

## THE USE OF LIGASURE IN THYROID SURGERY

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### ABSTRACT

The LigaSure Vessel Sealing System (Valley Lab, CO,USA) is a bipolar diathermy system that seals vessels with reduced thermal spread and has been introduced as a new method for hemostasis during thyroidectomy. This report reviews our experience with use of LigaSure in thyroid surgery in one hundred twenty patients. This study was conducted in 7<sup>th</sup> October, Jala hospital and Benghazi Medical Centre, University Hospitals, Benghazi-Libya, On one hundred twenty patients who underwent thyroid surgery from June 2007 to December 2010. The medical records of the patients were collected and reviewed retrospectively regarding age, sex, histopathological diagnosis, type of operation performed (hemithyroidectomy vs. subtotal thyroidectomy vs. total thyroidectomy), operating time, postoperative complications and hospital stay. There were 17 males and 103 females (3 children), with a mean age of 42 years, mean operative time was 57 minutes, one patient died (mortality 0.8%) due to pulmonary embolism and postoperative morbidity rate was (6.6%) 8 patients. Use of the LigaSure in thyroid surgery is a safe method with minimal complications, good haemostasis and significantly reduce operating time.

**KEY WORDS:** LigaSure, Thyroidectomy, Hemostasis, Operating time.

### INTRODUCTION

Thyroid surgery involves meticulous devascularization of the thyroid gland which has one of the richest blood supplies among the organs, with numerous blood vessels and plexuses entering its parenchyma. Therefore, haemostasis is of paramount importance to control and divide various vessels before excision of the gland<sup>(1,2)</sup>.

There is a wide spectrum of complications associated with thyroid surgery, including hypocalcaemia from devascularization of parathyroids, airway compromise from hematoma /bleeding, and hoarseness from recurrent laryngeal nerve injury<sup>(3-6)</sup>.

To prevent complications a surgeon must practice meticulous haemostasis and have anatomical orientation to allow for careful identification of these structures.

The principles of safe and efficient thyroid surgery were established some 60 Years ago and are still valid<sup>(7-10)</sup>. Although standard vessel ligation is efficient in bleeding control it takes long time, and the use of electric monopolar coagulation is no longer recommended to decrease the occurrence of potentially life-threatening complications occasionally due to transmission of electric power and diffusion of heat to nearby tissue.

Hence, recently time saving operations are becoming an increasingly important issue for the turnover of patients and for decreasing anesthesia time<sup>(11-14)</sup>. The perfect surgical technique should aim to manage both the time and the potential complications of thyroid surgery.

The LigaSure Vessel Sealing System (LVSS) is a new hemostatic device which has been used to secure haemostasis in various fields of surgery<sup>(15-24)</sup>. It

was developed in 1995 and has previously been used in a range of surgical procedures. It is a bipolar electro-surgical device, sealing vessels by denaturing collagen and elastin within vessel wall and surrounding connective tissue. It is associated with reduced thermal spread (<2mm) and minimal tissue charring<sup>(24)</sup>. It can be safely used for sealing vessels up to 7 mm in diameter<sup>(24,25)</sup>. The sealed vessels are capable of withstanding 360mmHg burst pressure after seal formation<sup>(26)</sup>.

The combination of effective localized coagulation with minimal collateral thermal spread seems to be its most useful characteristic for thyroidectomy. Additionally, the effective use of LigaSure lead to shorter operating time and hence less much anaesthesia exposure<sup>(27-29)</sup>.

Since June 2007, we have carried out more than one hundred twenty procedures and documented in details the early outcomes of these patients. The aim of this report is to document our experience and compare our results with that of others.

### PATIENTS AND METHODS

One hundred twenty patients have been admitted for thyroid surgery in 7<sup>th</sup> October, Aljala hospital and Benghazi medical centre, University hospitals, Benghazi – Libya. Data was retrospectively collected from June 2007 to December 2010, including age, sex, histopathological diagnosis, type of operation performed (hemithyroidectomy vs. subtotal thyroidectomy vs. total thyroidectomy), operating time, postoperative complications and hospital stay.

All patients underwent a routine preoperative workup; vocal cord function was evaluated in all patients by an otolaryngologist and was admitted the night before surgery. Informed consent was obtained and all procedures were performed using endotracheal general anesthesia, patients with an ASA (American Society of Anesthesiologists') grade

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higher than II were excluded. Patients underwent hemithyroidectomy, subtotal or total thyroidectomy.

