

Use of Harmonic Scalpel in Total Thyroidectomy as Against Conventional Methods

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Abstract

Background and Objectives: Thyroid disorders are frequently encountered at the surgical outpatient department. Harmonic scalpel uses high-frequency mechanical energy to cut and coagulate tissues and vessels simultaneously. In this study, we evaluated the efficiency, safety, and the impact on the surgical outcome of the utilization of harmonic scalpel during total thyroidectomy. *Methods:* Out of 60 patients included in the study, 30 underwent total thyroidectomy using conventional methods including monopolar/ bipolar cautery and 30 using harmonic scalpel. Post-operative transient hypocalcemia, recurrent laryngeal nerve palsy, drain output and total duration of surgery were compared among the groups. *Results:* Both the groups had comparable age and sex ratios. The duration of surgery was significantly ($p < 0.05$) shorter in the harmonic scalpel (97.5 ± 13.75 min) than in the conventional technique group (131.5 ± 21.21 min). Post-operative drain output at 24 and 48 hours in harmonic scalpel group (23 ± 8.8 ml, 34 ± 8.0 ml) was significantly lower than conventional group (30 ± 5.8 ml, 46.33 ± 9.18 ml) ($p < 0.05$). The incidence of transient hypocalcemia was significantly more ($p < 0.05$) in conventional ($n = 6$) group as compared to harmonic group ($n = 1$). Hoarseness of voice associated with recurrent laryngeal nerve injury was observed in three patients in conventional group. Hoarseness of voice was not observed in patients of harmonic scalpel group. *Conclusion:* Use of harmonic scalpel in thyroidectomy is safe and effective and lowers incidence of post-

operative complications, shorter operative time, and lower drain output.

Keywords: Thyroidectomy; Harmonic Scalpel; Electro Cautery.

Introduction

Thyroid disorders are common disorders frequently encountered at the surgical outpatient department. Thyroidectomy involves three basic principles: identification and ligation of blood vessels, identification and preservation of recurrent laryngeal nerves, and preservation of parathyroid glands [1,2].

Although the basic surgical instruments have not undergone significant changes; the main innovations are new methods of hemostasis and vascular section [3,4]. Hemostasis during thyroidectomy can be achieved by classic suture ligation with clamp-and-tie maneuvers and/ or by electrocoagulation. Whereas suture ligation is a time consuming procedure and carries the risk of knot slipping; electrocautery on the other hand is an unattractive alternative because it implies the potential risk of injuring surrounding tissues from dispersion of heat [5]. One of the advances of early 1990s was the development of an ultrasonically activated device that includes shears and a scalpel, thus permitting the surgeon to cut tissues and control blood loss at the same time [6].

The Harmonic Scalpel uses high-frequency mechanical energy to cut and coagulate tissues and vessels simultaneously without the need for knot tying [7]. Various studies have been conducted which compare conventional methods of dissection like cold knife or electrocautery with harmonic scalpel in various surgical procedures [8-17].

In this prospective randomized study, we evaluated the efficiency, safety, and the impact on the surgical

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outcome of the utilization of harmonic scalpel during total thyroidectomy by comparing post-operative transient hypocalcemia, recurrent laryngeal nerve palsy, post-operative drain collection and total duration of surgery.

Materials and Methods

This was a prospective randomized trial conducted in Victoria hospital and Bowring & Lady Curzon hospital attached to Bangalore Medical College & Research Institute from period of January 2017 to December 2017. 60 cases undergoing total thyroidectomy for benign thyroid swellings were taken for the study. Patients presenting with multi nodular goiter, age group between 18 to 70 years were included in this study. Patients presenting with thyroiditis, malignancies of thyroid, those who had undergone hemi/total thyroidectomy previously were excluded from the study.

Thirty of them underwent total thyroidectomy using conventional methods including monopolar or bipolar cautery and the other 30 underwent total thyroidectomy using harmonic scalpel. After admission of the patient, clinical data was recorded as per the proforma. A complete history was obtained from all patients with respect to the complaints as detailed in the proforma in a chronological order. General physical examination to look for signs of hyperthyroidism or hypothyroidism. Local examination with inspection, palpation, percussion and auscultation as per standard methods was done for the thyroid swellings and findings were noted down. Systemic examination to assess fitness for surgery and to look for systemic manifestations of thyroid disorder. An indirect laryngoscopy was performed to record movement of vocal cords preoperatively. X ray of neck in anteroposterior and lateral views, USG of neck were performed in all patients before surgery.

Routine blood investigations like complete blood counts, random blood sugar, renal function tests, serum electrolytes and viral markers were done for all patients. Specific investigations included thyroid function tests, serum calcium and serum albumin. Only euthyroid patients were selected for the study.

A fine needle aspiration cytology was performed on all patients undergoing surgery. Only patients with colloid goiter were selected for study. Patients with malignant thyroid disease or thyroiditis were excluded from the study. All patients who were fit for surgery underwent total thyroidectomy under general anesthesia as per the standard guidelines after taking

written, informed consent for surgery and willingness to participate in the study

The patients were randomly divided into two groups those undergoing total thyroidectomy using conventional methods including monopolar or bipolar cautery for dissection and ligation of pedicles and those undergoing total thyroidectomy using harmonic scalpel.

Patients were monitored for post-operative complications and for drain output, symptoms of hypocalcemia, recurrent laryngeal nerve injury. Drain output was measured after 24 hours and 48 hours and drain was removed after 48 hours. Postoperative calcium was monitored in all the patients. Both preoperative and postoperative RLN statuses were determined by indirect laryngoscopy.

