

Original Research Article

Ultrasonic cutting and coagulation device versus conventional diathermy dissection in thyroid surgery: prospective randomized trial

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ABSTRACT

Background: The objective of this study was to compare the operative time and postoperative outcomes in thyroid surgeries using the ultrasonic cutting and coagulation device with conventional diathermy dissection.

Methods: This study was a prospective, interventional, cohort study. The patients were randomized in two groups by lottery system. The patients operated with ultrasonic device were labeled as Group A: UCCD and by conventional diathermy as Group B: CDD. The operative time, postoperative drain volume, pain score on VAS and complications were assessed and compared in between the two techniques of surgery.

Results: Total of 18 males and 58 females underwent thyroid surgery with age ranging from 17 to 75 years. The operative time in UCCD group was less than CDD group (93.29 min vs. 106.59 min; $p=0.06$). The cumulative mean amount of drain was found to be less in UCCD group, this difference was statistically significant (77.86 ml vs. 138.05 ml; $p=0.00018$). The drain was removed earlier in UCCD group, this comparison was also statistically significant (2.49 days in UCCD group vs. 3.02 days in CDD group; $p=0.000009$). The mean pain score was found to be statistically significant on all the postoperative days in UCCD group.

Conclusions: The patients experienced less pain and complication while using UCCD as technique for surgery. Hence, ultrasonic device using both cutting and coagulating mode at the same time is efficient in hemostasis and lesser post-operative pain, and found to be advantageous.

Keywords: Thyroid surgery, Ultrasonic device, Bipolar cautery, Operative time, Drain volume, Pain scale

INTRODUCTION

Rapid advancement in the medical technology has lead surgeons to use newer surgical instruments. Given the significant vascularity of the thyroid gland and the relatively small operative field, meticulous hemostasis has and will always be an important prerequisite for a successful outcome in thyroid surgery.¹ Hemostasis in thyroid surgery is achieved by means of the conventional clamp-and- tie technique, diathermy, hemostatic clips, and recently, the UCCD.²⁻⁴ The ultrasonic technology was

introduced in early 1990s and has four main functions of cutting the tissues, cavitation, co-aptation and coagulation of tissues.⁵ Since the adoption of the UCCD into modern surgical practice, its utility for a wide variety of operations has been well documented.

An ultrasonic based device when activated using ultrasound waves of a high-frequency (55 kHz) that can cut vessels of diameters up to 5 mm.⁶ The active blade vibrates in longitudinal way against an inactive blade resulting in cutting and coagulation. The temperature

working is 60 – 80 degree celsius which is quite low as compared to electro-diathermy (350-450 degree celsius), hence there will be less thermal trauma and damages to tissues in surrounding of around 1-3 mm vertically and longitudinally.^{2,7} The objective of this study was to compare the operative time and postoperative outcomes in thyroid surgeries using the ultrasonic cutting and coagulation device with conventional diathermy dissection. Till date there is only one study in Nepal that compares the efficacy of ultrasonic based device with the conventional techniques.⁸ In addition in this study the patients undergoing sub-total, near and total thyroidectomy were also compared.

METHODS

This study was conducted at Ganesh Man Singh Memorial Academy of ENT - Head & Neck Studies, Maharajgunj Medical Campus, Tribhuvan University Teaching Hospital (TUTH), Institute of Medicine (IOM), Kathmandu, Nepal. The study was carried out over a period of 18 months from October 2015 to April 2017. The ethical approval was obtained from the institutional review board and informed written consent was taken from all the patients.

The study was a prospective, interventional, cohort study. Patients aged 15 years and above, who underwent thyroid surgeries were included in this study. However, patients who underwent any previous neck dissection or irradiation were excluded. The total of 76 patients were randomized in two groups by lottery system for technique of surgery. The patients operated with ultrasonic device were labeled as Group A: UCCD and by conventional diathermy as Group B: CDD. The operative time, postoperative drain volume on 1st, 2nd, 3rd and 4th POD, cumulative drain volume, the day of drain removal, pain score on VAS was 1st, 2nd, 3rd and 6th day (day of stitch removal) and complications were assessed and compared in between the two techniques of surgery (Group A vs Group B). Independent 't' test was used to calculate

statistical difference and $p < 0.05$ was considered significant.

RESULTS

A total of 76 patients (18 male patients and 58 female patients) were included in this study. The age of patients included in this study ranged from 16 to 75 years as depicted in Table 1. The age, sex and pathologies were comparable in both the groups. Mean operative time comparison between two techniques has been depicted in Table 2. The operative time was measured from the time of incision to the last stapler applied over skin, in minutes. The mean operative time in Group A was 93.29 minutes whereas in Group B, it was found to be 106.59, however this was not statistically significant (p value: 0.06). Mean amount of drain in ml in two techniques on different postoperative days has been depicted in Figure 1. The mean amount of drain in Group A on 1st POD was found to be 47.86 ± 21.22 ml whereas in Group B it was found to be 79.51 ± 62.65 ml, this difference was found to be statistically significant (p value: 0.006). On 2nd POD, the drain amount was 23.57 ± 12.16 ml in Group A and 41.83 ± 21.67 ml in Group B, which was also statistically significant. (p value: 0.000033). The drain was removed earlier in UCCD group, this comparison was statistically significant (2.49 days in UCCD group vs 3.02 days in CDD group; p value: 0.000009). Mean pain score comparison between two techniques has been depicted in table 3. The mean pain score on 1st POD in Group A was 5.2 ± 1.13 vs Group B was 6.390 ± 1.18 , which was statistically significant (p value: 0.000028). On 2nd POD, the mean pain score was found to be 4.03 ± 1.04 in Group A whereas in Group B, it was 5.15 ± 1.17 which was also found statistically significant (p value: 0.000042). The mean pain score on 3rd POD was found to be 3.06 ± 0.96 in Group A whereas 3.83 ± 1.2 in Group A with p value of 0.003. On 6th POD, the mean pain score in Group A was 1.69 ± 0.53 and in Group B was 2.51 ± 1.24 which was also found significant (p=0.000049).

