Randomized Comparative Study between Ligasure Vessel Sealing System, Harmonic Scalpel, and Conventional Suture Ligation Technique to Achieve Hemostasis in Thyroidectomy for Toxic Goitre

Thesis

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بسم الله الرحمن الرحيم
وَأَنزَلَ اللَّهُ عَلَيْكَ
الْكِتَابَ وَالْحِكْمَةَ
وَعَلَّمَكَ مَا لَمْ تَكُن
تَعْلَمُ وَكَانَ فَضْلُ
اللَّهِ عَلَيْكَ عَظِيمًا
صدق الله العظيم
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مقارنه بين استخدام غالق الاوعية الدموية(الليجاشور) والمشرط التوافقى (الهارمونيك)، وطريقة الربط التقليدية لتحقيق توقف النزف فى استئصال الغده الدرقيه لمرضى الغدة التسممية

رسالة

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فى الجراحة العامة

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INTRODUCTION

Thyroidectomy is one of the most frequently performed operations in the field of general surgery. Total thyroidectomy is the treatment of choice for many thyroid diseases. As with any surgical procedure, the surgeon tries to minimize the risk of complications and to ensure that the operation proceeds as smoothly and rapidly as possible ***(Cipolla et al., 2008).***

In the late 19th century thyroidectomy was associated with massive blood loss and a mortality of 50%.Theodore Kocher revolutionized thyroid surgery with the introduction of ligation of major arteries, which reduced mortality considerably ***(Musunuru et al., 2008).***

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, hemostasis is of paramount importance to control and divide various vessels before excision of the gland ***(Youssef et al., 2008).***

There is a wide spectrum of complications associated with thyroid surgery, including hypocalcaemia from devascularization of parathyroids, airway compromise from haematoma, bleeding, and hoarseness from recurrent laryngeal nerve injury. To prevent complications, a surgeon must practice meticulous hemostasis to allow for careful identification of these structures ***(Musunuru et al., 2008).***

The principles of safe and efficient thyroid surgery were established from 60 years ago and are still valid. The gold standard technique for intraoperative hemostasis in thyroid surgery is suture ligation together with bipolar electrocautery for the small vessels ***(Youssef et al., 2008).***

Even if knot and tying technique is efficient in bleeding control, it is time consuming and non absorbable materials,such as suture ligations, clips, and staples, may, in rare cases, produce inflammation and poor wound healing; therefore, many devices have been introduced over the years, in clinical practice, to save time and to decrease postoperative complications ***(Sartori et al., 2008).***

The LigasureTM Vessel Sealing System (LVSS) is a new hemostatic device, primarily designed for use in abdominal surgery. It is a bipolar electrosurgical device, sealing vessels up to 7mm in diameter, by denaturing collagen and elastin within vessel wall and surrounding connective tissue. The addition of extreme pressure applied by the instrument causes the denatured collagen and elastin to reform with the vessel walls in apposition. It is associated with reduced thermal spread (<2mm)and minimal tissue charring.

It consists of an electrosurgical generator and a handpiece 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.

The sealed vessels are capable of withstanding 360mmHg burst pressure after seal formation.The combination of effective localized coagulation with minimal collateral thermal spread seems to be its most useful characteristic for thyroidectomy ***(Youssef et al., 2008).***

There are several handpieces available for the LVSS generator. The most suitable for thyroid surgery is the LS1200 Ligasure Precise instrument. It is a single use instrument, 16.5cm long, with 15 degrees jaws angle, designed for structures requiring fine grasping ***(Lachanas et al., 2005).***

THE HARMONIC scalpel is a new device that has been introduced to surgery during the last decade. It is a device that uses high-frequency mechanical energy to cut and coagulate tissues at the same time. Laparoscopists were the first ones to use this method widely. It has been proven to decrease operation time and complications ***(Amaral, 2002).***

The development of ultrasonically activated coagulating shears in the early 1990s has provided an alternative to other methods of controlling blood vessels. The device divides tissue

by using high-frequency (55 000 Hz) ultrasonic energy transmitted between the instrument blades to divide vessels of up to 5 mm during thyroidectomy ***(Voutilainen et al., 1998).***

The active blade of the instrument vibrates longitudinally against an inactive blade over an excursion of 50 to 100 μm. This mechanical action disrupts protein hydrogen bonds within the tissue. This takes place at a relatively low temperature (80°C) causing a lesser tissue injury (<1.5 mm) compared with both electrocautery and laser. Because the water in the tissue does not boil due to this mild increase in temperature, the proteoglycans and collagen fibers in the tissue become denatured and mix with intracellular and interstitial fluids to form a gluelike substance (a coagulum) ***(Amaral, 2002).***

AIM OF THE WORK

This study aims to compare between the use of Ligasure Vessel Sealing System, Harmonic Scalpel, and conventional clamp and tie technique in total thyroidectomy for treatment of toxic goitre.

SURGICAL ANATOMY AND EMBRYOLOGY OF THE THYROID GLAND

The thyroid is a brownish-red and highly vasculargland located anteriorly in the lower neck, extending from the level of the fifth cervical vertebra down to the first thoracic. The gland varies from an H to a U shape and is formed by 2 elongated lateral lobes with superior and inferior poles connected by a median isthmus (with an average height of 12-15 mm) overlying the second to fourth tracheal rings. The isthmus is encountered during routine tracheotomy and must be retracted (superiorly or inferiorly) or divided. Occasionally, the isthmus is absent, and the gland exists as 2 distinct lobes. Each lobe is 50-60 mm long, with the superior poles diverging laterally at the level of the oblique lines on the laminae of the thyroid cartilage. The lower poles divergelaterally at the level of thefifth tracheal cartilage. Thyroid weight varies but averages 25-30 g in adults (slightly heavier in women). The gland enlarges during menstruation and pregnancy ***(Dominique and David, 2011).***