Statistical methods: Descriptive statistics have been applied. Various case observations were documented on MS office Excel Spreadsheets 2014. Necessary analysis of data for the purpose of the study has been carried out on SPSS 24.0 software. In pursuance of the objectives of the study, to test the difference of significance between the two groups, independent t test has been applied for quantitative data and chi square test was used for categorical data. P value of less than 0.05 was considered significant.

Results

The patients considered for the study were in the age group of 18-70 years, and out of 60 patients majority were female patients totaling 55 and the remaining 5 were males. The electrocautery and harmonic dissection groups were comparable with respect to age and sex ($p > 0.05$). Mean age of patients was 45.73 (range 33-65 years). The maximum incidence of benign thyroid swellings undergoing total thyroidectomy is in the age group of 40-49 years with 25 cases, followed by 30-39 years with 19 cases. Benign thyroid swellings and thyroidectomies were much more common among females than males, in the ratio of 9:1. When compared the duration of surgery was significantly ($p < 0.05$) shorter in the harmonic scalpel (97.5 ± 13.75 min) than in the conventional technique (131.5 ± 21.21 min). Post-operative drain output at 24 hours in harmonic scalpel group was 23 ± 8.8 ml compared with conventional group where it was 30 ± 5.8 ml. Also drain output at 48 hours in harmonic scalpel group was 34 ± 8.0 ml compared with conventional group where it was 46.33 ± 9.18 ml ($p < 0.05$).

Hypocalcemia was the most common complication observed in both the groups with overall incidence of

11.67%. The incidence of hypocalcemia was significantly more ($p < 0.05$) in conventional ($n = 6$) group as compared to harmonic group ($n = 1$). Hypocalcemia was transient and reverted to normocalcemia by the end of 60 days. Respiratory discomfort was reported in only one patient of conventional group and there was no statistical

difference between the two groups. Hoarseness of voice associated with recurrent laryngeal nerve injury was observed in three patients who underwent total thyroidectomy by conventional methods. Hoarseness of voice was not observed in patients of harmonic scalpel group.

Table 1: Age distribution

Age group	Conventional methods	Harmonic scalpel	No. of cases	Percentage
30-39	9	10	19	31.67%
40-49	13	12	25	41.67%
50-59	7	5	12	20%
60-69	1	3	4	6.66%
Total	30	30	60	100%

Table 2: Sex distribution

Sex	Conventional methods		Harmonic scalpel		Total
	No. of cases	Percentage	No. of cases	Percentage	
Male	3	10%	2	6.67%	5
Female	27	90%	28	93.33%	55

Table 3: Comparison of operative time and post-operative complications between the two groups

	Conventional methods	Harmonic scalpel	P value
Duration of surgery	131.5 ± 21.21 min	97.5 ± 13.75 min	<0.05
Transient hypocalcemia	6(20%)	1(3.33%)	<0.05
Hoarsness of voice	3(10%)	0	0.07
Respiratory discomfort	1(3.33%)	0	0.31
Wound infection/ Seroma	2 (6.67%)	1 (3.33%)	0.55

Table 4: Comparison of postoperative drain output between the two groups

Drain output	Conventional methods	Harmonic scalpel	P value
At 24 hours	30 ± 5.88	23 ± 4.84	<0.05
At 48 hours	46.33 ± 9.18	34.84 ± 8.03	<0.05

Discussion

When compared, the duration of surgery was significantly ($p < 0.05$) shorter in the harmonic scalpel (97.5 ± 13.75 min) than in the conventional technique (131.5 ± 21.21). However, potential increased cost and the skill required in overcoming the learning curve are possible disadvantages. Drain output at 24 hours in harmonic scalpel group was 23 ± 8.8 ml compared with conventional group where it was 30 ± 5.8 ml. Also drain output at 48 hours in harmonic scalpel group was 34 ± 8.0 ml compared with conventional group where it was 46.33 ± 9.18 ml. This difference was statistically significant ($p < 0.05$). The major complications of thyroid surgery are RLN palsy and

hypocalcemia. Our results seem to support the hypothesis that the reduced tissue injury resulting from less heat generated by the HS might lead to a reduced risk of impaired vascularity in the parathyroids glands. In our study we observed and recorded transient hypocalcemia in total of 7 patients (11.67%) out of which 6 occurred in conventional group and 1 in harmonic group which was found to be significant statistically. Injury to recurrent laryngeal nerve occurred 3 patients (5%) and all in conventional group. We did not record recurrent laryngeal nerve injury in harmonic group. Seroma and wound infection was noted and recorded in 2 patients of conventional group and 1 patient of harmonic group. The difference observed was not statistically significant.

Conclusion

Multinodular goiter is a common presentation of thyroid disorders in the department of surgery. The benefits of using the harmonic in thyroidectomy is reduction in operative time, as repetitive 'clip, cut and tie' routines are avoided and also reduction in postoperative hypocalcaemia as a consequence of less injury to the parathyroids and surrounding structures through lateral dispersion of heat. Excellence in haemostasis also permit a better view of these and other important structures to preserve when operating. Use of harmonic scalpel in thyroidectomy is safe and effective, and it improves the operative course. It provides a superior alternative to the currently used high frequency monopolar technology in terms of a lower incidence of post-operative hypocalcemia, shorter operative time, and a low drain output that may obviate the need of drain, making thyroidectomy a day care procedure.

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