Comparative Study between Total and Subtotal Thyroidectomy in Benign Multi Nodular Goiter: Outcome and complications

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Abstract: Background: The surgical treatment of benign thyroid disease is still controversial, although many surgical subspecialties have developed, each have many angles and views. Many treatment modalities have been advocated for the surgical management of multinodular goiter, there are several methods for thyroid gland operation such as subtotal thyroidectomy (STT), near-total thyroidectomy (NTT), hemi-thyroidectomy plus subtotal resection (Dunhill procedure) and total thyroidectomy (TT), nevertheless clarity is missing regarding the safest and best option for the patients on a longer perspective. **Objective**: To compare between total thyroidectomy and subtotal thyroidectomy in simple multinodular goiter as regard achievable benefits of the procedures and complications. **Patients and methods**: A prospective comparative study was carried out on 50 patients with benign simple multinodular goiter. Two types of surgical procedures were performed: total and subtotal thyroidectomy. **Results:** The study included 50 patients operated for benign multinodular goiter. 25 patients underwent total thyroidectomyand the other 25 patients underwent subtotal thyroidectomy. In this study, no recurrent laryngeal nerve (RLN) injuries occurred for patients in both groups. One patient (4%) from the total thyroidectomy group developed a complication of external laryngeal nerve injury compared with no patients (0%) in the subtotal thyroidectomy group. Also, in this study, two patients (8%) in the total thyroidectomy group developed complications of transient hypoparathyroidism and hypocalcemia. No permenant hypocalaemia in either group. The incidence of incidental carcinoma in total thyroidectomy group was in one (4%) patient and in one (4%) patient also in subtotal thyroidectomy group. **Conclusion:** Total thyroidectomy is a safe procedure, with low postoperative complications.

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1. Introduction

Goiters (from the Latin gutter, throat), which are defined as an enlargement of the thyroid gland, have been a recognized medical condition since 2700 B.C. A multi-nodular goiter is simply a thyroid gland that is usually enlarged and contains multiple thyroid nodules (**Mobayen,*2015*).**

The indications for total thyroidectomy in the management of thyroid diseases are not well defined. The literature lists a few, like histories of head and neck irradiation, a multinodular goiter grossly involving both the lobes, compressive symptoms and nodule with suspected malignancy. If the goiter is voluminous with compressive symptoms or if it is not possible to leave a grossly homogeneous thyroid remnant tissue because of location of possible nodules, total thyroidectomy is recommended. There is a growing evidence that total thyroidectomy is appropriate for patients with multinodular goiter where there is significant nodular disease involving both lobes ***(Raj M. and Akmal. 2016).***

In recent decades, total thyroidectomy has replaced subtotal thyroidectomy as the preferred surgical procedure for benign multinodular goiter (BMNG) in the practice of the majority of endocrine surgeons, and with good results and justification. Total thyroidectomy for BMNG provides the advantages of eliminating the risk of recurrence, resulting in resolution of compressive symptoms of BMNG, and of being an adequate surgical procedure for an incidental differentiated thyroid cancer. However, there are concerns that total thyroidectomy is an overly radical procedure (for a benign disease like BMNG) that is associated with significant permanent morbidity of postoperative RLN palsy and hypoparathyroidism ***(Gaurav A. and Vivek A. 2012).***

2. Patients and Methods

This prospective study has been included (50) fifty patients who were admitted to Department of General Surgery, Al-Zahraa Hospitals in Cairo, Egypt. From March 2016 to March 2018. The patients included were subjected to either total or subtotal thyroidectomy.

Inclusion criteria

patients of both sex and any age presented by simple multinodular goiter (SMNG), patients with clinical manifestations of nonmalignant goiter, proved

by ultrasound (US) to be nodular & by laboratory investigations (thyroid functions) to be euthyroid.

Exclusioncriteria

Patiente with history of:

- Hyperthyroidism.
- Radiation exposure to the neck.
- Familial thyroid cancer.
-Symptoms suggestive malignancy.
- Patients have thyroid cancer proved by fine needle aspiration cytology.
-Have history of thyroiditis.
-Have any morbidity diseases like hypertension, diabetes mellitus, bleeding tendency, morbid obesity.
-In the subtotal group cases with peripherally located nodules necessitating total thyroidectomy has been excluded from the study.
-Have solitary thyroid nodule.

All the included patients were subjected to the following:

Clinical examination, full neck ultrasound, free T3, freeT4, TSH, serum calcium concentration, and vocal cords status is checked by laryngoscopy.

Operative assessment were included:

*operative time from the first incision to the last suture.

*operative complications.

Total thyroidectomy was done in 25 patients, and subtotal thyroidectomy was done in 25 patients.

Ethical considerations

Written consent was obtained from all patients or first-degree relatives before the management procedure. The localethics committee approved the study.

