Research Article

Electro thermal bipolar Thyroidectomy Safe and effective operation

Hussein Hadi Rahi, *F.I.C.M.S* [1], **Saif Mundher Ismael,** *D.S, F.I.C.M.S* [2]

[1] Baghdad Teaching Hospital Dept. of General Surgery
[2] Al-Yarmouk Teaching Hospital Dept. of General Surgery

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Address for Correspondence:
E-Mail: hussainrahi2@gmail.com
Tel: 009647717201001

Abstract

Background: Thyroidectomy is a very common operation. Bleeding is a major complication of thyroid surgery. However in the last 20 years there has been a dynamic development of new instruments, which had a significant impact on the improvement of old, and the introduction of new surgical techniques.

Aim of study: To evaluate the homeostatic effect and safety of total Thyroidectomy or lobectomy, using electro-thermal bipolar diathermy or conventional vessel ligation.

Patients and Methods: This is a prospective randomized controlled trial of patients need total Thyroidectomy, or hemi -Thyroidectomy performed in Baghdad teaching hospital and private hospitals from January 2012 to June 2014. Patients were assigned into two groups, group A (58 patients) had Thyroidectomy with the classic suture ligation technique and group B (62 patients) had Thyroidectomy with the use of electro-thermal bipolar diathermy of low voltage. We took into consideration in our study the operation time measured from skin opening to skin closure, and the amount of postoperative blood loss calculated in the 1st postoperative day and in few cases drains were left for 48 hours if the amount of blood loss in the 1st 24 hours was more than 200 mls between two groups.

Results: 120 patients were enrolled in this study. We found that the significant difference is in the main operation time between the two groups: in group A 48.2 minutes in total Thyroidectomy, and 52.2 minutes in lobectomy, compared to mean time in group B 60 minutes in total Thyroidectomy, and 36.6 minutes in lobectomy. We found that there's a significant reduction in postoperative blood loss in group B compared to group A.

Conclusion: Electro thermal bipolar removal of thyroid gland is an effective good alternative to classic suture and ligation and can be used safely with advantages of reduction in operation time and postoperative blood loss.

Key words: Thyroidectomy, Electro thermal bipolar, Thyroid lobectomy.

INTRODUCTION

In the late 19th century, Thyroidectomy was associated with massive blood loss and a mortality rate of 40 %.(1) Since the introduction of the classical thyroidectomy by Kocher in the late 1800s, thyroidectomy has become widely used, which reduced mortality rates considerably.(2) Since that time, several alternative methods such as electrocautery , the harmonic scalpel , and laser techniques have been tested and used during thyroid procedures with effective reduction in operating time and blood loss during the operation (3,4) However , suture ligation with bipolar or mono-polar electro-coagulation for smaller vessels remains the gold standard for intra-operative homeostasis in thyroid procedures. Over the past decades, the techniques of thyroid operations have undergone small changes only, however the last 20 years have seen dynamic development of new instruments that has had significant impact on the improvement of old, and, the introduction of new surgical techniques.(5) The use of electro-coagulation to control bleeding carries a risk of damage to the surrounding structures because of the lateral heat

dispersion.[6] Thyroid surgery in the 21st century has become safe and effective with improved outcomes and minimal complications. Total thyroidectomy, after a period of 25 years of major evolutions, has become the standard procedure for patients with malignant thyroid tumors, bilateral multinodular goitre and Graves' disease. The importance of safe operative technique is emphasized because gentle and skillful maneuvers are essential for safe dissection of the gland, avoiding damage to the delicate and important adjunct structures. Thyroidectomy demands a great amount of clip –and –tie maneuvers for ligation of the named and numerous smaller thyroid vessels. A bloody stained operative field makes troublesome the recognition and safe dissection of the recurrent laryngeal nerve and parathyroid glands, and efforts to control bleeding from retracted thyroid vessels increase the risk of damage to adjacent structures. With bipolar electrosurgery the electrodes on either side of the forcep jaws. The targeted tissues are held lightly between the jaws, causing coagulation. There is little opportunity for tissue cutting when bipolar current is used alone, but the ability to coapt the electrodes across a vessel provides the best method of small-vessel coagulation without thermal injury to adjacent tissues.[7]

Aim of the study

To evaluate the homeostatic effect and safety of total Thyroidectomy or lobectomy using electro-thermal bipolar diathermy compared by conventional vessel ligation.

