

Original Article

COMPARISON OF USE OF ULTRASONIC DISSECTOR WITH ELECTROCAUTERY IN THYROID SURGERY

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Objective: To determine whether use of ultrasonic dissector (UD) in thyroid surgery results in shorter operative time, hospital stay and reduced average drainage and to compare the incidence of postoperative complications with electrocautery (EC).

Material & Methods: Hundred patients with thyroid disease were inducted in the study. The patients were randomized in two groups. Group A (EC), & Group B (UD).

Results: The study carried out on patients undergoing ultrasonic dissector group B (UD) for thyroid surgery revealed meager post operative complications attributable to harmonic scalpel but on the contrary the benefits were decrease in operative time, less post operative pain, less drainage, early hospital discharge and very few complications as compared to Electrocautery group A (EC).

Conclusion: The complete ultrasonic dissection of thyroid gland with Harmonic scalpel is not only safe but it also reduces pain, hematoma formation and drainage. Hospital stay and operative time is also shortened.

Keywords: Ultrasonic dissector (UD), Electrocautery (EC), Harmonic Scalpel

Introduction

Various surgical procedures on the thyroid have been described over the past century.¹ Thyroid is one of the most vascular glands in the body² with a relatively restricted operative field. It is always important to have meticulous haemostasis so to achieve a successful outcome. Traditional methods of haemostasis for example suture ligation, monopolar and bipolar electrocautery (EC) and even haemostatic clips have their respective advantages and disadvantages. The use of ultrasonic dissector (UD) was introduced two decades ago using mechanical vibration at 55.5 kHz.

It has advantage over the conventional techniques in that it can both cut tissues and coagulate vessels simultaneously thus demonstrating its ability to diminish blood loss as well as operative time.³ The advantages of ultrasonic dissector (UD) includes least thermal injury to the adjacent tissues, avoidance of electrical energy transmission between two poles and therefore through the patient saving patient from electrical & thermal injury. UD also avoids neuromuscular stimulation.⁴

Aims & Objectives:

The aim of our study was to compare the UD with EC in thyroid surgery. The comparison was made of operative time, post operative drain output, postoperative pain, hospital stay, postoperative haemorrhagic complications and hoarseness.

Material & Methods

This was prospective randomized control trial (RCT). Randomization was done using random number tables. The study was conducted in surgical unit-II, Services Hospital, Lahore from March, 2008 to March, 2010. 100 patients with thyroid disease were inducted in the study. The patients were randomized in two groups, Group A (EC) & Group B (UD). Euthyroid patients with multinodular goiters without any compressive symptoms were included in the study. Only patients with ASA < III were included in the study.

The study was approved by the hospital ethical committee and every patient was required to sign an informed consent regarding induction in the study & the procedure itself. The outcome parameters were set as (a) operative time, (b) postoperative drain output, (c) postoperative pain (d) hospital stay and (e) the postoperative hemorrhagic complications, (f) hoarseness of voice.

The operative time was measured in minutes from the time of the skin incision till the last skin suture was applied. The post operative drainage of blood and serous fluid was calculated on a daily basis. The total amount of drain output in ml/day and the total number of days the drain was retained were noted.

Postoperative pain scoring was done using visual analog scale, the scoring was done at 1,4,8,12 postoperative hours after surgery. The hospital stay was calculated in days.

Surgical Technique

100 thyroidectomies were performed during the last 2 years, through a cervical Kocher approach 2-3 cms over the sternal notch. Platysma was cut in the line of incision and flaps were raised. Pretracheal muscles were divided through the middle white line to reach the thyroid gland. In few cases of large thyroid sternomastoid muscle was divided partially. When indicated, section was done on the side of larger hemithyroid. The middle thyroid vein was ligated first as in 30% of cases it drains directly in internal jugular vein.⁵ Identification of the laryngeal recurrent nerve was done in the right side close and right to the trunk of the inferior thyroid artery. Dissection of the upper thyroid pole started with ligature of the anterior descending branch of the artery and of the superior thyroid vein over the convexity of the thyroid away from the superior thyroid artery trunk. Gentle caudal gentle traction of the thyroid lobe is of great help to facilitate this maneuver and avoid superior laryngeal nerve damage. Upper parathyroid gland (usually intracapsular) was separated close to the entrance of the recurrent laryngeal nerve at the cryco-thyroid membrane. Once the upper pole had been liberated, dissection of the tunnel between the thyroid capsule and Berry's ligament was performed over the recurrent laryngeal nerve. Care was taken on the section of small arterial and venous branches over the nerve until its entrance at the cryco-thyroid membrane had been completely identified.

Inferior parathyroid gland location and proper identification was done properly because otherwise the gland may be included and removed in the surgical specimen. It was separated along with the thyroid capsule and the caudal vascular pedicle originating from the inferior thyroid artery was preserved.

