

Outcomes of Capsular Dissection Technique with Use of Bipolar Electrocautery in Total Thyroidectomy: A Rural Tertiary Center Experience

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ABSTRACT

Introduction: Total thyroidectomy is one of the most routinely performed head and neck surgical procedures with extremely low mortality. This procedure has been associated with two major complications such as recurrent laryngeal nerve injury and hypocalcaemia due to parathyroid insufficiency. The use of bipolar electrocautery has not been widely accepted in view of thermal damage to adjacent structures.

Aim: To study the outcomes and complications of capsular dissection technique along with use of bipolar electrocautery in total thyroidectomy.

Materials and Methods: The study was conducted from May 2013 to May 2016. The study was performed at Department of ENT

Otorhinolaryngology, DM WIMS Hospital, Wayanad, Kerala, India. This retrospective descriptive study analysed the outcome of 130 patients who underwent total thyroidectomy by capsular dissection technique along with use of bipolar electrocautery for cauterization of vascular pedicles, at our institution over a 3 year period.

Results: The incidence of permanent unilateral vocal cord palsy was 1.5% and permanent hypocalcaemia was 2.3%. There was no case of haemorrhage or haematoma in this study.

Conclusion: Total thyroidectomy by capsular dissection technique along with the use of bipolar electrocautery has very low incidence of recurrent laryngeal nerve and parathyroid injury, as per our data. Hence, we recommend this technique along with routine use of bipolar electrocautery for total thyroidectomy.

Keywords: Bipolar diathermy, Hypocalcaemia, Thyroidectomy, Vocal cord paralysis

INTRODUCTION

Total thyroidectomy is one of the most routinely performed head and neck surgical procedures with extremely low mortality. Theodore Kocher is considered as the father of thyroid surgery. He introduced the technique of capsular dissection and total thyroidectomy using aseptic precautions [1]. With the introduction of artery forceps in clinical practice in 1879, surgeons were able to get better haemostasis. The main complications associated with this procedure were recurrent laryngeal nerve injury and hypocalcaemia [2].

Some surgeons still perform bilateral subtotal thyroidectomy for benign thyroid diseases in order to prevent these complications and avoid the need for thyroid hormone supplementation. The problems associated with subtotal thyroidectomy included recurrence and long-term thyroid dysfunction needing thyroid supplementation [3].

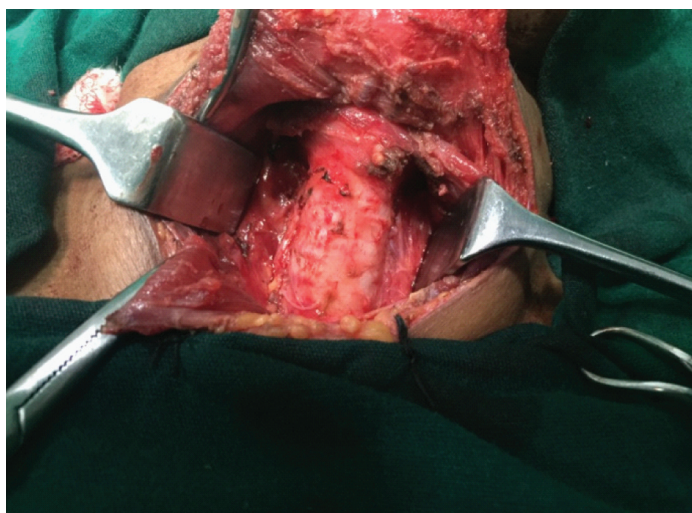
Bleeding is one of the major post-operative complications of thyroid surgery. Intra-operatively, bleeding can obscure the surgical field of vision thereby, making identification of parathyroid glands and recurrent laryngeal nerves difficult. Traditional clamp and tie technique has enabled to achieve effective haemostasis. There are several studies which have reported the successful use of ligasure and harmonic scalpel in reducing blood loss [4-9]. The high cost of these vessel sealing generators and specialized handpieces make it unaffordable to most hospitals in developing countries. The use of bipolar electrocautery in thyroidectomy has not been widely accepted in view of thermal damage to adjacent structures. We wish to present our experience with capsular dissection and the benefits of bipolar electrocautery in total thyroidectomy.

