



2023

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### How to Cite This Article

Radwan, Amr (2023) "The outcome of total intracapsular thyroidectomy as a choice of surgery for benign thyroid diseases," *Al-Azhar International Medical Journal*: Vol. 4: Iss. 2, Article 23.

DOI: <https://doi.org/10.58675/2682-339X.1678>

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# The Outcome of Total Intracapsular Thyroidectomy as a Choice of Surgery for Benign Thyroid Diseases

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## Abstract

**Background:** The prevalence of thyroid diseases is growing, which will increase the total amount of thyroid surgeries performed. Parathyroid gland damage and the recurrent laryngeal nerve damage are the commonest complications encountered. There is a need for a technique to decrease the chance of damaging these important structures during surgery.

**Patients and methods:** A total of 97 patients with benign thyroid diseases who underwent total intracapsular thyroidectomies between January 2020 and April 2022 were included.

**Results:** There was no permanent or temporary affection of the recurrent laryngeal nerve. Three cases had hypocalcemia, 2 of which required hospital admission for intravenous medications. Moreover, two cases showed affection of the external laryngeal nerve, which improved after 1 month.

**Conclusion:** Total intracapsular thyroidectomy has a lower rate of complications in benign thyroid diseases as it has less affection of the recurrent laryngeal nerve and the parathyroid glands as both are not encountered during the procedure owing to the change of dissection planes.

**Keywords:** Benign multinodular goiter, Intracapsular, Thyroidectomy

## 1. Introduction

The prevalence of thyroid diseases globally is about two billion.<sup>1</sup> The diagnosis of thyroid diseases is increasing due to the increased awareness and availability of expertise. Voice alteration and loss of voice are recognized as complications of thyroidectomy, which has increased the need of skilled surgeons to perform these operations.<sup>2</sup> The aim of performing thyroidectomy is to remove the diseased organ with the least rate of complication and the minimum chance of recurrence.<sup>3</sup> There is a high recurrence rate in subtotal thyroidectomy (30–50%), which requires another surgery in the same operative field, where the risk of injury of the recurrent laryngeal nerve and parathyroid glands increases about 20 folds.<sup>4</sup> The standard approach to thyroidectomy was to perform exploration of the recurrent laryngeal nerve all through its course to make sure it is not ligated or affected by any energy device during hemostasis; however, this technique

always has the chance of traumatizing the nerve or cutting the blood supply to the parathyroid glands. This led many surgeons to adopt a new capsular dissection in a trial to decrease the incidence of recurrent laryngeal nerve and parathyroid gland injury, especially in the benign condition of the thyroid gland.<sup>5</sup>

## 2. Patients and methods

This study was performed between January 2020 and April 2022 on 97 patients diagnosed in our outpatient clinic with multinodular goiter with no criteria of malignancy on clinical examination or by ultrasound imaging.

All the patients had preoperative investigations, including neck ultrasonography, thyroid hormone profile (fT3, fT4, and TSH), routine tests (CBC, AST, ALT, creatinine, urea, PT, PC, INR, and RBS), indirect laryngoscopy, fine-needle biopsy under ultrasound guidance for cytology, and postoperative histopathological examination of the specimen.

### 2.1. Exclusion criteria

Any patient with recurrence after previous surgery or history of hemithyroidectomy were excluded. Any patients with recurrent laryngeal nerve affection on laryngoscopy examination were also excluded. Any case with fine-needle biopsy report score above Bethesda 2 and any case with malignant surprise in the postoperative histopathological examination were excluded as well.

### 2.2. Surgical technique

The operation was done using a collar incision about 2 cm above the suprasternal notch between the medial borders of the sternomastoid muscles. A flap was raised under the platysma in both upper direction till the thyroid cartilage and lower flap to the sternal notch. The midline of the neck between the two strap muscle groups was divided until the thyroid gland was reached. Dissection of the thyroid gland from its surroundings was done, with care to identify the middle thyroid vein if present to ligate before proceeding with delivery of the lobe by medial rotation. The dissection started with the superior thyroid pole to secure the vessels as near to the gland as possible to avoid injury to the external laryngeal nerve. The dissection then started from the lower pole using blunt dissection at the thyroid capsule level between the medial two-thirds and the lateral one-third as near as possible to the thyroid gland and high away from the tracheoesophageal groove to avoid encountering the recurrent laryngeal nerve in our operative field. This technique also helps to spare the parathyroid glands and their blood supply. The same steps are carried out on the other lobe to separate the gland from the capsule.

### 2.3. Patient follow-up

All patients had a check by the anesthetic physician on recovery from general anesthesia for the mobility of the vocal cords and confirmation with the normal speaking and effortless breathing, ensuring the recurrent laryngeal nerve patency.

Follow-up in the ward included full vital data and emphasis on recognition of any change in the voice, the pitch of voice, and any problems during swallowing for the patency in external laryngeal nerve.

All the previous indicators were checked during the outpatient clinic visits alongside any manifestations of hypocalcemia for 1 month after the surgery.

## 3. Results

All the patients in the study were subjected to total intracapsular thyroidectomy. No complications regarding the recurrent laryngeal nerve were recorded in our study. Three cases had manifestations of hypocalcemia: one of them responded to outpatient medical treatment, whereas the other two required readmission and intravenous calcium injection for 4 days and then they were discharged with oral calcium supplements, which was stopped after 1 month for both cases. Two cases showed shocking during deglutition of water which was improved on taking semisolid meals and the ability to swallow fluids was regained gradually after 1 month from the operation time. All of the specimens were sent for histopathological examination, which revealed no malignant cells in the specimens (Tables 1–4).