Extent of Surgery and Definitions

Total thyroidectomy:

Both lobes and the isthmus are completely removed leaving behind only viable parathyroid glands.

Subtotal thyroidectomy:

Belongs to the bilateral removal of more than 50% and less than 90% of each lobe including the isthmus or (more than one half of the thyroid gland and isthmus) leaving the posteromedial part, or including thyroid lobectomy and isthmusectomy, with contralateral subtotal resection leaving 3 g to 5 g of normal remnant tissue on the less affected side following the same technique as described above. Thyroid hormonal release is maintained.

Operative steps

Patient Positioning

Under general anesthesia with endotracheal intubation the patient was placed in supine position. Rolled towels are placed under the shoulders which allow sufficient neck extension. A small pillow is placed under the occiput for adequate head support. In order to prevent venous congestion in the neck, the head of the table is elevated to a 30° position during surgery.

Betadine preparation was used for sterilization. The operative field is draped widely to include the chin, bilateral lateral neck, and the suprasternal notch.

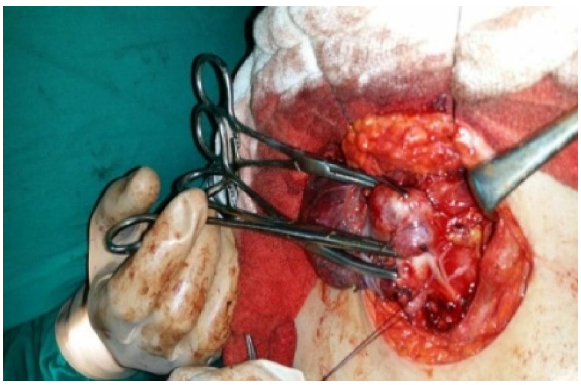
Upper Pole, Isthmus and Pyramidal Lobe

The superior pole vessels should also be individually divided and ligated relatively low on the thyroid gland to avoid injury to the external laryngeal nerve. Once the superior pole vessels have been ligated, the upper parathyroid gland, if not already identified, can be observed at the ligament of Berry and tubercle of Zuckerkandl.

By blunt and sharp dissection, the isthmus was freed from the underlying trachea. The pyramidal lobe, which originates more often from the left thyroid lobe, was traced upward and removed as completely as possible.

Recurrent laryngeal nerve and inferior thyroid artery:

Only the complete division of the superior thyroid vessels enables us to medially rotate and anteriorly mobilize the gland. Dissection was done in the plane between the thyroid capsule and the terminal branches of the inferior thyroid artery. The branches were ligated individually directly on the surface of the thyroid gland to minimize surgical damage to both the parathyroid glands and the RLN. Meticulous dissection steps were done for identification of the RLN where it crosses the inferior thyroid artery, as well as the two parathyroid glands.



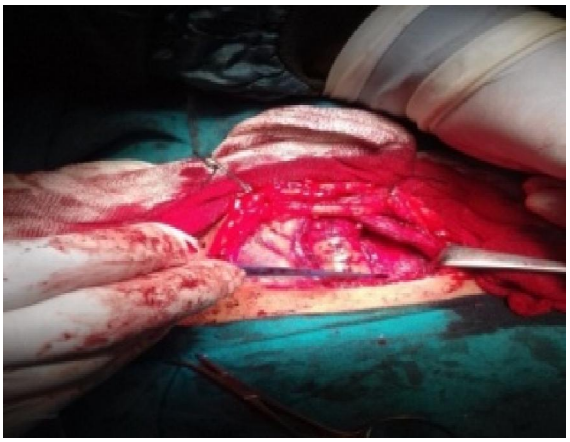
Identified and exposed right RLN.

Truncal ligation of the inferior thyroid artery was omitted. The RLN nerve easily found at its constant landmark, Zuckerkandltuberculum where it crosses beneath it and enters below Berry's ligament of the thyroid cartilage. The RLN can always be identified laterodorsally to the ligament of Berry, it never penetrates the ligament.

Identification of the Parathyroid Glands

Regardless of whether a subtotal thyroidectomy, or total thyroidectomy was performed, all identified

parathyroid tissue was preserved on its native blood supply. The best way was used to preserve the parathyroid glands in situ was the extracapsular dissection of the thyroid gland. With the utilization of the extracapsular dissection, the parathyroid glands were swept off the thyroid capsule and were left in situ with their vascular pedicles.



Identification of parathyroid glands.

Identification of the parathyroid glands according to: Anatomical location: most commonly found in an area 2 cm in diameter centered 1 cm above the intersection of the inferior thyroid artery and the recurrent laryngeal nerve. Size typically measures (5 × 3 × 1 mm). Colour, which is typically brown to reddish tan and is often described as a salmon color.

