Transoral Robotic Thyroidectomy

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Abstract

Several innovative remote-access robotic thyroidectomy methods have been developed, including transaxillary and retoauricular approaches. Surgeons are always interested in techniques that result in no visible scarring. For this reason, the application of transoral robotic thyroidectomy (TORT) has begun in recent years. In this review of the literature, we discuss the history, areas of application, and the advantages and disadvantages of the TORT method.

Introduction

The history of modern thyroidectomy began approximately 150 years ago when Theodor Billroth described the transcervical method. Since then, a significant focus has been on the reduction the surgical incision and scar size. In the last 2-3 decades, these developments have gained momentum [1]. This has happened through the introduction of minimally invasive endoscopic thyroid surgery in the 1990s, followed by the introduction of remote-access methods [2,3]. Robotic surgery for thyroidectomy started with the use of the da Vinci robotic system (Intuitive Surgical, Sunnyvale, California). In 2007, Chung described a novel method for robotic thyroidectomy using the transaxillary approach [2,4].

New methods of robotic thyroidectomy have since been developed. These include the retroauricular, axillary-breast, and transoral approaches [5]. The applicability and feasibility of the transoral method was evaluated through work on cadavers by Richmon et al. [6]. The first clinical application on humans was by Lee et al. [7] in 2014. Studies using a combination of these methods have since been performed.

Preoperative Evaluation

The main indication for transoral robotic thyroidectomy (TORT) is cosmesis. Ideal patient characteristics for TORT include an ultrasonographic (USG) thyroid length of less than 10cm, a thyroid volume less than 45mL, and a dominant nodule less than 50mm. In addition, the lesions should be benign in nature, such as a nodular goiter, a cyst, or a non-metastatic papillary microcarsinoma, and the patient should have no history of no thyroid surgery, radiation, vocal cord paralysis, or non-invasive thyroid malignancy in the surrounding tissues [8]. Currently, there is no consensus on these criteria and these are the characteristics of the ideal patient, as surgeons who are still learning the technique. Kim et al. [9] reported t

hat good oral hygiene is required before the operation. Russel et al. [10] have included patients with thyroid nodules measuring less than 60mm.

Surgical Technique

When developing the TORT approach, feasibility studies were first performed on cadavers and pigs [6,7,11-13]; several resulting case series published [1,7,9,10].

Under general anesthesia, the head of the patient is put into the supine position and the head is brought into slight extension. Nerve monitoring is routinely performed. In the Richmon [6] cadaveric model, the lingual frenulum underwent a 1.5cm incision postero-anterior, forming a subplathysmal pocket after passing genioglossus, geniohyoid, mylohyoid muscles. Two additional 1.5cm incisions are made in the gingivobuccal sulcus in the direction of the first molar teeth. This sublingual access method has been abandoned over time as manipulation of the maxilla and nose is difficult, and the complication rate is high [8]. Currently, the middle incision is made in the gingivobuccal sulcus 1-2cm below the lower lip, with this being the vestibular approach. Subsequently, a submental subplatysmal pocket is created. The platysma is separated from the descending strep muscles and is separated towards the suprasternal notch. After the flap is created, a 30 ° endoscope is inserted. A careful dissection is performed near the adjacent incision and an adequate working area is established for the placement of the instruments [1,2].

Kim et al. [9] have a different approach. The patient is put into the lithotomy position, the oral cavity is irrigated with chlorhexidine and povidone-iodine, and an 8mm bariatric trocar is placed through the axilla in order to create traction and to insert a drain. Once a workspace is created, the robotics system is deployed. The

Maryland Discrete and Harmonic Scalpel are placed in the left and right ports, respectively. The strap muscles are separated from their midline attachments and the thyroid is dissected. The pyramidal lobe is removed from the thyroid cartilage and the isthmusectomy is performed. The superior pole of the right lobe is retracted infero-medially. The upper vascular pedicle is cauterized and the recurrent laryngeal nerve and Berry's ligament are identified. The thyroid lobe is separated from the trachea and removed. The same procedure is applied to the contralateral lobe, and only if necessary another incision is created. Hemostasis and washing are performed. A drain can be inserted If an axillary port is present [2,6].

Patients are often discharged 1-3 days post procedure and a 7-day prophylactic antibiotic treatment is given. Post procedure, patients are provided a liquid diet for the initial 4 hours, a soft diet for the next 24 hours, and finally a normal diet after 48 hours. The drain is removed on the third postoperative day [9,10].

Complications similar to those seen after traditional thyroidectomy can occur after TORT, and include hematoma, infection, vocal cord paralysis, hypoparathyroidism, tracheal injury, and chylous leak. However, no study has been performed comparing both methods for rates of complication. Other complications reported following TORT include hypoesthesia in the lower lip, weakness of the lips, tear at the incision sites, injury to the zygomatic area, perforation in the skin near the chin, and mental nerve injury. There is also a potential risk for spreading infection from the oral cavity to the surgical site. Therefore, all authors recommend prophylactic antibiotics. Russel et al. [10] recommend giving a combination of amoxicillin-clavulanate and clindamycin to all patients.

Advantages of TORT include no visible scarring, image advantage (3-D), no effect when tremor is present, manipulations in a small working area, and the thyroid reaching the midline.

Disadvantages include the high cost of the procedure, no tactile feedback, a requirement for multiple ports, its only being applicable for selected patients, difficulty in working in the mental area as many complications can result, and the significant experience required.

In conclusion, TORT has shown great promise through its application in cadaveric, porcine, and clinical studies. It can be used in patients who do not want visible scarring; however, it is technically difficult and few studies have evaluated its safety.

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