Endoscopic thyroidectomy versus conventional open thyroidectomy for early differentiated thyroid cancer

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Abstract

Introduction: Endoscopic thyroidectomy has been applied prudently for malignant thyroid tumors. The aim of our study was to compare the outcomes of endoscopic lobectomy and conventional open lobectomy for early differentiated thyroid cancer.

Materials and Methods: From October 2018 to October 2019, 485 patients with early differentiated thyroid cancer underwent thyroid lobectomy in National hospital of Endocrinology enrolled. Of them, 235 patients underwent endoscopic lobectomy (EL) and 250 patients underwent conventional open lobectomy (OL).

Results: The mean age of the patients was lower in the EL group (22,3 ± 3,6 years) than in the OL group (31,0 ± 5,8 years, P = 0,013). The ratio female/male was higher in the EL group than in the OL group (12/1 vs 7/1, P = 0,002). The operation time in the EL group was longer than in the OL group (58,4 ± 12,9 vs 42,3 ± 9 minutes, P = 0,014). However, there was no significant differences between EL group and OL group in tumor size (1,2 ± 0,2 vs 1,1 ± 0,6, P = 0,123), blood loss (12,5 ± 0,9 vs 13,6 ± 1,6ml, P = 0,457), postoperative hospital day (4,35 ± 1,4 vs 4,1 ± 1,1 days, P = 0,061), transient hypoparathyroidism (0,85% vs 0,8%, P = 0,431) or transient recurrent laryngeal nerve injury (1,27% vs 1,2%, P = 0,311). The drainage volume in the EL group was higher than in the OL group (75,5 ± 11,4 vs 54,1 ± 10,1ml, P = 0,046). Postoperative bleeding was similar in two groups (0,42% vs 0,4%, P = 0,457). There was no postoperative complications such as permanent recurrent laryngeal nerve injury, tracheal perforation, conversion to open surgery, chyle leak, surgical site infection. Patients in the EL group experienced with less pain than those in the OL group at 1 and 2 days after operation according to a visual analog scale (VAS) (P = 0,047). Wound site numbness is significantly less pronounced in the OL group (p = 0,032). Cosmetically, patients in the EL group were more satisfied than in OL group according to the questionnaire we used (P = 0,021).

Conclusions: Endoscopic thyroidectomy for patients with early differentiated thyroid cancer is a safe and effective procedure with excellent cosmetic outcome. Postoperative hospital length stays and complications were similar to conventional open surgery.

Introduction

Thyroid cancer is the most common cancer in the endocrinology system, accounts for more than 90% of all endocrine cancer. Recent studies show that thyroid cancer is the fifth most frequent cancer in women [1], [2]. Early differentiated thyroid cancer (DTC) has recurrence rate of less than 5%, clinically, those are the group of patients that have tumor ≤ 2cm, no extrathyroidal extension and no nodal metastasis [3]. In America, the incident rate of DTC have tripled over the last 30 years, which occurs mostly in the younger women group with tumor less than 2cm in size. Similarly, the increase in the number of cases can be seen all over the world, of which Korea ranks first place [1], [2]. This can be explained by the growth in early diagnosis and screening tests especially thyroidal ultrasound and fine needle aspiration as well as the rise in patient health awareness. The shift in tumor size leads to the changes in initial treatment and follow up plan for the DTC group, widening the indication for lobectomy without lymph node dissection [3].

Conventional open lobectomy for DTC is very effective, can be applied to all stages of the disease with few complications... However, the scar from the procedure is one of the main concerns for patients cosmetically, for some patients, the scar could deeply affect their confidence.

Many major and multicenter researches have proved the applicability of endoscopic surgery in treatment of thyroid carcinoma. With the progresses made in developing the technology, endoscopic surgery has become one of the choices for early stage thyroidal cancer. Since it is a minimally invasive procedure, it can help avoiding a large scar on the anterior neck.

To evaluate the pros and cons of both procedure, we did this research to compare the outcome of thyroidal lobectomy using endoscopic and open surgery.

Patients and methods

Subject

485 patients underwent thyroidal lobectomy for early differentiated epithelial cell thyroid cancer between October 2018 and October 2019, among them, 235 patients had endoscopic surgery and 250 had open surgery.

Research method

Research design: Longitudinal prospective descriptive study with convenience sampling.

Inclusion criteria: Patients diagnosed with differentiated thyroid cancer, tumor ≤ 2cm, without extrathyroidal extension, no contralateral nodule, no lymph node or metastasis (confirmed by clinical exam, cervical US + CT, intraoperative evaluation).

Exclusion criteria: History of neck surgery.

Research index: Age, sex, tumor size, operation duration, blood loss, post op hospital stay, post op complications such as: post op hemorrhage, hypoparathyroidism, transient recurrent laryngeal nerve palsy,...

Endoscopic procedure: has been assessed by Science Committee of National hospital of Endocrinology.

- Intubated anesthesia.

- Patient position: Supine, neck extended, face turned to the opposite side of the lesion. Arm abduct 90 degree to expose the axillary fossa, position shoulder roll.