Post-operative care

Patients were observed for any complications: bleeding, dyspnea, hoarseness of voice, chocking.

All patients were carefully observed for manifestation of hypocalcemia (numbness, paresthesia, carpopedal spasm).

If any patients develop manifestation of hypocalcemia at same day of operation: serum calcium measured immediately and started medical treatment with intravenous calcium gluconate.

- 1st postoperative day for all patients: serum calcium, hypocalcaemia was defined by serum calcium level <8mg/dl. In hypocalcaemia patients serumca was estimated daily until discharge on medical treatment (oral cacium with or without vitamin D)

- After one month: serum calcium, recurrent laryngeal nerve RLN if injured.

-After six months: serum calcium, recurrent laryngeal nerve RLN palsy.

-After one year: reassessment of serum calcium, thyroid function, RLN.

In cases of total thyroidectomy, therapy with thyroid hormone (L-Thyroxin) was started in each patient 10 days after surgery, thyroid hormone serum levels was measured every 6 months.

3. Results

In this study, 50 patients with multi-nodular goiter underwent thyroid operation in the department of surgery of Al-Zahraa University Hospital, between March 2016 and March 2018 using two different methods of operation were done: subtotal thyroidectomy (STT) and total thyroidectomy (TT).

Fifty patients, 47 females (94%), 23 of them underwent total thyroidectomy and 24 of them underwent subtotal thyroidectomy and 3 males (6%) 2 of them underwent total thyroidectomy and 1 of them underwent subtotal thyroidectomy (table 1). With female to male ratio 15.6:1. The age of our patients ranged between 27 and 60 years old (median 43.5). All patients are euthyroid.

Table (1): Patients distribution according to sex comparing the 2 procedures.

Sex	Total thyroidectomy	Subtotal thyroidectomy	Total
Females	23(92%)	24(96%)	47(94%)
Males	2(8%)	1(4%)	3(6%)
Total	25	25	50

37 patient complaining swelling in the neck, 23 complained by themselves for cosmetic or annoying symptoms, 6 during examination for unrelated condition, 8 accidentally discovered by relative. 13 patient complaining of pressure symptoms, 10 complained of dyspnea, and 3 complaining dysphagia (table 2).

Table (2): Patients distribution in standard group according to patient main complain

Operation	Swelling	Pressure symptoms	Total
Total thyroidectomy	16(64%)	9(36%)	25
Subtotal thyroidectomy	21(84%)	4(16%)	25
Total	37(74%)	13(26%)	50

We found that we had 42 patients (84%) with simple multinodular goiter, and 8 patients (16%) with simple multinodular goiter with prominent nodule (table 3).

Table (3): Patient distribution in standard groups according to the preoperative diagnosis.

Operation	simple multinodular goiter	simple goiter with prominent nodule	Total
Total thyroidectomy	20(40%)	5(10%)	25(50%)
Subtotal thyroidectomy	22(44%)	3(6%)	25(50%)
Total	42(84%)	8(16%)	50(100%)

Table (4): Postoperative complications of thyroidectomy.

Complication	TT	ST	Total
Number of patients	25	25	50
Hematoma	0%	0%	0%
Wound infection	0%	0%	0%
External laryngeal nerve injury	(1 case)4%	0%	(1 case)2%
Transient RLN injury	0%	0%	0%
Permanent RLN injury	0%	0%	0%
Transient hypocalcaemia	(2 cases)8%	0%	(2 cases)4%
Permanent hypocalcaemia	0%	0%	0%
Incidental carcinoma	(1 case)4%	(1 case)4%	(2 cases)4%
Mortality rate	0%	0%	0%
Follow up months	12	12	12

4. Discussion

MNG is a common endocrine disorder in the world. It can give rise to complications like local compression effects, development of toxicity and malignant transformation. As there is no standard treatment for MNG, regional trends influence the treatment ***(Raj M. and Akmal. 2016).***

The extent of thyroidectomy in benign thyroid disease is still a matter of debate and shows a large spectrum of management strategies. The aim of these procedures is to perform the most effective treatment with the less complications, without an incidence of recurrence and without the need for secondary surgical intervention, which will be difficult and carries more complications to the patient. Because of disturbed anatomy and adhesions.

Limits of resection for thyroid surgery have changed over years. Until the end of the 20th century, total thyroidectomy, except for thyroid cancer, was performed very rarely due to high complication rates. Subtotal resections for benign thyroid diseases have been accepted as gold standard therapy during this period. However, after long-term follow-up results of subtotal resection, it was obvious that this procedure was involved with increased recurrence rates. Afterwards, discussions on the type of surgery for benign diseases came into question ***(Tayfun Y. et al., 2015).***

25 patients were subjected to total thyroidectomy and the other 25 were subjected to subtotal thyroidectomy as a surgical management for benign multinodular goiter. Postoperative follow-up for those patients was performed to detect any complications, especially recurrent laryngeal nerve injury and hypoparathyroidism.