## 4. Discussion

The new standard in benign thyroid disease is total thyroidectomy as the recurrence in subtotal thyroidectomy indicates reoperation with high risk of complications.<sup>6</sup> A keen attempt for safety of the patients urged the evolution of the intracapsular thyroidectomy to keep away from the recurrent laryngeal nerve and the parathyroid glands and their blood supply.<sup>4</sup>

As the thyroid gland has two capsules, a true inner one and a second one formed by the fascia of the neck, the superior parathyroids usually is between them, whereas the inferior pair varies in place either between the capsules, in the gland parenchyma, or outside the capsules in the neck fascia, so at least two glands are not in the dissection plane.<sup>7</sup>

Another consideration for the parathyroid gland preservation is to keep their blood supply that comes from the inferior thyroid artery as even with meticulous dissection of their blood supply, which adds to the operation time. Thrombosis of the friable vascular supply or edema of the capsule may lead to parathyroid gland infarction later as compared with intracapsular dissection where only the intracapsular branches of the inferior thyroid

Table 1. The data of the sex, age, and operative time in this study.

Sex [n (%)]	Male	22 (22.68)
	Female	75 (77.32)
Age	Mean ± SD	39.12 ± 11.46
	Range	23–65
Operation time	Mean ± SD	104.44 ± 9.81
	Range	90–130

Table 2. The number and percentage of complications in this study.

Complications	n (%)
Temporary recurrent laryngeal nerve affection	0
Permanent recurrent laryngeal nerve affection	0
Temporary parathyroid gland affection	3 (3.09)
Permanent parathyroid gland affection	0
Temporary external laryngeal nerve affection	1 (1.03)
Permanent external laryngeal nerve affection	0

dissection plane to the capsular level increases the chance of preserving it.<sup>7</sup>

The incidence of transient hypocalcemia in this study was 3.09% in comparison with 1.8, 4.87, 7.6, 13.4, and 24.1% in the studies done by Sewefy et al.,<sup>8</sup> Sumanth and Panduranga Rao,<sup>9</sup> Efremidou et al.,<sup>10</sup> Serpell and Phan,<sup>11</sup> and Koyuncu et al.,<sup>12</sup> respectively. There were no cases of permanent hypo-

Table 3. Comparison of the results from this study and other studies regarding parathyroid gland affection.

	Sewefy and colleagues	Sumanth and Panduranga Rao	Efremidou and colleagues	Serpell and Phan	Koyuncu and colleagues
Temporary parathyroid gland affection	1.8%	4.87%	7.6%	13.4%	24%
Permanent parathyroid gland affection	0%		0.3%	1.8%	0%

Table 4. Comparison of the results from this study and other studies regarding recurrent laryngeal nerve affection.

	Sewefy and colleagues	Rageh and colleagues	Algammal and colleagues	Chisthi	Dong et al.
Temporary RLN affection	0%	0%	0%	0.5%	0%
Permanent RLN affection	0%	0%	0%	0%	One case of hoarseness of voice

artery are ligated and the parathyroid blood supply is kept intact.<sup>7</sup>

Hypoparathyroidism after thyroidectomy may be persistent if the blood supply to the glands is interrupted with subsequent infarction or it may be transient which may not have a definite cause, but some theories include functional hypoparathyroidism, calcitonin released during surgical manipulation, inadequate renal calcium reabsorption, and revision of thyrotoxic osteodystrophy.<sup>8</sup>

Some important anatomical variations increase the chance of recurrent laryngeal nerve injury such as the extralaryngeal bifurcation of the nerve, which is present in about one-third of the population and, if present, make the dissection harder with double chances of injuring the nerve.<sup>7</sup>

Another rarer variation is a connection between the cervical sympathetic ganglia and the recurrent laryngeal nerve, which is larger than the recurrent laryngeal nerve and puts the nerve in danger for injury if the surgeon mistakes it for a nonrecurrent laryngeal nerve.<sup>7</sup>

There are several types of injury to the recurrent laryngeal nerve during thyroidectomy such as partial or complete transection, traction, contusion, crushing, electrical or thermal injury, ligation, and compromise of the nerve blood supply.<sup>8</sup>

The recurrent laryngeal nerve lies outside the neck fascia in the lower third or in the capsule in the middle third of the fascia with a rare incidence of being in the gland parenchyma, and shifting the

parathyroidism in our study, as recorded by Sewefy et al.,<sup>8</sup> whereas Efremidou et al. and Serpell and Phan recorded 0.3 and 1.8%, respectively.<sup>10,11</sup>

The recurrent laryngeal nerve in this study was not affected either permanently or temporarily, similar to Rageh et al.,<sup>13</sup> Elgamaal et al.,<sup>6</sup> and Sewefy et al.,<sup>8</sup> but 0.5% temporary and no permanent affection of the nerve were reported by Chisthi.<sup>14</sup> Dong et al.<sup>15</sup> reported one case of hoarseness of voice out of 44 cases in their study.

#### 4.1. Conclusion

Total intracapsular thyroidectomy is a safer technique for the patients as it reduces the incidence of temporary and permanent complications of injuring the recurrent laryngeal nerve or the parathyroid glands in benign thyroid diseases requiring thyroidectomy.

#### Ethical approval

the research was approved by the Research Ethical committee of Al-Azhar University, An informed written consent was taken from all the participants in this study, All of the questions about the operation and the study were answered.

#### Conflict of interest

There are no conflicts of interest.

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