Procedure

Step 1: Trocar placement:

- A 10mm Trocar is placed in the junction of the middle axillary line and the upper border of the breast.

- CO2 was insufflated at the speed of 6l/m and pressure of 6mmHg.

- 5mm Trocars placement.

15mm Trocar at the apex of the ipsilateral axillary fossa, 15mm Trocar at the ipsilateral periareolar (at 2 o'clock if tumor is on the right side and 10 o'clock if tumor is on the left side).

The 2 Trocar must be in the dissection area of CO2 and the 10mm Trocar must be equidistant with them.

Step 2: Operative space creation:

Dissect with monopolar to approach the sternal

notch then continue to reach the thyroid cartilage, then begin dissect to 2 sides until the internal border of the sternocleidomastoid muscle.

Step 3: Thyroid approach:

- Dissect along the anterior part of the sternocleidomastoid muscle, and omohyoid muscle.

- Incise the sternothyroid muscle to reach the thyroid.

Step 4: Evaluate the lession and lobectomy:

- Assess the nodules position, border, capsule invasion,...

- Excise the thyroid lobe with Harmonic scapel according to this order: mobilize the inferior border, dissect the avascular layer, mobilize the superior border, identify the recurrent laryngeal nerve then release the Berry ligament.

Step 5: Remove specimen and drainage placement:

- Check the recurrent nerve, parathyroid gland, irrigate the surgical field and meticulously hemostasis.

- Remove the specimen through plastic bag, place a drainage through 10mm Trocar.

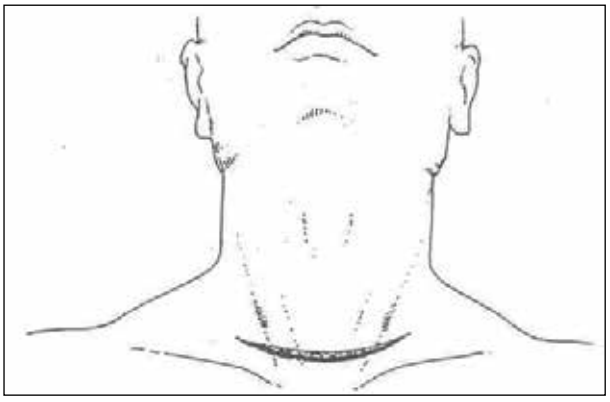

Fig 1. Incistion inllustration

- Close the Trocar incision.

Open surgery technique

• Intubated general aneasthesia

• Patient position:

- Supine

- Place a shoulder roll to extend the neck

- Lower the head.

- Arms to the side

Step 1: Skin incision and fascia dissection:

Skin is incised 1cm above the sternal notch, the length of the incision depends on thyroid size.

Incise the platysma just above the anterior jugular veins.

Dissect the avascular layer to create flaps.

+ Superiorly to the thyroid cartilage.

+ Inferiorly to the sternal notch.

- Continue on both side to the lateral border of the sternocleidomastoid muscle.

- Release the sterncleidomastoid muscle from the sternothyroid muscle and sternohyoid muscle with monopolar.

- Retract the sternocleidomastoid to expose the sternothyroid and sternohyoid muscle at the inferior border of the omohyoid muscle.

- Continue to dissect the inferior border of the superior belly of the omohyoid muscle superiorly and laterally.

- Retract the omohyoid muscle superiorly and laterally to expose the whole body of the sternothyroid and sternohyoid muscle.

- Usually by this stage, the lobe would push the sternothyroid muscle anteriorly, at the junction of the omohyoid and sternothyroid muscle, incise the sternothyroid at the distal and middle 1/3 point superiorly. Retract the incised muscle bilaterally to expose the thyroidal lobe.

Step 2: Thyroid resection:

- Evaluate the lessions location, border, capsule invasion,...

- Lobectomy of thyroid with Harmonic scapel according to this order: mobilize the inferior border, dissect the avascular layer, mobilize the superior border, identify the recurrent laryngeal nerve then release the Berry ligament, release the isthmus.

Step 3: close the wound:

- Place a drain.

- Close the superficial fascia with interupted 3/0 Vicryl.

- Close the skin with subcuticular running 6/0 Vicryl.

Results

Patient demographic	Endoscopic Lobectomy n = 235	Open Lobectomy n = 250	p
Age	22,3 ± 3,6	31,0 ± 5,8	0,013
Sex (female/male)	12/1	7/1	0,002
Tumor size (cm)	1,2 ± 0,2	1,1 ± 0,6	0,123
Operation duration (mins)	58,4 ± 12,9	42,3 ± 9	0,014
Amount of blood loss (ml)	12,5 ± 0,9	13,6 ± 1,6	0,457
Drainage volume (ml)	75, 5 ± 11,4	54,1 ± 10,1	0,046
Length of hospital stay (days)	4,35 ± 1,4	4,1 ± 1,1	0,061
Hypoparathyroidism	0,85%	0,8%	0,431
Recurrent laryngeal nerve palsy	1,27%	1,2%	0,311
Post op hemorrhage	0,42%	0,4%	0,457
Skin burn	0,42%	0%	
Painful scar	0,85%	3,6%	0,047
Wound site numbness	5,1%	2%	0,032
Wound site cosmetic dissatisfaction	0,4%	10,4%	0,021

Discussions

Age and sex

Male/female ratio in our study was 1/12 for EL group and 1/7 for OL group; EL group of Kyung Tae, Yong Bae Ji research is 3/17 [4], OL group of K.N.Park, C.H.Jung, J. O. Mok [5] was 2/5. The ratios showed a notably higher number of women chose the EL indicate the demand for aesthetic is higher in women. But the overall higher number of women in both group also meant that the disease is more frequent in women.

