

## Report of a Track Seeding of Thyroid Papillary Carcinoma During Robot-Assisted Transaxillary Thyroidectomy

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### Abstract

**Background:** The Robotic Thyroidectomy (RT) is a minimally invasive surgical technique initially developed in Asia, for cultural reasons. The principles of its use are still undergoing development. Showing to all appearances satisfying outcomes, the long-time safety and medico-economic benefit of the procedure have not been established yet. The use of this technique in thyroid carcinology remains rare, and provides specific risks, not encountered with the Open Thyroidectomy (OT).

**Patient Findings:** We report the case of a patient who underwent a two-stages RT for a pT3 follicular carcinoma causing dissemination along the surgical track, in spite of the radioactive iodine treatment.

**Summary:** This case reminds us the limits of the RT in the oncologic field and the lack of perspective, with the recent discovery of the risk of dissemination along the surgical track. Our synthetic review of the literature comparing RT to OT shows the advantages and limitations of the RT.

**Conclusions:** The development of the RT should pursue its way, but the use of this procedure in thyroid carcinology must remain reasonable. Further data is necessary to assess the long-term oncologic safety, regarding even the uncommon risks, as the track seeding. To this day, OT remains the gold standard for the complex thyroid pathologies.

**Keywords:** Robot-assisted transaxillary thyroidectomy; Thyroid carcinoma; Dissemination; Recurrence; Track seeding

**Abbreviations** RT: Robotic Thyroidectomy; OT: Open Thyroidectomy; Tg: Thyroglobulin

### Introduction

The Robotic Thyroidectomy (RT) is a minimally invasive surgical technique initially developed in Asia, for cultural reasons, with the very first cases published in 2009 [1]. This procedure shows to all appearances satisfying outcomes, similar to the Open Thyroidectomy (OT). But it is hard to prove the long-time safety of the RT, and its medico-economic benefit has not been established yet. Furthermore, the concern about a neck scar is much less important in Europe. The principles of the use of the RT are still under development, based on the results of many publications. The use of this technique in thyroid carcinology remains rare, and provides specific risks, not encountered with the OT. We hereby describe the case of a patient who underwent a RT for a follicular carcinoma and presented dissemination along the surgical track.

### Case Presentation

A fifty-year-old male was admitted for a neck recurrence one year after a two-stages total thyroidectomy, under robotic assistance, followed by a radioactive iodine treatment. Indeed, he underwent a robot-assisted trans-axillary right-sided thyroid lobectomy, in

November 2014. The indication was a 6 cm nodule with oncocytic cells at the fine needle aspiration (Bethesda IV). The surgical approach was traditional: dissection over the anterior surface of the pectoralis major muscle, then between the sternal and clavicular heads of the sternocleidomastoid muscle branches, and finally underneath the infra-hyoid muscles. The resection was reported as "very hemorrhagic but not fragmented". The peroperative frozen-section examination could not establish the malignancy of the tumor. The definitive histopathology reported an encapsulated follicular carcinoma measuring 6 cm, with microscopic angio-invasion, staged pT3. There was no extrathyroidal extension.

A completion of the thyroidectomy was performed 8 days later, by the same right-sided robotic axillary approach. No central neck dissection was made, as there were no targeted adenopathies at the ultrasonography and CT-scan. Four weeks later, the patient received an additional treatment by 100 mCi of radioactive iodine, in hypothyroidism. The thyroglobuline (Tg) level at one month was 17.23 µg/L (normal values: 1.6 to 50 µg/L) with a TSH level of 92 mUI/L (normal values: 0.4 to 5.3 mIU/L). One year later, a cervical recurrence was suspected on the ultrasonography and the PET-scan. The Tg was 25.6 µg/L for a TSH of 0.07 mUI/L. A bilateral central and right unilateral neck dissection were performed. We observed during the surgery inferior cervical masses, infiltrating the lateral part of the right sterno-thyroid muscle, evoking tumoral nodules more than adenopathies. There was no remnant in the thyroid bed. An extensive resection was performed, removing the infra-hyoid muscles.

None of the retrieved lymph nodes were metastatic but the histopathology reported three tumoral nodules of the carcinoma, with an oncocyctic differentiation, without any trace of lymphoid tissue. Their long-axis measured 3.5, 1.7 and 0.5 cm. Then the patient received radiotherapy, with a total dose on the primary tumor bed of 63 Gy. The Tg level after the radiations was 1.17 µg/L with a TSH level of 0.03 mUI/L, witnessing the persistence of a residual disease. A new dose of 100 mCi 131I treatment has therefore been administered.

## Discussion

The RT can be carried out by four main approaches: breast, bilateral axillo-breast, axillary and facelift approaches [2]. The advantages of this procedure are a magnified 3D sharp and zoomed view, a freedom of motion of the articulated instruments, a decreased tremor, and better ergonomics. Nevertheless, the strength of the robot arms can be a risk for the inexperienced surgeon, regarding the lack of force feedback.