MATERIALS AND METHODS

This is a retrospective study of 130 total thyroidectomies performed by the ENT surgeon at Department of Otorhinolaryngology,

DM WIMS Hospital, Wayanad, Kerala, India. The study was conducted from May 2013 to May 2016. Informed consent was obtained and study was approved by ethics committee. All the patients underwent total thyroidectomy by capsular dissection technique along with use of bipolar electrocautery for cauterization of vascular pedicles instead of tying knots. Patients with both benign and malignant lesions of thyroid were included in the study. Those patients with pre-operative recurrent laryngeal palsy and pre-existing calcium imbalance were excluded from the study. Patients undergoing re-operative thyroid surgery and concurrent lymph node dissection were also not included in this study. Those patients with thyrotoxicosis were controlled pre-operatively with anti-thyroid drugs and beta-blockers. All the patients were subjected to Ultrasonography (USG) of neck, Fine Needle Aspiration Cytology (FNAC) and thyroid function tests prior to surgery. Indirect laryngoscopy was done before the surgery to confirm the vocal cord mobility.

Intra-operatively the superior, middle and inferior thyroid vessels were divided with bipolar electrocautery. The distal extra-laryngeal course of recurrent laryngeal nerve was dissected on both sides [Table/Fig-1]. Parathyroid glands were preserved on both sides and inadvertent removal was managed by auto-transplantation at the lower one-third of sternocleidomastoid muscle. Hypocalcaemia was assessed clinically and biochemically in the post-operative period. Those patients who developed hypocalcaemia was stabilized with intra-venous calcium gluconate and oral calcium supplements along with vitamin D3 and discharged on the sixth or seventh day, while those who were normocalcaemic were discharged on the fourth or fifth day. All the patients were reviewed after one week and one month of surgery and assessed biochemically for serum calcium. Those with hypocalcaemia were reassessed after three months and six months. Permanent hypocalcaemia is considered when serum calcium does not return to normal within six months. Those patients with hoarseness of



[Table/Fig-1]: Intra-operatively distal recurrent laryngeal nerves were dissected on both sides.

voice were assessed with videolaryngoscopy at the end of every month for the first six months.

RESULTS

Out of the 130 patients who underwent thyroid surgeries, majority of patients (54 cases) were in the age group of 41 to 50 years. Most of the patients were females (125 out of 130). In this study [Table/Fig-2], 92 patients underwent total thyroidectomy for multi-nodular goiter, 22 patients had multi-nodular goiter with retrosternal extension [Table/Fig-3], four patients had thyrotoxicosis which was

Indication	Number of cases
Solitary nodule	1
Multi-nodular goiter	92
Multi-nodular goiter with retrosternal extension	22
Thyrotoxicosis (Controlled)	4
Papillary cancer	4
Follicular cancer	6
Medullary cancer	1
Total	130

[Table/Fig-2]: Indication for total thyroidectomy.



[Table/Fig-3]: Multi-nodular goiter with retrosternal extension (8 cm approximately).

controlled with medications pre-operatively, while only one patient had solitary nodule. There were 11 patients with cancer who underwent total thyroidectomy, of which four of them had papillary cancer while six patients had follicular cancer and one patient had medullary cancer.

As per this study, no patient had developed bleeding or haematoma despite using bipolar electrocautery for haemostasis. Thus, none of them required blood transfusion in the post-operative period. There was only a single patient who had developed seroma in the second post-operative week which was drained in the out patient department by needle aspiration. There were only two patients (1.5%) of multi-nodular goiter with retrosternal extension which had developed unilateral vocal cord palsy after the procedure. Both these patients developed adequate compensation of the vocal cords within 2 months as confirmed by videolaryngoscopy. There was only a single patient (0.77%) that had transient vocal cord palsy which recovered completely within one week. There were only 3 cases of permanent hypocalcaemia after total thyroidectomy, of which 2 cases had multi-nodular goiter with retrosternal extension greater than 2cm, while one case had thyrotoxicosis. There were 37 cases (28.5%) of temporary hypocalcaemia needing oral calcium supplementation for less than one month [Table/Fig-4].

Complications	No. of cases	Percentage
Haematoma	0	0
Seroma	1	0.77%
Unilateral vocal cord palsy		
Transient	1	0.77%
Permanent	2	1.5%
Hypocalcaemia		
Temporary	37	28.5%
Permanent	3	2.3%

[Table/Fig-4]: Post-operative complications.