The rest of the thyroid lobe is then dissected upward following the internal border of the thyroid capsule. On the left side identical steps are advised considering that the recurrent laryngeal nerve on this side has a more horizontal course being easily localized on the oesophago-tracheal space. If identification becomes difficult it must be searched on the left side of the inferior thyroid artery or caudally to its entrance at the cryco-thyroid membrane. This is mandatory in the case of large intrathoracic goiters. When dealing with the parathyroid gland the nerve trunk must be identified before it crosses the inferior thyroid artery because of the close relation with the parathyroid gland at this level and mainly if it is of large size.

Procedure

The techniques did not affect the methodology that

must keep the principles here above. After skin section with a regular scalpel, subcutaneous tissue and platysma muscle was sectioned between both leaves of the harmonic scalpel (level 5) as well as the area behind the muscle using the cavitation effect of the active leave of the scalpel. Opening of the white line is done in the same manner and both sterno-hyoid and sterno-thyroid muscles are laterally retracted gently and the thyroid lobe dissected with regular scissors until superior and inferior laryngeal nerves were identified and exposed. Haemostasis of small vessels and larger vascular branches was achieved by coaption pressure of the harmonic scalpel (Level 3) taking care to apply the inert side toward neural structures in the dissection of the upper pole, the dissection of the laryngeal recurrent nerve and haemostasis of the above mentioned small retro-recurrential artery. For liberation of the parathyroid glands harmonic scalpel was utilized (Level 5) by the cavitation effect, as well as for the dissection of the pretracheal Gruber's fascia. Long contact time between active probe and trachea must be avoided to prevent tracheal perforation.

Results

A total number of 100 patients were included in our study; group A (EC) had total of 50 patients out of which 46 were female patients and 4 were male patients. In group B (UD) there were also total of 50

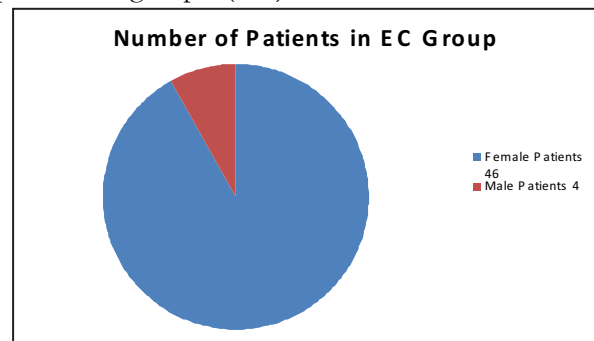


Fig.1: Group A (EC)

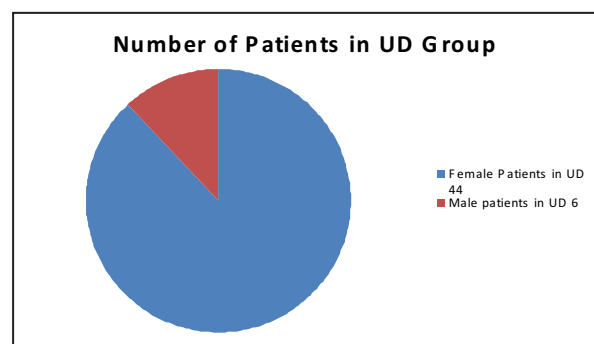


Fig.2: Group B (UD)

patients in whom 6 were male patients and 44 were female patients. The average age range was between 18 to 70 years of age for the both A and B groups with mean of 43.

Mean Operative Time :

In our study mean operative time for group A (EC) was 88.64 minutes with standard deviation of 3.412. Regarding the Group B (UD) mean operative time was 50.40 minutes with standard deviation of 7.412 ($p < 0.000$). There was an obvious decrease in the operative time of 38.24 minutes as compared to Group A (EC) which was also statistically significant.

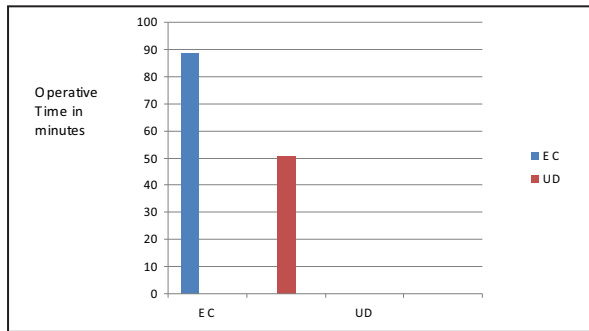


Fig.3: Operative time in minutes.

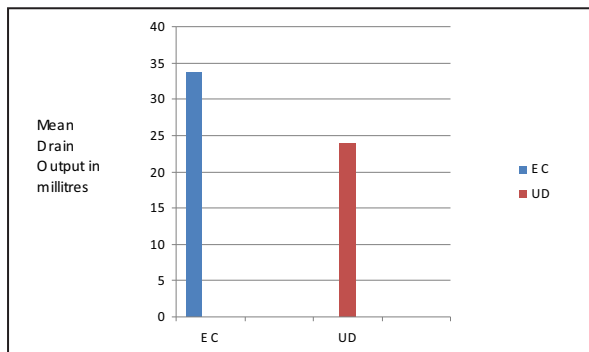


Fig.4: Mean drain output in millilitres.

