Journal of Visceral Surgery (2011) **148**, e447—e451

Available online at
SciVerse ScienceDirect
www.sciencedirect.com

Elsevier Masson France
EM|consulte
www.em-consulte.com/en

ORIGINAL ARTICLE

Initial experience using robot- assisted transaxillary thyroidectomy for Graves' disease

E. Kandil[a,*], S. Noureldine[a], M. Abdel Khalek[a], S. Alrasheedi[a], R. Aslam[b], P. Friedlander[b], F.C. Holsinger[c], C.F. Bellows[a]

[a] *Department of Surgery, Endocrine and Oncological Surgery Division, New Orleans, LA, USA*
[b] *Department of Otolaryngology, Tulane University School of Medicine, New Orleans, LA, USA*
[c] *Department of Head and Neck Surgery, The University of Texas MD Anderson Cancer Center, Houston, TX, USA*

Available online 25 November 2011

KEYWORDS
Graves' disease;
Thyroidectomy;
Robotics;
Robotic transaxillary thyroidectomy;
Robotic gasless thyroidectomy

Summary
Introduction: Graves' disease is the most common form of hyperthyroidism and surgery to remove the thyroid gland is a common treatment option for many of these patients. Interestingly, due to the enlarged gland size, their high vascularity, and the difficulty to control bleeding, many authors feel that Graves' disease remains a contraindication to current endoscopic techniques. We hypothesize that performing robotic subtotal thyroidectomy in Graves' disease settings could overcome the limitations of conventional endoscopic surgeries in the surgical management of this challenging thyroid disease.
Methods: Prospective study in an academic hospital.
Results: Sixty-seven patients had robotic transaxillary thyroidectomy within a year. Of these, five cases (7%) were done for Graves' disease. There were three females and two males (mean age, 36 years). There were no conversions to laparoscopic or open surgery. The mean (SD) thyroid volume was 16.6 (3.2) ml. The mean (SD) operative time was 159 (17.8) min and docking time was 81 (20) min. Mean blood loss was 18 mL. All patients were discharged home in 24 h. There were no perioperative or postoperative complications. There was no evidence of postoperative vocal cord palsy or paresis.
Conclusions: We showed that robotic transaxillary thyroidectomy is feasible and can be safe and effective in patients with Graves' disease. To our knowledge, this is the first article describing this approach for Graves' disease. These findings, however, warrant additional investigation within future prospective clinical trials.

* Corresponding author. Tel.: +1 504.988.7407; fax: +1 504.988.4762.
E-mail addresses: ekandil@tulane.edu (E. Kandil), snouredi@tulane.edu (S. Noureldine), mabdelkh@tulane.edu (M. Abdel Khalek), srasheedi@yahoo.com (S. Alrasheedi), raslam@tulane.edu (R. Aslam), pfriedla@tulane.edu (P. Friedlander), fholsinger@mdanderson.org (F.C. Holsinger), cbellows@tulane.edu (C.F. Bellows).

1878-7886/$ — see front matter © 2011 Elsevier Masson SAS. All rights reserved.
doi:10.1016/j.jviscsurg.2011.10.002

Introduction

During minimally invasive surgery for Graves' disease, one of the key points is how to control bleeding during dissection of the thyroid gland, particularly in the markedly enlarged thyroid, which is usually highly vascular [1—5]. Control of bleeding during Graves' disease surgery is usually challenging to experienced surgeons, particularly around the superior thyroid arterial branch, due to the relatively small working space and the highly vascular pattern of the gland. This was documented to prolong the operative time and is frequently the reason for conversion from endoscopic to open surgery [1,6—8]. Some of the difficulties encountered with early endoscopic methods, namely difficulty manipulating rigid endoscopic instruments in a narrow field, two-dimensional view of the operative field, and presence of a small cervical scar, led to application of the da Vinci S surgical robot system (Intuitive Surgical, Sunnyvale, CA, USA) via a transaxillary approach [9]. This robotic system allows for a magnified, three-dimensional view of the field, and precise wristed hand motions via a hand-tremor filtering system. Initial reports for robotic transaxillary thyroidectomy utilized CO_2 gas insufflation into the operative field [6,9,10]. However, due to initial concerns of metabolic derangements from CO_2 absorption [11—13], the gasless method was developed [11,14,15].

Graves' disease is the most common form of hyperthyroidism and surgery to remove the thyroid gland is a common treatment option for many of these patients. Interestingly, due to the enlarged gland size, their high vascularity, and the difficulty to control bleeding under endoscopy, many authors feel that Graves' disease, remains a contraindication to current endoscopic techniques [8,16]. The robotic surgical technology, however, provides improved dexterity in confined spaces owing to articulating surgical instruments. We hypothesize that performing robotic subtotal thyroidectomy in Graves' disease settings could overcome the limitations of conventional endoscopic surgeries in the surgical management of this challenging thyroid disease.