**Statistical methods:**

SPSS based model and Descriptive parameters were used to describe and illustrate the data.

**Operative technique:**

The skin was prepared routinely, the incision is made about two fingers above the sternal notch as usual collar incision, elevation of subplatysmal flaps, separation of the strap muscles at the midline, and medial reflection of the thyroid gland. The superior (figure 1).



(Figure 1)

Inferior thyroid vessels (figure 2) were then divided with the LigaSure. Every effort was made to identify and protect the recurrent laryngeal nerves and parathyroid glands. The same steps were repeated for the contralateral lobe. Finally the strap muscles and the platysmal layer were approximated using 3-0 polyglactin suture in an interrupted manner. Small-sized closed-suction drainage was used in majority of cases and finally the skin was closed using subcutaneous 4-0 polyglactin sutures or skin staplers. Operative time was calculated.



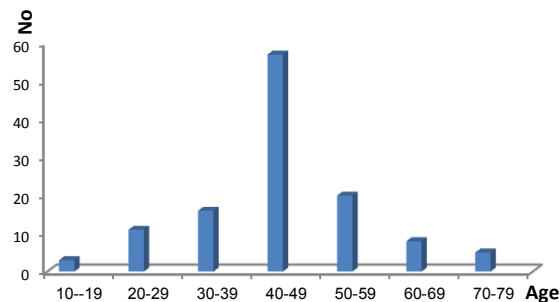
(Figure 2)

The recorded complications included hypoparathyroidism, recurrent laryngeal nerve (RLN) palsy and postoperative bleeding. Hypoparathyroidism was defined as the need for calcium supplementation after surgery. The patients were checked for (RLN) palsy by the ear, nose and throat physician only in the case of voice complaints. Hypoparathyroidism

and (RLN) palsy were defined as permanent when there was no evidence of recovery within six months of surgery.

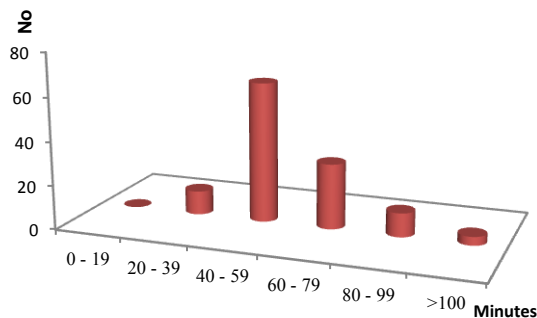
**RESULTS**

This study included 103 females (86%) and 17 males (14%), where 112 of the patients (93%) were Libyan. The mean age of patients was 42.3±14 with a range from 10 to 79 years (figure 3).



(Figure 3) Age distribution of patients operated by ligasure thyroid surgery

Mean operative time was 57±16.2 minute, where the operation took less than 60 minutes in 75 patients (63% of all patients) (figure 4).



(Figure 4) Operative time of patients operated by ligasure thyroid surgery

The mean hospital stay was 2.0±0.27 days. There was eight minor complications (6.6%) (table 3), one mortality (0.8%) due to pulmonary embolism. Histopathological data are shown in (table 1).

(Table 1) Histopathological data of patients operated by ligasure thyroid surgery

Pathological finding	No	%
Benign	117	97.5
MNG	91	75.8
Toxic adenoma	2	1.6
Graves disease	13	10.8
Follicular adenoma	6	5
Hashimoto thyroiditis	5	4.1
Malignant	3	2.5
Papillary carcinoma	2	1.7
Follicular carcinoma	1	0.8

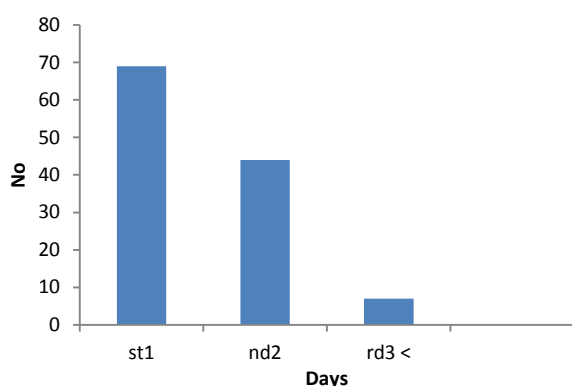
**(Table 2)** Surgical procedure of patients operated by ligasure thyroid surgery

Operative procedure	No	%
Total thyroidectomy	28	23
Subtotal thyroidectomy	35	29
Hemithyroidectomy	57	48

**(Table 3)** Complication rat of patients operated by ligasure thyroid surgery

Type of complication	No	%
Temporary hypoparathyroidism	4	3.3
Permanent hypoparathyroidism	0	0
Temporary RLN palsy	2	1.6
Permanent RLN palsy	0	0
Postoperative bleeding	2	1.6

RLN – recurrent laryngeal nerve.