PATIENTS AND METHODS

This is a prospective randomized controlled trial of patients needing total Thyroidectomy, and or hemi - Thyroidectomy performed in Baghdad teaching hospital, and private hospitals from January 2012 to June 2014. Patients were put in two groups. Group A (58 patients) had Thyroidectomy with the classic suture ligation technique. And group B (62 patients) Thyroidectomy with the use of electro-thermal bipolar diathermy of low voltage. Under GA, supine position with extended neck the lower collar incision; the subcutaneous tissue and the platysma were divided, and skin flaps were constructed with mono polar electro cautery .the strap muscles were splitted in the midline and retracted laterally.

Regardless of the vessel diameter; the inferior, midline and superior thyroid vessels, were ligated with knot tying in the conventional way, and divided between two ligatures in group A and were sealed with just knot tying distal to the gland and proximal to it sealed with bipolar electro-thermal device of 40-45 milli-volts in group B. After good mobilization of the thyroid gland and sealing of the retracted vessels , identification of the recurrent laryngeal nerves and parathyroid glands without ligation of the inferior thyroid artery , started to remove the thyroid gland (total Thyroidectomy or lobectomy according to case) by meticulous dissection and cauterization by bipolar diathermy from the pre-tracheal fascia , the use of bipolar diathermy was not recommended when the hand piece was very close to the recurrent laryngeal nerve or parathyroid gland. Closure of the surgical wound followed the conventional procedure in both groups. Thyroid bed drainage were used and most of them was removed at the 1st post-operative day, post-operative blood loss measured in mls was found to be reduced in group B :about 76% of patients had blood loss less than 50 mls and about 24% of patients had blood loss about 100 mls. Statistical package for social science versions 20 (SPSS 20) was used for data analysis. Continuous variables presented as mean ± standard deviation and discrete variable presented ad number and percentages. P value was set at 0.05.

RESULTS

120 patients were enrolled in this study. They were selected and divided into two groups. Group A 58 patients had Thyroidectomy with the classic suture ligation technique and group B 62 patients had Thyroidectomy with the use of electro-thermal bipolar diathermy of low voltage. Mean age for group A was 40.2±10.7 years while for group B it was 38.8±11.0 with p value 0.502 (table 1). We subdivided age groups to three subgroups. The 1st group has age up to 45 years. The 2nd group's age was 46-65 years, and the 3rd group above 65 years. We found no significant difference between the two arms of the study with p value of 0.051 (table 1).

Table 1: Personal characteristics of patients underwent thyroid surgery.

Variables	Study Group				
	Clip and ligation		Bipolar removal		
	N=58	%	N=62	%	P value
Age (y); mean±SD	40.2±10.7		38.8±11.0		0.502
Age Group (y)					0.051
• **Up to 45**	37	63.8%	50	80.6%	
• **46-65**	21	36.2%	11	17.7%	
• **> 65**	0	0.0%	1	1.6%	
Sex					0.519
• **Male**	12	20.7%	10	16.1%	
• **Female**	46	79.3%	52	83.9%	

There was no significant difference in the surgical characteristics of sampled patients between the groups of study (Table 2).

