

ULTRASONIC CUTTING IN MULTINODAR THYROID SWELLINGS

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ABSTRACT

Objectives: To compare the operative time and postoperative outcomes in thyroid surgeries using ultrasonic cutting with conventional diathermy dissection.

Material and Methods: This prospective study was conducted in Abaseen Hospital, Peshawar, Pakistan from April 2018 to December 2018. Ethical approval was taken from the hospital administration. After taking informed consents from the patients, these were divided into two groups by lottery system. The patients operated with Ultrasonic Cutting device (UCD) were labelled as Group A and Conventional Diathermy dissection (CDD) as Group B. The operative time and outcome of thyroid surgeries were assessed and compared between the two groups.

Results: Total of 4 males and 15 females underwent thyroid surgeries during the study period with age ranging from 25 to 70 years, the operative time in Ultrasonic Cutting device (UCD) was less than Conventional Diathermy dissection (CDD) group (100.15 minutes vs 150 minutes $p=0.06$). The cumulative mean amount of drain was found to be less in UCD group, the difference was statistically significant (80.5 ml vs 133.05 ml $p=0.00018$). The drain was removed earlier in UCD group, this comparison was also statistically significant (2.5 days in UCD group vs 3.02 days in CDD group, $p=0.00007$). The mean pain score was found to be statistically significant on all the postoperative days in UCD group.

Conclusion: Less operative time, reduce postoperative pain and minimal complications were recorded in patients who undergone thyroid surgery by Ultrasonic Cutting Scalpel than Conventional method.

Key Words: Ultrasonic scalpel, Thyroid Surgery, Pain, Bipolar cautery.

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INTRODUCTION

In the present era due to new advent of technologies surgeons use newer instruments¹. For a successful thyroid surgery meticulous haemostasis will always be an important prerequisite². Haemostasis in thyroid surgery is achieved by means of diathermy, hemostatic clips, conventional clamps and recently by Ultrasonic devices³. In early 1990s the ultrasonic technology was introduced it has four main functions of cutting the tissues, cavitation, coaptation and coagulation of tissues⁴. The UCD is commonly used in the west and its utility for

a wide variety of operations has been well documented⁵. A vessel of diameter 5mm can be cut when ultrasonic based device gets activated using ultrasound waves of a very high frequency (55 KHz)⁶. The active blade vibrates in longitudinal way against an inactive blade resulting in cutting and coagulation. The temperature of the working is well below the diathermy (350-450 degrees Celsius) use which is 60-80 degrees Celsius⁷, hence there will be less thermal trauma and damage to the tissues in surrounding of 1-3 mm vertically and longitudinally⁸. As this technology is totally new and for the first time in the history of this province is done, the main objective of the study was to compare the operative time and postoperative outcomes in thyroid surgeries using the ultrasonic cutting and coagulation device with conventional diathermy dissection.

MATERIAL AND METHODS

This prospective study was conducted in Abaseen Hospital, Peshawar, Pakistan from April 2018 to

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December 2018. Ethical approval was taken from the hospital administration. After taking informed written consents from the patients, these were divided into two groups by lottery system. The patients operated with Ultrasonic Cutting device (UCD) were labelled as Group A and Conventional Diathermy dissection (CDD) as Group B. The operative time and outcome of thyroid surgeries were assessed and compared between the two groups.

The study was a prospective and interventional. Patients aged 25-70 years who underwent thyroid surgeries were included in the study, however those patients who underwent any previous neck dissection or irradiation were excluded. The total of 20 patients were randomized in two groups by lottery system for technique of surgery. The patients operated with ultrasonic cutting device were labelled as Group A and by conventional diathermy as group B. The operative time, postoperative drain volume, after 24 hours, 48 hours, 72 hours and 4th postoperative day. Cumulative drain volume, the day of drain removal, pain score on VAS on 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 $p \leq 0.05$ was considered significant.

RESULTS

A total of 20 patients {4 males and 15 females} were included in this study who underwent thyroid surgeries during the study period with age ranging from 25 to 70 years as shown in Table 1. The age, sex and pathologies were comparable in both the groups. The mean operative time in Ultrasonic Cutting device (UCD) was less than Conventional Diathermy dissection (CDD) group (100.15 minutes vs 150 minutes $p=0.06$) as shown in Table 2. The operative time was measured from the time of incision to the last stitch applied to the skin in minutes. Mean amount of drain in ml in two techniques on different postoperative days was calculated, the cumulative drain was found to be less in UCD group, the difference was statistically significant (80.5 ml vs 133.05 ml $p=0.00018$). The mean amount of drain in group A on 1st Post Operative Day (POD) was found to be 46.36 ± 20.25 ml whereas in group B it was found to be 92.76 ± 33.56 ml, this difference was found to be statistically significant (p value 0.006). On 2nd POD, the drain amount was 22.75 ± 1.3 ml in group A and 40.67 ± 3.5 ml in group B which was also statistically significant ($p = 0.0003$). The drain was removed earlier

in UCD group, this comparison was also statistically significant (2.5 days in UCD group vs 3.02 days in CDD group, $p=0.00007$). The mean pain score comparison between two groups is depicted in Table 3 and was found to be statistically significant on all the postoperative days in UCD group. In this study all the patients were discharged after 6th POD, during this period 2 patients had right Recurrent laryngeal nerve paresis in group B and one patient developed hypocalcemia. The patient of group B who had persistent hypocalcemia was re-admitted to cure refractory hypocalcemia, the patient improved at the time of discharge with serum calcium levels of 10 mg per deciliter. None of the patient had seroma, wound infection or secondary haemorrhage.