Mean drain output:

The post operative drains were calculated in milliliters per 24 hours till the removal of the drains, when there was no further addition in the drains. The mean drain output was 33.70 ml in group A (EC) and 23.9 ml in Group B (UD) as shown in **fig.4**.

Hospital stay:

The post operative hospital stay in Group A (EC) was 5.44 days and that of group B (UD) was 2.66 days. **Post operative pain:**

Post operative pain scoring was done using visual analog scale. The scoring was done at 1,4,8,12 postoperative hours after surgery. The mean for

(EC) group was 82 with maximum of 6 according to VAS scoring scale. The mean for (UD) group was 79 with maximum of 4.

Post operative complications:

Hoarseness of voice was observed in 2 cases on first post operative day in EC group. IDL was done in both patients with normal cord movements. Both of our patients recovered in next few days without any further management. Transient hypocalcaemia was noted in 3 patients; one of these patients was from UD group while other 2 were from EC group. These three patients were treated symptomatically and their serum calcium levels returned to normal after 2 weeks. No case of reactionary hemorrhage was noted in our study.

Discussion

Development of endocrine surgery has been related to progress made on haemostasis, control of pain and infection and a better understanding of physiology. Until recently complication rate in thyroid surgery was prohibitive. Haemorrhage resulted in heroic practice and sometimes associated to catastrophic outcomes. In thyroid surgery haemorrhage results from inadequate visualization of anatomic structures with increasing risk of damage to neural structures and life-pending postoperative complications (haematoma suffocates).³ Progress in technology has resulted in an improvement of the techniques for blood vessel control and handling and experienced surgeons have contributed to a dramatic decrease in operative complication rates all over the world.⁵ Currently and widely used mono-polar electrocautery has a non-negligible risk in damaging nerves directly or by thermal diffusion through metallic instruments or fluids. Even coagulated tissue may easily be removed and result in late bleeding. Bipolar electrocautery has the advantage of less thermal diffusion but the risk of neural damage or vascular deprivation of the parathyroid glands remains. This is why it is so scarcely employed nowadays in thyroid surgery. Recently, new devices using bipolar energy with higher standards of security and less heat diffusion are on the way and its results and cost effectiveness are currently being analysed. Harmonic scalpel (Ultracision) performs sectioning and haemostasis by means of a fixed frequency vibration of 55.500 Hertz and a longitudinal displacement of 100 micrometers. Cutting speed and degree of coagulation can be adjusted to power source and pressure applied on the terminal. Lateral thermal effect is 1-3 mm wide what represents less than a half

of the one produced by bipolar electrocautery. Care must be taken otherwise when directing the active leave toward neural structures and prolonged contact with the trachea must be avoided. Correct haemostasis requires good pressure between the two blades of the shears with no angle formation with the anatomic course of the blood vessel. If done properly operative time is greatly reduced.³ The sample size in this study was 100 patients with selection of 50 patients in each group; age range was 18-70 years in both groups. Utilization of UD for total and sub-total thyroidectomy significantly reduced operative time compared to elector ES technique by greater than 38.40 minutes ($p < 0.000$). A study conducted at department of surgery at University of Seville and Basque country University Department of surgery Virgen Macarena Hospital, Seville and San Sebastain, Spain had operative time using UD between a minimum of 25 minutes and a maximum of 120 minutes for thyroid surgery resulting in an average value of 55.31 minutes. In EC minimum time was of 30 minutes and a maximum time of 180 minutes with an average value of 72.2 minutes with a difference of 17 minutes.³ In our study there was decreased average drain by 23.9 ± 15.08192 ml with UD utilization compared to 33.7 ml of EC technique ($p < 0.0024$). Another study conducted in Spain showed drain discharge averaged 60.77 ml of UD which is less than 78.48 ml in EC.⁹ The hospital stay of the patients with utilization of

UD was 2.60 ± 1.069 days as compared to 5.044 ± 2.082 days of EC ($p < 0.000$) which is comparable with study conducted abroad with mean hospital stay length in UD resulted in 1.64 days and 1.78 days in EC.⁶ In our study pain tabulation was performed using VAS with variation between 0 to 10 score. However 32 patients of UD group had a pain score of 4 which is 64.0% within this group. Other benefits seen with UD demonstrated in our study included no case of post operative hematoma formation,⁸ no ties used,⁹ less drain utilization,¹⁰ less post operative pain or analgesic requirement¹¹ and smaller incisions.¹² From the current study we are able to conclude that the use of UD significantly decreases operative time compared to EC techniques. As compared to other techniques using ties, clips, and/or electrocautery UD is also safe in terms of reducing the incidence of transient postoperative hypocalcemia.

Conclusion

The complete ultrasonic dissection of thyroid gland with Harmonic scalpel is not only safe but it also reduces pain, hematoma formation and drainage. Hospital stay and operative time is also shortened.

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