	21.2
40 to 50	11	21.2
Total	52	100

Twenty-eight patients (53.8%) underwent hemithyroidectomy, Twenty (38.5%) patients underwent a near total thyroidectomy whereas four (7.7%) of patients underwent a total thyroidectomy

Table 2: Type of procedure

Procedure	Frequency	Percentage
Hemithyroidectomy	28	53.8
Near total thyroidectomy	20	38.5
Total thyroidectomy	04	7.7
Total	52	100

48.1% of patients took 30 to 45 minutes for their procedures, 46.2% of patients took 45 to 60 minutes, and 5.8 patients took up to 75 minutes. Histopathology report of 86.5% of patients turned out to be benign colloid goiter, 13.5% of patients were having papillary carcinoma. There were no patients of follicular carcinoma or other diseases like Hurthle cell tumors.

Table 3: Histopathology

Histopathology	Frequency	Percentage
Benign	45	86.5
Papillary carcinoma	07	13.5
Follicular carcinoma	Zero	Zero
Others	Zero	Zero
Total	52	100

Of the 52 patients, none developed any vocal cord palsy or weakness immediately after the completion of surgery, seen after extubation at the operating table.

Table 4: Vocal cord palsy

Vocal cord palsy	Frequency	Percentage
No vocal cord palsy immediately after surgery	52	100
Total	52	100

## DISCUSSION

Thyroidectomy is a common surgical procedure worldwide but still poses a challenge to the operating surgeon. New equipment is continuously launched everyday in the surgical world with promises and claims which are needed to be subjected to test by the surgeons and experiences are needed to be recorded and shared for cross reference. There is a good volume of reliable, high quality research data on the use and safety of bipolar cautery in thyroidectomy in medical literature. Manaouras et al when compared the classical knot and tie technique with bipolar vessel sealer, found that the operating time was reduced by about 20% <sup>11</sup>. In our study, operating time for 48.1% of patients was less than 45 minutes while in 46.2% of patients it was between 45 to 60 minutes.

Govindaraj et al mention in their studies that the mean operating time for Lobectomy was 20 minutes, total Thyroidectomy 45 minutes, total Thyroidectomy with neck dissection is 180 minutes.<sup>12</sup>

Sandonato L et al share their experience about the use of electric cautery in thyroid surgery, they have calculated its efficacy regarding the prevention of post-operative complications like hypoparathyroidism and recurrent laryngeal nerve palsy.<sup>13</sup>

Govindaraj et al study shows complication rate of 10.18% in which 1.85% is due to unilateral recurrent laryngeal nerve injuries. Bove et al study showed the incidence of transient hypocalcemia 24.5%.<sup>13</sup> In our study of 52 patients who underwent thyroidectomy, none of the patients developed any degree of nerve damage or cord weakness. Among these patients 28 were hemithyroidectomies, 20 patients underwent near total thyroidectomy and 4 patients underwent total thyroidectomy.

## CONCLUSION

Bipolar cautery is perfectly safe regarding prevention of recurrent laryngeal nerve injury during thyroidectomy. It is more cost effective as compared to harmonic scalpel, LigaSure.

Bipolar cautery is available in most hospitals in our country. Thyroidectomy using Bipolar Cautery is less time consuming, the blood loss during surgery is less compared to conventional suture tying technique. The post-operative complications are markedly reduced with bipolar cautery. The machine used for monopolar supports the bipolar system with no modifications required. Unlike monopolar, there is no chance of burn injuries at other sites. Bipolar cautery is perfectly safe to be used in the BEAHR's triangle regarding RLN safety, as there is very limited current spread, and tissue held in between the two prongs of bipolar forceps gets cauterized only.

## ETHICAL APPROVAL

The study was approved by the Ethical Review Committee of Islam Medical & Dental College, Sialkot, Pakistan.

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**AUTHORS' CONTRIBUTION:**

- KW:** Principal author editing  
**NA:** Surgical assistance & follow up data  
**MAK:** Proof Reading, data collection  
**TM:** Proof Reading, data collection  
**MI:** Literature research  
**MUI:** Data analysis  
**MTI:** Reference search & proof reading