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Sutureless Retrograde Thyroidectomy using Ligasure –A Prospective study

S. Hassranah[1] MBBS, S. Teelucksingh[1] MBBS, S. Islam[2] MBBS, DM, FACS, S. Cawich[2] MBBS, DM, FACS, D. Hassranah[2] FRCS, FACS, V. Naraynsingh[1,2] FRCS, FACS

1. Medical Associate Hospital, St Joseph, Trinidad & Tobago

2. Department of Clinical Surgical Sciences, UWI; St. Augustine; Trinidad &Tobago

Corresponding Author:

Dr. Shariful Islam MBBS, DM, FACS
Associate Lecturer, Department of Clinical Surgical science, University of the West Indies, St Augustine, Trinidad and Tobago
Consultant, Department of Surgery, San Fernando Teaching Hospital, Trinidad and Tobago
Phone: 868 797 4951. Email: sssl201198@yahoo.com / shar_islam7@hotmail.comTrinidad and Tobago

Highlights:

1. Retrograde thyroidectomy ensures adequate exposure with resultant decrease in risk of injury of the EBSLN.

2. Ligasure shortens the operating time, provides a relatively bloodless field, minimises injury to the parathyroids and the laryngeal nerves.

3. The combined use of retrograde thyroidectomy and ligasure ensures adequate safety for patients undergoing thyroid surgery for benign MNG's.

4. The authors of this paper seek to highlight their combined benefits and strongly recommend this procedure when considering thyroidectomy for large multi-nodular goiters.

Abstract:

Background:

Haemostasis is very important for a successful outcome of any thyroid surgery. With the introduction of ligasure device, the traditional use of sutures for haemostasis is slowly fading away. Although the literature has documented the results of retrograde thyroidectomy and the use of ligasure separately no results of their combined use has yet been published in the English literature. The benefits of combining the sutureless technique with retrograde thyroidectomy are discussed in this paper.

Methods: All patients undergoing thyroidectomy using the Ligasure Bipolar Vessel Sealing System, for benign multinodular goitre in our tertiary institute during the period January 2015 to December 2017, were prospectively included in this study. Blood loss, operating time and postoperative complications were recorded.

Results:

During the 3-year period, 95 lobectomies were performed in 57 patients, 38 bilateral and 19 unilateral. The average blood loss was minimal and the operating time was 52 +/- 20 minutes for bilateral and 38 +/- 15 minutes for unilateral lobectomies. One patient had transient hypocalcaemia that settled after one week. There were no cases of postoperative haemorrhage or recurrent laryngeal nerve palsy.

Conclusion: The combined use of retrograde thyroidectomy and ligasure ensure adequate safety for patients undergoing thyroid surgery for benign multinodular goitres. The sutureless technique shortens the operating time and provides a relatively bloodless field which enhances

easily visualization of the RLN and parathyroids, while the retrograde technique facilitates preservation of the EBSLN.

Kew words: MNG, Sutureless thyroidectomy, Retrograde thyroidectomy, the use of ligasure, Surgical technique of thyroidectomy, Post-op complications of thyroid surgery

Introduction:

This paper documents a new technique, retrograde thyroidectomy using ligasure, and its results. Historically, the recurrent laryngeal nerve (RLN) has been the nerve surgeons strive to visualise and protect since the morbidity associated with its injury was emphasised by Billroth in 1877[1]. So prevalent has the focus been on RLN preservation that Delbridge described the external branch of the superior laryngeal nerve (EBSLN) as 'the neglected nerve' in thyroid surgery; he emphasized the importance of its preservation in ensuring voice integrity.[2] Naraynsingh et al described the technique of retrograde thyroidectomy to enhance visualisation of the upper pole and the superior thyroid vessels; this allows the lobe to be drawn well below (caudally) the cricothyroid muscle and EBSLN[3,4]. Thus, the point of transection is far away from the EBSLN, thus decreasing risk of nerve injury. The EBSLN provides the sole nerve supply to the cricothyroid muscle and its damage leads to changes in pitch of the voice.