DISCUSSION

Total thyroidectomy has been indicated by most surgeons in view of the multi-centricity of thyroid cancer, incidence of 5 to 15 % local recurrence in the opposite thyroid lobe and higher incidence of complications in re-operative thyroid surgery [10-13]. Besides total thyroidectomy also facilitates follow-up with thyroglobulin, which would not be possible in the presence of normal thyroid tissue [10]. Though capsular dissection technique is the preferred method, many surgeons still prefer not to perform total thyroidectomy for benign thyroid swellings due to fear of associated complications.

The most common cause for iatrogenic recurrent laryngeal nerve injury is total thyroidectomy. It leads to either temporary or permanent damage. The various mechanisms of nerve injury include complete or partial transection, traction, contusion, crush injury, thermal damage while using electrocautery, misplaced ligature or compromised blood supply [14]. Delayed onset recurrent laryngeal palsy developing within few days after surgery is considered to be caused either by pressure effect of surrounding tissue oedema or haematoma [14]. There is increased chance of recurrent laryngeal nerve palsy when there is increased local scar formation as seen in thyroiditis, previous radiation and prior neck surgeries.

In the previous studies, temporary recurrent laryngeal nerve palsy was in the range of 4 to 5.8% while permanent palsy was in the range of 0 to 5% [15-17]. As per our study, we had a temporary recurrent laryngeal palsy of 0.77% and permanent palsy of 1.5%, which was well within the prescribed standards despite using bipolar electrocautery.

Temporary or permanent hypocalcaemia is a common complication following total thyroidectomy arising due to parathyroid insufficiency. The incidence of temporary hypocalcaemia can be upto 50% while permanent hypocalcaemia can be upto 4% [18-20]. In our study

the incidence of temporary and permanent hypocalcaemia was 28.5% and 2.3% respectively.

The highly variable location of parathyroid glands along with variations in its blood supply creates significant difference in the incidence and degree of the parathyroid insufficiency [21]. There is increased chance of hypocalcaemia following auto-transplantation, extensive thyroid resection and ischemia of the parathyroid gland [22]. The risk factors pre-disposing to post-thyroidectomy hypocalcaemia include large volume goiter, recurrent goiter, retrosternal extension, advanced cancer and hyperthyroidism [22].

The main concern with the use of bipolar electrocautery has been the adequacy of ligation of vessels and the fear of thermal damage to recurrent laryngeal nerve and parathyroid vasculature. Only a single study by Tysome, attempted to prove the efficacy of bipolar cautery in thyroid surgery [23]. He found that patients undergoing hemithyroidectomies required fewer drains with reduced hospital stay. As per our study, we found that despite using bipolar electrocautery there were no cases of haematoma or bleeding and the complications like recurrent laryngeal nerve injury and hypocalcaemia were similar to conventional suture ligation technique. This also helped us in reducing our operating time and it serves as a cheaper alternative to the other expensive devices like ligasure and harmonic scalpel. Besides it helps in avoiding the complications associated with routinely practiced suture ligation that includes risk of knot slipping and suture granuloma [6]. This suture granuloma can pose a problem in patients with cancer as they can mimic tumour recurrence. As per the study by Manouras et al., they found that, both bipolar vessel sealer and harmonic scalpel had comparable results and hence, the choice between them need to be based on the surgeon's preferences and experience [7].

The routine dissection of distal extra-laryngeal course of recurrent laryngeal nerve rather than the entire nerve course helps in avoiding devascularising the adjacent parathyroids and the nerve itself. Thus, capsular dissection helps in avoiding parathyroid insufficiency and damage to recurrent laryngeal nerve.

The lateral thermal spread and char formation associated with use of bipolar electrocautery can be minimized by the use of saline irrigation and lifting the vessels away from vital adjacent structures including recurrent laryngeal nerve before the application of electrocautery. The bipolar forceps was regularly cleared of char, so as to improve the accuracy of cauterization applied in the surgical field.

LIMITATION

The main limitation of this study was that, there was no control group. The complication rates are dependent on the skill and surgical experience of the operating surgeon. Better understanding of the anatomic variations of the recurrent laryngeal nerves helps in avoiding inadvertent damage to the recurrent laryngeal nerve.

CONCLUSION

Total thyroidectomy by capsular dissection technique has very low incidence of recurrent laryngeal nerve and parathyroid injury, as per our data. Hence, we recommend this technique over the dissection of the recurrent laryngeal nerve along its entire course.

Besides total thyroidectomy offers immediate and permanent cure with no recurrences. The use of conventional bipolar electrocautery is time-saving and safe adjunct for thyroid surgeries and equally effective when compared to expensive devices like ligasure and harmonic scalpel.

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