Table 2: Surgical characteristics of sampled patients:

Variables	Study Group			
	Clip and ligation		Bipolar removal	
	N=58	%	N=62	%
Goiter Type				
• **Toxic Multinodular**	4	6.9%	12	19.4%
• **Non-toxic Multinodular**	42	72.4%	32	51.6%
• **Single Nodule**	9	15.5%	17	27.4%
• **Non-toxic Multinodular with Retrosteranal extension**	3	5.2%	0	0.0%
• **Recurrent Multinodular**	0	0.0%	1	1.6%
Operation Type				
• **Total Thyroidectomy**	46	79.3%	45	72.6%
• **Near Total Thyroidectomy**	3	5.1%	1	1.6%
• **Loboectomy**	9	15.5%	16	25.8%
Operation Category				
• **Thyroidectomy**	49	84.5%	46	74.2%
• **Lobectomy**	9	15.5%	16	25.8%

In group A: 48.2 minutes in total Thyroidectomy, and 52.2 minutes in lobectomy compared to mean time in group B: 60 minutes in total Thyroidectomy, and 36.6 minutes in lobectomy and p value of < 0.001 in total Thyroidectomy and p value of 0.002 in lobectomy (table 3 –A).

Table 3: Operative time for each surgical method and A) operation type, B) Toxicity status of the goiter

Table3A:

Operation Category	Study Group	Age Group	N	Operative Time (min) Mean	SD	P value
• **Thyroidectomy**	**Clip and ligation**	All	49	84.2	7.9	**< 0.001**
	Bipolar removal	All	46	60.0	7.5	
	Clip and ligation	≤45	28	83.0	6.6	0.246
		>45	21	85.7	9.4	
	Bipolar removal	≤45	34	59.3	7.0	0.265
		>45	12	62.1	8.6	
• **Lobectomy**	**Clip and ligation**	All	9	52.2	8.7	**0.002**
	Bipolar removal	All	16	36.6	11.7	
	Clip and ligation	≤45	9	52.2	8.7	---
		>45	0	---	---	
	Bipolar removal	≤45	16	36.6	11.7	---
		>45	0	---	---	
• **All**	**Clip and ligation**	All	58	79.2	14.1	**< 0.001**
	Bipolar removal	All	62	54.0	13.5	
	Clip and ligation	≤45	37	75.5	15.1	**0.007**
		>45	21	85.7	9.4	
	Bipolar removal	≤45	50	52.0	13.7	**0.019**
		>45	12	62.1	8.6	

The operation time was shorter in group B compared to group A in both toxic and non-toxic goitre with p value < 0.001. (Table 3 –B).

Table 3 B:

Study Group	Goiter	N	Operative Time (min) Mean	SD	P value
Clip and ligation	All	58	79.2	14.1	**< 0.001**
Bipolar removal	All	62	54.0	13.5	
Clip and ligation	Toxic	4	88.8	2.5	0.164
	Non-toxic	54	78.5	14.4	
Bipolar removal	Toxic	12	60.0	5.6	0.083
	Non-toxic	50	52.5	14.4	
All	Toxic	16	67.2	13.8	0.816
	Non-toxic	104	66.0	19.4	

We found there's a significant reduction in postoperative blood loss in group B compared to group A. Group A had 50 -250 ml blood loss in the 1st postoperative day, while group B had 0 -100 ml blood loss in the 1st postoperative day. With p value < 0.001 (Table 4).

Table 4: Distribution of study sample according to study group and to postoperative drain level according to age and according to toxicity of the goitre:

Operation Category	Study Group	Age Group	Operative Time (min)			P value
			N	Mean	SD	
• **Thyroidectomy**	**Clip and ligation**	All	49	84.2	7.9	**< 0.001**
	Bipolar removal	All	46	60.0	7.5	
	Clip and ligation	≤45	28	83.0	6.6	0.246
		>45	21	85.7	9.4	
	Bipolar removal	≤45	34	59.3	7.0	0.265
		>45	12	62.1	8.6	
• **Lobectomy**	**Clip and ligation**	All	9	52.2	8.7	**0.002**
	Bipolar removal	All	16	36.6	11.7	
	Clip and ligation	≤45	9	52.2	8.7	---
		>45	0	---	---	
	Bipolar removal	≤45	16	36.6	11.7	---
		>45	0	---	---	
• **All**	**Clip and ligation**	All	58	79.2	14.1	**< 0.001**
	Bipolar removal	All	62	54.0	13.5	
	Clip and ligation	≤45	37	75.5	15.1	**0.007**
		>45	21	85.7	9.4	
	Bipolar removal	≤45	50	52.0	13.7	**0.019**
		>45	12	62.1	8.6	