**(Figure 5)** Postoperative hospital stay of patients operated by ligasure thyroid surgery

## DISCUSSION

Thyroidectomy remains to be one of the most frequently performed operations in our country. The purpose of the surgical treatment in thyroid disease should be to eliminate the disease with acceptable low complication rate. Any new surgical technology or operative technique should yield similar or improved patient outcomes and similar or lower rates of complications compared with conventional methods. LigaSure diathermy system constitutes a novel hemostatic method that produces a consistent permanent autologous seal to veins, arteries, and tissue bundles up to 7mm in diameter. It is associated with reduced thermal spread and minimal tissue charring. It consists of an electro-surgical generator and a hand piece with a ratchet scissor mechanism. The tissue is grasped and compressed by the instrument, and the response generator senses the density of the tissue bundle. In turn, the generator's computer automatically adjusts the amount of energy to be delivered. When sealing is completed, the microprocessor-controlled feedback automatically terminates the pulse. After the instrument is removed the seal is visible as a semi-transparent window that can be safely divided<sup>(24,27)</sup>.

LigaSure, allowing vessel sealing and division with no dispersion of the electric power and with little or no heat production, The device acts through denaturation of the collagen and elastin in the vessel wall. The pressure applied by the scissors opposes the walls to allow the proteins to form a seal has been widely used in diverse fields of surgery for its efficiency and safety. However, in thyroid surgery, where a considerable amount of minute vessels must be divided and hence microsurgical techniques required, LigaSure is also preferred for its further efficiency by shortening the duration of the operation<sup>(30)</sup>.

Available studies reported that the use of the LigaSure in thyroid surgery did not increase complication rate<sup>(2,5,17,19)</sup>. Whenever a new surgical technology or operative technique is introduced a learning period is usually needed.

This study is carried out at three big Hospitals in Benghazi, 7<sup>th</sup> October, Benghazi Medical Center (BMC) and AlJala Hospital. LigaSure was introduced to our hospitals only few years ago and we thought that documenting our experience would help create a baseline knowledge about the procedure in our area. We report the data collected on the first one hundred twenty patients carried out by our teams. They represent the developmental and learning curve of the involved surgical team. All operations are carried out by specialist and consultant surgeon.

In our experience, employing of the LigaSure in thyroid surgery is so easy that a surgeon is able to acquire it within the first few operations with this instrument.

The combination of effective localized coagulation with minimal collateral thermal spread seems to be its most useful characteristic for thyroidectomy. We have noticed that the mean operating time was markedly reduced in all procedures (57 minutes). This was most probably due to the reduction in time consumed in blood vessel ligation owing to specific ligation properties of the device. The LigaSure has a reduced energy spread profile (<2 mm) when compared with unipolar cautery, with potential decreased risk of injury to important structures as it delivers a precise amount of energy according to the grasped tissue density.

This explains lower complication rate in our study, cervical hematomas (1.6%), transient hypoparathyroidism (3.3%) and transient recurrent laryngeal nerve palsy (1.6%).

In modern series, the incidence of post-thyroidectomy hematoma ranges from 2.1% to 5.4%<sup>(31,32)</sup>, the rates for temporary and permanent post-thyroidectomy hypocalcaemia were 6% and 2%, respectively<sup>(31)</sup>, and the rate of recurrent laryngeal nerve palsy in benign goiter surgery was 1.9% in hospitals with operative volume of more than 150 thyroidectomies a year<sup>(31)</sup>. We have only one patient

died (0.8%) due to pulmonary embolism in second post-operative day.

Finally the limitation of our study is the number of the patients, but we wanted to share the early results of our study with use of ligasure technique which decreases the operation time to a level of less than 57 minutes with no increase in complication rate.

### CONCLUSION

This study shows that the use of LigaSure technique in thyroid surgery is a safe method with minimal complications, good haemostasis, significantly reduce operating time, anesthesia exposure and shortening postoperative hospital stay.

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