The ligasure device was first introduced in 1998 providing hemostasis through vessel compression and bipolar energy emission. It replaces the traditional use of sutures for hemostasis. Proposed advantages of sutureless thyroidectomy include reduction in operating theatre time, increased cost effectiveness and a reduction in complications including hemorrhage, hypoparathyroidism and damage to the recurrent laryngeal nerves.[5,6] In the highly vascular thyroid gland it is necessary that adequate hemostasis is ensured not only to minimize

blood loss but also to improve visualisation of the surgical field. Blood staining of the tissues can impair visualisation of parathyroids, nerves and blood vessels. Thus, preservation of the parathyroid glands and the laryngeal nerves is made easier for the surgeon using haemostatic devices.[5] Additionally, it has been shown that there is a significant reduction in operating time using the ligasure device[7].

The benefits of combining the sutureless technique with retrograde thyroidectomy are discussed in this paper.

Method:

All patients undergoing thyroidectomy using the Ligasure Bipolar Vessel Sealing System, for benign multinodular goitre in our tertiary institute during the period January 2015 to December 2017, were prospectively included in this study. All thyroidectomies, for benign multinodular goitre, were done using the Ligasure Bipolar Vessel Sealing System, which uses electrothermal coagulation for hemostasis. Patients with toxic goitre or suspected malignancy were excluded. Blood loss, operating time and postoperative complications were recorded prospectively.Ethical approval was obtained from the institutional review board to conduct this study.

Technique:

The technique for retrograde thyroidectomy has been previously described in considerable detail [3,4]. The critical step after mobilizing the lobe medially, off the strap muscles and carotid sheath (dividing the middle thyroid vein if present), is to clear the lower pole of all areolar tissue, lifting it off the posterolateral tissues, on to the anterior aspect of the trachea. When the inferior thyroid veins are divided and the capsule of the lower pole laid bare, capsular dissection is done cephalad using the ligasure. True, meticulous capsular dissection ensures that only thyroid tissue is removed and negates the need for specific identification of either the parathyroids or the RLN though the latter is usually encountered at the lateral margin of the

ligament of Berry (Fig 1). Because ligasure ensures excellent haemostasis, the RLN and parathyroids can be easily visualized and preserved (Fig 2).

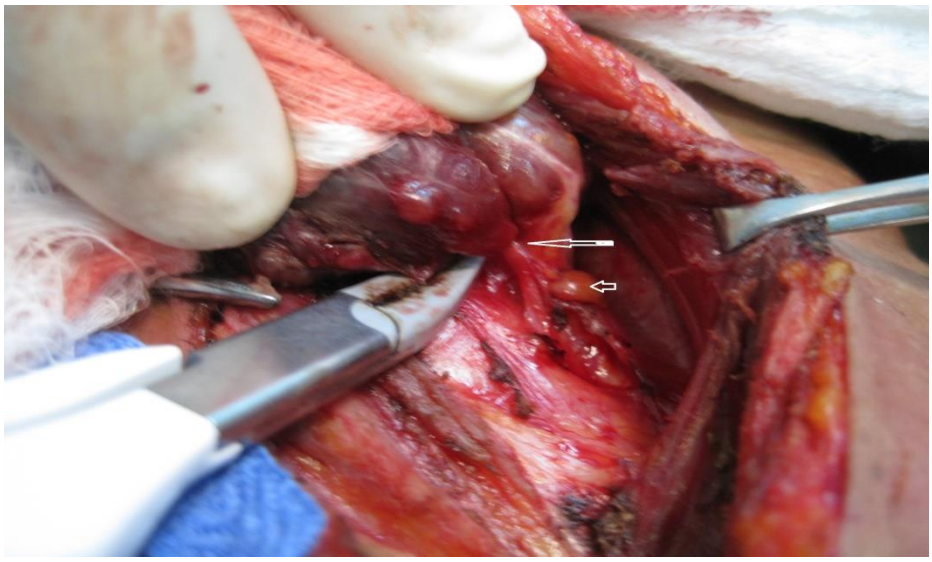

Fig 1 - Ligasure dividing the ligament of Berry. Recurrent laryngeal nerve (RLN) at the lateral edge of ligament of Berry (LB) (long arrow), Parathyroid gland near recurrent laryngeal nerve RLN (short arrow)