DISCUSSION

The thyroid gland is one of the largest endocrine glands in humans and consists of two connected lobes. The thyroid gland secretes thyroid hormones, which influence the metabolic rate, protein synthesis, and have a wide range of other effects, including on development. Blood flow through the gland is approximately 80 ml \100 g \s, & it may double in hyperthyroid states. Thus the thyroid is the best blood supplied organ in the body.[8] Rapid and effective haemostasis is essential to performing successful thyroid surgery, although the traditional method of clamping and tie using surgical ligature remains a safe and effective method of achieving haemostasis, it does present the risk of knots slipping with resulting postoperative haemorrhage.[9] Intraoperative & postoperative blood loss leads to serious consequences, from immediate reoperation to severe damage of vitally important structures, such as laryngeal nerves and parathyroid gland.[10] Over the recent years, alternative techniques of achieving vessel haemostasis have been developed including bipolar vessel sealing systems, which have been reported to be as safe as conventional clipping and tie using surgical ligature[11]. In this study, 120 patients were enrolled in this study. They were selected and divided into two groups. Group A 58 patients had Thyroidectomy with the classic suture ligation technique and group B 62 patients had Thyroidectomy with the use of electro-thermal bipolar diathermy of low voltage, There's no significant difference in age and gender between age groups, 10 males (20.7%), and 46 females (79.3%), and 10 males (16.1%) and 52 females (83.9%) for group A and B respectively, and this was similar study done by James Russell and Rudaina Hassan in (2009).[12] There was no significant difference in the surgical characteristics of sampled patients between the groups of study and this

was similar study also done by James Russell and Rudaina Hassan in (2009).[12] The operation time measured in minutes is significantly reduced in (group B) up to 25 minutes(71%) in total Thyroidectomy, & 16 minutes in lobectomy(70%) in electro thermal group compared to classic operation group(group A) so there's no difference in time reduction if operation was total Thyroidectomy or lobectomy and if operation was done to remove toxic or nontoxic goitre by using bipolar diathermy, while in another study done by Kiriakopoulos A ,et al in 2004,they found that the mean length of operation was not significantly different between classic suture ligation technique or electro-thermal bipolar technique either total or hemithyroidectomies.[13]

In another study done by Andreas Manouras, et al found that there's significant time reduction about 15% in total Thyroidectomy by using electro-thermal bipolar technique compared to classic suture technique, but they don't perform lobectomy procedures.[14] Post-operative blood loss measured in mls was found to be reduced in the electro-thermal group (group B): about 76% of patients had blood loss less than 50 mls and about 24% of patients had blood loss about 100 mls . Compared to 78% of patients had blood loss from 100-250 ml in the classic operation group (group A). This is true for patients with either toxic or non toxic goitre, also a study done by Alherabi A et al at (2005), drains were used less often and patients discharged significantly earlier following hemithyroidectomies, but not total thyroidectomies by using electro-thermal bipolar technique.[15] In study done by Challa. S, Sushama Surapaneni found that Out of 40 patients who underwent sutureless thyroidectomy by using bipolar electrothermal cautery, none of them had any primary, secondary or reactionary haemorrhage.[16] Regarding intra-operative blood loss they found no significant difference in intraoperative blood loss between the two types of techniques (both group A and group B), but they reported that one case (1.7%) (female aged 65 years with multinodular goitre) operated by classic suture ligation (group A) had significant bleeding during the immediate post-operative day and required reoperation, while a large multicenter retrospective study found a 1.2% rate of reoperation for postoperative haemorrhage operated by classic suture ligation[17], while in another study done by Corsten M, et al in 2005 found that a 4.3% rate of all haematomas after thyroid surgery.[18] But in our study we found there is significant blood loss reduction by using electro thermal technique compared to classic suture and ligation technique.

Conclusion:

Electro thermal bipolar removal of thyroid gland is an effective, good alternative to classic suture and ligation and can be used safely with advantages of reduction in operation time and post-operative blood.

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