Methods

Informed consent was obtained in all patients. Thyroid examination revealed evidence of mild thyromegaly without evidence of palpable nodules or tracheal deviation. There was no palpable lymphadenopathy in the central, lateral or posterior compartments of the neck. Preoperative fiber optic laryngoscopy revealed normal intact bilateral vocal cords in all patients. The remainder of physical examination was normal. Thyroid ultrasonography revealed evidence of enlarged thyroid glands, with no evidence of discrete thyroid nodules. All patients were instructed to take lugol solution for a week prior to the procedure. We performed a subtotal thyroidectomy in this select group of patients in order to preserve a very small part of the thyroid at the level of the contralateral tubercle of Zuckerkandl to avoid contralateral recurrent laryngeal nerves (RLN) injury.

Subtotal thyroidectomy was performed using the transaxillary approach without gas insufflation, as described before by Yoon et al. [15] and the authors [17]. The gasless method eliminated the risk of complications such as hypercapnia, respiratory acidosis, tachycardia, subcutaneous emphysema and air embolism [14]. This method involved the use of an external retractor that is connected to a continuous suction system, which provided a stable working space without any disruption from air or blood suction [4,11,14,15]. Briefly, all patients were intubated with a NIMS endotracheal tube (Medtronic Xomed, Jacksonville, FL, USA) to allow intraoperative monitoring of the RLN function. Appropriate placement of the NIMS endotracheal tube was confirmed by direct laryngoscopy and by visualization of the electromyographic waveform on the NIMS monitor.

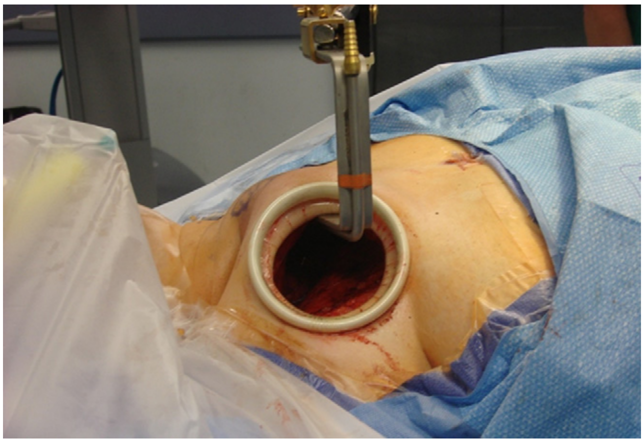

Figure 1. Specially designed retractor allows continuous exposure of the surgical field, maximizing access to the thyroid bed.

A shoulder roll was placed to extend the neck, and the right arm ipsilateral to the larger lobe of the thyroid was positioned cephalad and flexed above the head; this optimized exposure of the axilla and created a short distance from the axillary skin to the thyroid gland, through which dissection would be carried. The thyroid was identified by palpation and a vertical line was drawn from the midline of the thyroid to the sternal notch, demarcating the medial boundary of dissection. A transverse line was then drawn from the sternal notch to the ipsilateral axilla, denoting the inferior limit of surgical incision, and an oblique line was drawn from the thyrohyoid membrane 60° from midline to the axilla to mark the superior limit of the incision. The intersection of the oblique mark with the anterior axillary line marked the superior limit of the axillary incision. The intersection of the transverse mark with the anterior axillary line defined the inferior limit of the axillary incision. A mark for a third arm incision was made in holding area four cm lateral to the areola, in the medial fold of the breast, approximately 2 cm from midline.

A 4—6 cm axillary incision was then made and monopolar electrocautery was used to continue dissection down to the pectoralis fascia. A myocutaneous flap was raised in a subplatysmal plane in the direction of the thyroid until the sternal and clavicular heads of the sternocleidomastoid were visualized. A wound protector was placed to protect the axillary wound edges from any heat generated by the electocautery or harmonic scalpel. The modified Chung thyroid retractor [18] (Marina Medical, Sunrise, FL, USA) was placed under the strap muscles and secured to the table mount lift (Fig. 1). The triangular window (Fig. 2) between the sternal and clavicular heads was entered using the Harmonic Scalpel (Ethicon, Somerville, NJ, USA), allowing identification of the carotid sheath.

Next, the da Vinci S robot was docked from the side of the bed contralateral to the operative field. A 12 mm camera was used, approaching through the axillary incision. The two axillary arms were equipped with a Maryland forceps (Intuitive Surgical, Sunnyvale, CA, USA), the Harmonic Scalpel