Multiple meta-analysis with large series compared RT to OT [3-10], without noticing any significant difference in most of the surgical complications: transient or permanent hypoparathyroidism, permanent recurrent laryngeal nerve palsy, hematoma, seroma... The blood loss is also similar. Only one meta-analysis reported a significantly higher rate of transient recurrent laryngeal nerve palsy after RT [7]. There is no significant difference in the long-term voice outcomes, assessed by VHI and GRBAS scale [11,12]. The quality of life is similar, with a logically better aesthetics satisfaction provided by the RT [13]. The swallowing impairment seems significantly lower after RT [11], probably due to the preservation of the superficial sliding planes, not dissected and therefore free of adhesion.

However, the RT implies:

- a significantly increased operative time (mean difference=56 minutes), which is known to be a risk factor of surgical-site infections in the thyroid surgery [14],
- a significantly longer mean hospital stay, according to a meta-analysis by Lang et al. [7],
- an increased global cost (\$13,087 vs. \$9,028) related to the consumables, the maintenance, the duration of the hospital stay and of the operating room occupation [2,15].

Some unusual risks of the RT must be quoted [16]: flap perforation (0.1%), paresthesia and fibrosis along the flap, brachial plexus traction injury (0.1%), great vessels injury at the thoracic outlet (0.03%), tracheal (0.2%) or carotid injury (0.03%), more frequent due to the absence of force feedback, or even disturbance of the interpretation of future mammograms [17]. The risk of dissemination of tumoral cells along the surgical track is probably higher in case of bulky nodule, fragmented resection, extrathyroidal or vascular invasion.

According to the American Thyroid Association [2], the surgical indications should be the same as for the conventional OT, limited to patients having a particular cosmetic interest or a history of bad wound healing, and a preferentially thin body habitus, without excessive body fat along the flap trajectory. They recommend to use this technique with caution, by experimented surgeons in high-volume centers, on well-circumscribed nodules not larger than 3 cm, in a thyroid lobe smaller than 5-6 cm in the largest dimensions. The contraindications are thyroiditis (mainly Grave's disease), a history of

previous neck surgery, a substernal extension, an evidence of cancer with extrathyroidal extension or lymph node metastasis.

In the case of a peroperative frozen-section examination in favour of a cancer, the central neck dissection can be carried out under robotic assistance, but the number of retrieved lymph nodes is significantly inferior to the conventional approach [4,5]. According to the recent American Head and Neck Society consensus statement [18], a large tumor size (T3 or T4) is an indication for central neck dissection, but it is not consensual. In terms of oncologic safety, the results of RT and OT seem equivalent. But as the papillary thyroid cancer has a very slow evolution and a good prognosis, the data remains insufficient. Further studies with more perspective will be necessary.

The tumoral cells dissemination has initially been reported after fine needle biopsy or even aspiration [19], and then after endoscopic thyroidectomy, with at least 5 cases published in the literature: dissemination of 3 benign and 2 malignant tumors [20-24]. To our knowledge, only one case of cancer track seeding after RT has been described [25]. An experimented surgeon removed a 6 cm tumor in 2 fragments. It was a papillary carcinoma with extrathyroidal and vascular invasion. In spite of the 131I treatment, a multiple recurrence was observed one year later, with a homolateral thyroid remnant, several nodules along the track of the flap, cervical lymph nodes and lung metastases. A dedifferentiation was reported by the pathologists.

In our case, the RT was performed by a very experienced surgeon. The track seeding occurred whereas there was no extrathyroidal extension, and the removal was not reported as fragmented, though difficult and very hemorrhagic. Nevertheless, it was a two-stages thyroidectomy, involving an isthmotomy during the first surgery. This section could be responsible for dissemination as there was an angio-invasion. Indeed, even a sane-looking isthmus thyroid tissue could have been contaminated by malignant cells. Besides, the axillary approach provided, in our opinion, an insufficient quality of exposure in order to proceed to an oncologically safe resection of this nodule, that was large (6 cm), hemorrhagic, and possibly malignant (Bethesda IV=15 to 30% of malignancy). The salvage surgery occurred early enough to remove the macroscopic disease, but the latest biology witnesses the persistence of a residual disease. The systematic use of a bag to extract the thyroid gland and a cautious choice of the indications of RT should help to avoid the risk of tract seeding along the flap. It appears essential to use the RT reasonably, without hesitating to convert in OT in some cases: fragmented tumor, malignancy at the peroperative frozen-section examination, especially if the nodule measures more than 3 cm or is located near the thyroid capsule.

## Conclusion

The development of the RT should pursue its way, but the use of this procedure in thyroid carcinology must remain reasonable. Further data are necessary to assess the long-term oncologic outcomes. To this day, no randomized study compares RT to OT, and all the comparative studies have an important bias: the patients selected for RT generally have less complicated diseases than the ones undergoing OT. Indeed, OT remains the gold standard for the complex thyroid pathologies.

## Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

## Ethic Statement

The patient was informed and gave his full consent to the publication of this article.

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