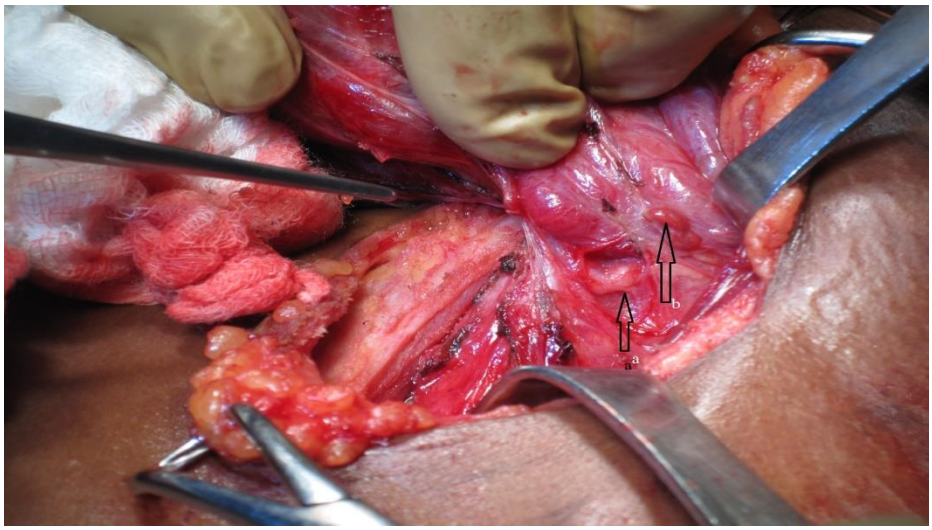

Fig 2) - Excellent visualization of the recurrent laryngeal nerve (a) and parathyroid (b)

With the retrograde technique, the entire lobe is freed and brought downwards (caudally) before the superior pole vessels are coagulated and divided. This excellent visualisation and control of those vessels provide reliable hemostasis (Fig 3).

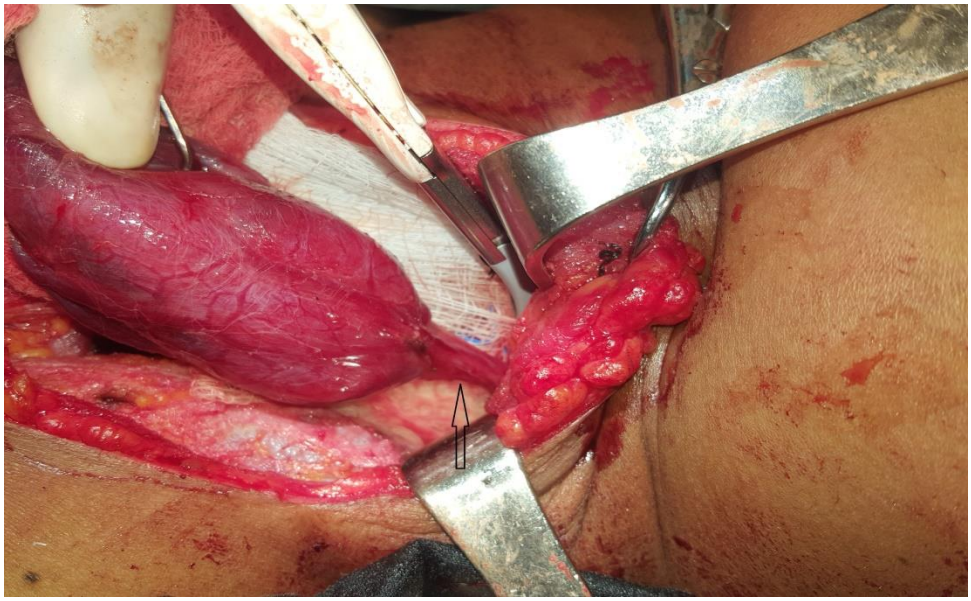

Fig 3 - The completely mobilized lobe, drawn caudally, provides excellent exposure of the upper pole vessels (arrow).

Results:

During the 3-year period January 2015 to December 2017, 95 lobectomies were performed in 57 patients, 38 bilateral and 19 unilateral.

Blood loss was 28+/- 12ml. Operating time was 52 +/- 20 minutes for bilateral and 38 +/- 15 minutes for unilateral lobectomies. There were no cases of postoperative haemorrhage or recurrent laryngeal nerve palsy.