Table 1: Distribution of Age

Age in Years	UCD	CDD	Frequency and % ages
25-35	08	02	50%
36-46	04	01	25%
47-57	02	01	15%
58-70	02	nil	10%

Table 2: Comparison of mean operative time

Operative time in minutes	UCD	CDD	P value
Mean	100.15	150.00	0.06
Standard deviation	31.87	28.73	

Table 3: Mean pain score comparison

Mean pain score in ml	UCD	CDD	P value
1st POD	5.20 ± 1.13	6.39 ± 1.18	0.000028
2nd POD	4.03 ± 1.04	5.15 ± 1.17	0.000048
3rd POD	3.06 ± 0.96	3.83 ± 1.2	0.0003
6th POD	1.69 ± 0.53	2.51 ± 1.26	0.000049

DISCUSSION

The meticulous haemostasis is of crucial importance for the success of thyroid surgery. It prevents the intra- and postoperative complications and helps to improve the quality and shorten the postoperative hospital stay. The conventional thyroid resections, using Kocher's technique require a massive amount of instruments, mainly for placing ligatures. In recent years other tools as electrocautery, argon plasma coagulation, Ultrasonic and Liga Sure as well as various clips have been introduced in thyroid surgery⁹. The harmonic scalpel was developed in the early 90's. An

active titanium blade vibrates with a frequency 55000 cycles per second and is used to simultaneously cut and coagulate the tissues. The harmonic scalpel ensures safe and effective hemostasis for blood vessels in diameter up to 5mm¹⁰. The sharp tip of the blade and the reduced heat generation permits to preserve the tissue and minimize the of the surrounding tissue injury several advantages of the harmonic scalpel, such as the minimized tissue trauma, reduced smoke production, avoidance of neuro-muscular stimulation and electricity conductance through the human's body, thrust on the device in the field of modern thyroid surgery^{11,12}. Our study includes patients with various thyroid diseases, which demonstrates the possibility to perform any extent of thyroid resection with improved anatomic dissection and visual control during the exploration of the gland and the surrounding structures in the neck.

Furthermore, in the absence of bleeding it is easily to find the underlying parathyroid glands and the nearby recurrent laryngeal nerve¹³. The latter is precondition for lesser postoperative complications. Harmonic scalpel application permits to decrease the traction and manipulation of the thyroid, especially when dissecting and cutting the upper vascular pedicle of the gland. The improved control over the upper thyroid pole vessels achieved with the harmonic scalpel leads to additional operative incision length reduction, especially with the video-assisted technique and as a consequence, improved cosmetic results¹⁴⁻¹⁶. The use of 30-degree, 5mm optics makes easier to identify the parathyroid glands and recurrent laryngeal nerve and also to visualize the upper thyroid vessels before cutting them with harmonic scalpel. Our results demonstrate that the

technique can be applied not only for solitary thyroid nodules but also for multinodular goiter^{17,18}. The most important determinant for the technique is the size of the dominant thyroid node and the size of thyroid lobe, because of the limited working space. We have accepted that the maximal lobe size should not exceed 7 cm in length and 3,5 cm in width. The volume of one thyroid lobe should not exceed 25 ml on ultrasound examination. The reduced number of hemostatic instruments followed by decrease in placement of ligatures leads to operative time shortening up to 45% compared with the conventional resections as well as to reduced tissue trauma¹⁹⁻²². Resulting in decreased transudation and exudation processes in the thyroid bed, all this helps to reduce the amount of fluid requiring draining

and the need of placing drainage in thyroid bed. Our experience confirms significantly better postoperative pain control and fast recovery for the patients where the harmonic scalpel has been used. The latter allows to shorten the postoperative hospital stay and to increase the planned patients admissions^{23,24}.

CONCLUSION

Harmonic scalpel is extremely safe and effective for surgical treatment of thyroid diseases. It allows extremely good and reliable hemostasis, shortens the operative time, reduces the complications, fastens the recovery of the patient with improved pain control, reduced postoperative stay and improved cosmetic results.

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AUTHOR'S CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under:

Khan AR: Main Idea, Operating Surgeon.

Hafeez M: Data Collection.

Arif AU: Data collection, bibliography.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.