Table 1: Age distribution in the groups (n=76).

Age Distribution (years)	Ultrasonic cutting coagulation device (Group A) (%)	Conventional diathermy dissection (Group B) (%)	Total (n=76) (%)
15-30	13 (54.17)	11 (45.84)	24 (100.00)
31-45	13 (43.33)	17 (56.66)	30 (100.00)
>45	9 (40.90)	13 (59.10)	22 (100.00)
Total	35 (46.05)	41 (53.95)	76 (100.00)

Table 2: Mean operative time comparison between two techniques.

Operative time (min)	UCCD (n=35) (Group A)	CDD (n=41) (Group B)	P value
Mean	93.29	106.59	0.06
Standard Deviation	31.87	28.73	

P value by independent 't' test

Table 3: Mean pain score comparison between two techniques.

Mean VAS Score (ml)	UCCD (n=35) (Group A)	CDD (n=41) (Group B)	P value
1 st POD	5.2 ± 1.13	6.390 ± 1.18	0.000028
2 nd POD	4.03 ± 1.04	5.15 ± 1.17	0.000042
3 rd POD	3.06 ± 0.96	3.83 ± 1.2	0.003
6 th POD	1.69 ± 0.53	2.51 ± 1.24	0.000049

P value by independent 't' test.

In this study, all the patients were admitted in the hospital for 6 days, following surgery. During this period one patient had RLN paresis in Group B, 2 RLN paresis and 6 patients developed hypocalcemia. The patient of Group B who had persistent hypocalcemia was admitted again after one month of surgery for refractory hypocalcemia. He improved at the time of discharge with serum calcium levels of 2.1 mmol/l. None of the patient had wound infection, seroma or secondary hemorrhage.

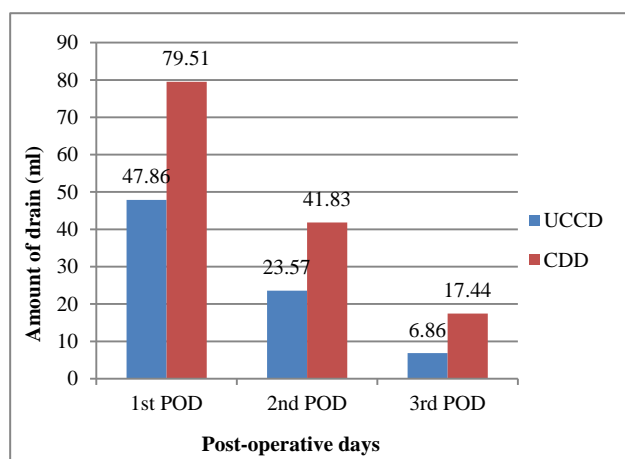


Figure 1: Mean amount of drain in ml in two techniques on different postoperative days.

DISCUSSION

In the last 20 years, thyroid surgery has undergone significant changes specifically, the type of surgery from total to subtotal thyroidectomy. This study was performed to present the possible advantages and disadvantages of using ultrasonic device in thyroid surgery. In this study, there were total of 76 patients, the age group of those ranged from 16 to 75 years. The age and gender criteria were found similar with others studies. In this study the females outnumbered the males with a ratio of 3.2:1. Similarly females outnumbered males in most of the studies reviewed, carried out by Siperstein et al and Waqas et al.^{9,10}

Oktay et al observed less operating time in hemithyroidectomy patients while using ultrasonic device (47.2 min vs 79.2 min; p value:0.001).¹ Miccoli et al also observed less operative time in hemithyroidectomy patients, however which was not statistically significant.

(40 min in HS Group vs 46.7 min in CT Group; p value: 0.2).² In a study by Aslam et al, they found the operative time to be 67.21 min in ultrasonic group and 109.6 min in conventional group, which was statistically significant.¹¹ Cirocchi et al found operative time less in ultrasonic group in total thyroidectomy (75 min vs 113 min).¹² Ecker et al found the overall drain to be 20.03 ml less while operating with ultrasonic device.¹³ Aziz et al found the postoperative drain on 1st POD to be only 18.2 ml in comparison to 76 ml in conventional techniques.¹⁰ The systematic review by Ecker et al shows difference in the mean VAS of 0.86.¹³ In a study by Miccoli et al the VAS noted on 24 hours was less in ultrasonic group (3.9) as compared to 5.3 in the conventional group, similar findings were noted at 36 hours (2.27 vs 3.95).²

CONCLUSION

The ultrasonic cutting and coagulation device is a more effective surgical device compared to conventional techniques in thyroidectomy. Its use offers several clinical advantages, including reduced operating time, intra-operative blood loss, drainage volume, and post-operative pain, length of hospital stay, and transient hypocalcemia which can ultimately benefit the surgeon, patient and hospital, without the addition of safety concerns.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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