One patient had transient hypocalcemia that settled after one week. Hospital stay was 26 +/- 14 hours; 14 were same day cases. Two patients developed subcutaneous seromas within 14 days and they were cured with aspiration.

Discussion:

Goiters have been noted by the ancient Chinese and Indians and have been described in Hippocratic writings.[8] Therefore, it is not surprising that the gland has been given significant attention throughout medical history.

Historically, the treatments for thyroid pathologies have varied widely [9] but the first description of thyroid surgery was as early as the 7th century.[9] Mortality of thyroid surgery before 1850 was 40% and was deemed too risky a practice with death from haemorrhage, asphyxia and gangrene being cited as causes.[1] Mortality decreased with the introduction of the hemostatic forceps and progressive attempts at ensuring a sterile field for surgery.[1]

Kocher's technique and attention to extracapsular dissection reduced his mortality to 0.5% within his lifetime.[9] Billroth's operating technique led to a high incidence of hypoparathyroidism and so his pupils thus focused on the reduction of the incidence of tetany in their thyroid surgeries.[9]

RLN injuries had been noted by Semon in 1881 who observed the paralysis of the vocal cord that accompanied it.[9] Kocher and Billroth chose to avoid the nerve to prevent its injury. However, Lahey determined that exposure of the nerve reduced its damage to 0.3%.[9] Thus, great attention has been given to preventing the postoperative side effects of parathyroid damage and recurrent laryngeal nerve injury throughout the history of thyroid surgery.

In modern medicine, two recent events have arisen that further impact the outcomes of thyroid surgeries. The first was the introduction of the ligasure and ultrasonic devices to replace suture ligation as the main hemostatic measure in thyroid surgeries. Good hemostasis of the highly vascular thyroid gland is essential for reduction of postoperative blood loss and for proper visualisation of the operating field.

Ligasure usage has been described by multiple researchers to either have a reduction of blood loss or to have no significant difference to suture ligation. In 2003, the first use of the ligasure was recorded by Sandonato et al showing 4.5% incidence of transient hypoparathyroidism, but no other complications. Butskiy et al in 2013 performed a systematic review of 50 studies that compared the use of the ligasure to conventional techniques for hemostasis.[7] They found that there was a reduction in operating time and in terms of length of hospital stay and blood loss it proved non-inferiority to other techniques. Ahmed et al[10] found a reduction in blood loss with the ligasure device while Cheng et al[12] found that the ultrasonic scalpel reduced blood loss when compared to conventional ligation. Sartori et al [12] and Upadhyaya et al [13] have both shown no differences between blood loss in ligasure ligation and ultrasonic ligation.

Additionally, Di Renzo et al[14] have suggested that the ultrasonic scalpel use in thyroid surgery to be superior to the clamp-and-tie technique with respect to the reduction of operating time suggesting that there may be benefits with respect to cost saving by reducing operating theatre time. This finding has also been shown by Al-Dhahiry et al.[6] Chang et al have also shown this to be true of both the ligasure and the ultrasound device. However, Ruggiero et al have shown no significant difference between the operating times with the ultrasound scalpel and ligasure device and Kwak et al showed the same. Bove however, has shown that the ultrasound device reduced operating times compared to the ligasure[15].

The second advance was the retrograde thyroidectomy technique described by Naraynsingh et al [3,4] that prevents injury of the EBSLN by drawing the superior pole below the crico thyroid before division. Historically, it's preservation has been seen as secondary to that of the RLN until the opera singer Amelita Galli-Curci underwent thyroid surgery that resulted in damage to her EBSLN, changing her singing voice; this highlighted the importance of the EBSLN.[16]

Conclusion:

The combined use of retrograde thyroidectomy and ligasure ensure adequate safety for patients undergoing thyroid surgery for benign multinodular goitres. The sutureless technique shortens the operating time and provides a relatively bloodless field while the retrograde technique facilitates preservation of the EBSLN. In addition, the clean meticulous capsular dissection in retrograde thyroidectomy also minimises injury to the parathyroid and the nerves, as only thyroid tissue is removed. While these techniques (suture less and retrograde thyroidectomy) have been described separately, this paper seeks to highlight their combined benefits.

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