Indication and patient selection

Indication for lobectomy: In National hospital of Endocrinology, we use the 2015 American Thyroid Association Guideline with recommendations 35: For patients with tumor ≤ 2cm without extrathyroidal extension and N0 (confirm through clinical exam, neck US + CT, intraoperative assessment), choice of treatment is lobectomy [3].

Patients selection criteria

In our research, all patients in the EL group are in stage I, has tumor ≤ 2cm, without extrathyroidal extension, N0, no evidence of thyroiditis, Graves' disease or history of previous surgery on the neck. Our criterias fit with most of the previous researches. By choosing stage I tumor ≤ 2cm, we experienced that small nodule would not affect the thyroid size and since the nodule did not invade the gland capsule, we could easily remove the whole lobe without disrupting the capsule. Those would ensure a radical and oncologically safe surgery.

The most advantage of open surgery is the ability to be applied on all stages of the diseases, while EL can not be used for stage III and IV since it would be difficult to create space - which is the main set back of EL compare to OT. Therefore, we also choose patients had tumor ≤ 2cm for the OT group to facilitate the comparison.

Surgical result and complications

The mean operative durations in our research were 58,4 minutes for EL and 31 minutes for OT. Our EL time is less than that of Jinbeom Cho and Hong Kyu Kim [6], [7], this could be explained by our familiarity with the techniques in benign diseases of the thyroid. However the operative duration is different in researches and EL duration is much longer than OL. It is suggested that operative time is hugely depends on surgeons experiences and the time difference is because of the trocar placement, space creation and specimen removal. On the other hand, EL has shorter wound closure time.

Mean blood lost for EL was 12,5ml and OL was 13,6ml, less than Zhang Ds research [8]. Since we had practiced regularly on the benign group prior

to the study, the more fluent the technique is, the less blood is lost. There was no differences in the amount of blood lost during both EL and OL (p = 0,457) that means endoscopic surgery is as safe as open surgery.

Temporary hypoparathyroidism in both groups is similar (0,85% and 0,8%; p = 0,431). Temporary recurrent laryngeal nerve palsy (1,27% and 1,2%; p = 0,311) and post op hemorrhage are also similar (0,42% vs 0,4%, p = 0,457). Skin burn was encounter in 0,42% of the cases. We did not have any permanent recurrent laryngeal nerve damage, open conversion, tracheal injury, chyle leak and post op infection. K. N. Park, C. H. Jung, J. O. Mok compared between 85 EL and 112 OT and concluded that there were no significant differences in these groups. In the EL group, 2 patients had temporary recurrent laryngeal nerve palsy, 1 had temporary hypoparathyroidism, 1 had post op seroma and no hemorrhage; in the OL group, 3 patients had temporary recurrent laryngeal nerve palsy, 1 had temporary hypothyroidism, 1 had hemorrhage [5]. In term of complications, the distinction between EL and OL group also between our research and others are insignificant.

Patients in our series were hospitalized for the mean of 4,35 ± 1,4 days for the EL group and 4,1 ± 1,1 days for the OL group. Yong-Seok Kim et al reported a mean hospital stay of 3,85 days in their 128 - EL research [9]. There is no significant differences between authors and between both techniques.

At 3 months follow up, patients in EL group had significantly lower wound VAS score on the first 2 day post op (p = 0,047). Numbness at wound site is significantly less pronounced in the OL group (p = 0,032). In endoscopic procedure, the subcutaneous tissues are dissected to reach the thyroid while the muscles are spared therefore, post op pain is very minor. On the other hand, the compartment creation phase damages the nerve end which causes post op numbness.

We use a set of questionnaire to evaluate the cosmetic satisfaction of the patient, patients from EL group is much more satisfied than the OT group (p = 0,021). Nakajo, A. [10] researched on 3 groups of 15-patient each: conventional open surgery, axillary-approach and chest - wall approach endoscopic surgery. At 3 months follow up, all patients in the axillary group were satisfied with their scars the rate of satisfaction in the chest - wall approach group is 70% and for the open surgery group is only 20%.

Conclusions

Endoscopic lobectomy for early differentiated thyroidal cancer proves to be a safe procedure, has good cosmetic result and length of hospital stay as well as complications similar to open procedure. However patients complain of neck numbness after endoscopic surgery while on the open surgery group, patient complain of painful scar.

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