In this study 47 patients were females (94%) and 3 patients were males (6%) and patients ages ranged from 27 to 60 years with a mean age of 43.5 year.

Raj M. and Akmal (2016) in their study on 40 patients 20 underwent to total thyroidectomy, and 20 underwent to subtotal thyroidectomy, 75% were females and 25% were male with the female-to-male ratio was 3:1. The mean age of the study population was 51.62 and the majority (55%) belong to 51–55 years of age.

Saber, et al., (2014): their study was on 242 thyroidectomies were performed, with 121 in each group of total and subtotal techniques, there were 74 men (30.6%) and 168 women (69.4%) with a mean age of 43.9 years.

Vaiman, et al., (2011): their study was on 6,223 cases: TT, n = 3,834 (61.6%) ST, n = 2,238 (36%); and NT, n = 151 (2.4%). Of this total, 2,758 (44.3%) patients were men and 3,465 (55.7%) were women with a mean age of 48.7 (6).

According to the research of **Randolph (2013)**, the incidence of transient/permanent RLN palsy was 0–6% and <1%, respectively.

Ozbaş and colleagues (2005) in his study on 750 thyroidectomy cases of which 260 underwent TT and 170 underwent ST and 320 underwent NTT reported a transient RLN palsy rate of 1.9% and a permanent RLN palsy rate of 0% after TT and the rate of a transient RLN palsy was (2.4%) and a permanent RLN palsy was (0.6%) of ST.

Fatih and colleagues (2015) in their study on 409 thyroidectomy cases of which 258 (63%) and 151 (37%) underwent TT and BST, respectively shows the permanent RLN palsy rate after TT (0-0.7%) and BST (0-1.3%) are performed by experienced surgeons. A particular study showed transient and permanent RLN palsy rates of 1.7% and 0% for TT and BST respectively.

Vaiman, et al., (2011): their study found that permanent recurrent laryngeal nerve (RLN) injury was observed in 1.4% in the TT group, 1.2% in the ST group.

Tezelman and colleagues (2012) in their study found that there were 28 (1.65%) patients with transient unilateral recurrent laryngeal nerve (RLN) palsy in subtotal thyroidectomy and 20 (1.65%) in total thyroidectomy. In subtotal thyroidectomy, 11 (0.64%) patients developed permanent unilateral RLN palsy, and 12 (0.9%) in total thyroidectomy. None of the patients in total thyroidectomy and subtotal thyroidectomy had bilateral RLN palsy.

In our study routine indirect laryngoscopy was done preoperatively for the 50 patients for assessment of vocal cord mobility revealing bilateral freely mobile cords in all patients and assessed immediately postoperatively during recovery by direct laryngoscopy. No further assessment was needed as there is no RLN injury.

In our study, on 50 cases 25 underwent TT and 25 underwent ST no transient nor permanent RLN palsy TT and ST groups.

Raj M. and Akmal. (2016) in their study on 40 patients the incidence of superior and recurrent laryngeal nerve injury was 5%, it seems to be more since the population size is less. As such only 1 patient had developed this complication out of 20 patients who underwent total thyroidectomy, whereas among the patients who underwent subtotal thyroidectomy there was no such complication occurred.

In our study, the rate of superior laryngeal nerve injury was 4% of total thyroidectomy group, while 0% in subtotal thyroidectomy group.

Mobayen M. et al., (2015) in their study found that the transient hypocalcaemia was observed in 23.33 % of TT group patients, no permanent hypocalcaemia.

Gal et al (2013) studied 264 cases underwent TT and the results showed 31 cases (11.7%) with transient hypocalcaemia, but only 1 (0.3%) symptomatic and only 4 (1.5%) with permanent hypocalcaemia.

In our study the rate of transient hypocalcaemia in total thyroidectomy was (8%), no permanent hypocalcaemia 0%. While in subtotal thyroidectomy no transient nor permanent hypocalcaemia (0%).

Incidental thyroid cancers have been detected in 3–16.6% of apparently benign goiters after TT or BST in various studies. About two thirds of cancers are micropapillary or microinvasive follicular cancers. Though the treatment of microcarcinomas is still a matter of discussion, some microcarcinomas may have a negative outcome, including distant metastasis and patient death **(Li Y. et al., 2016).**

Miccoli et al. (2016) in their study found that the rate of incidental carcinoma was (10.4%) (13).

Gomez Palacios et al. (2016) in their study found that the rate of incidental carcinoma was (8.5%) (14).

In our study, one patient (4%) in the total thyroidectomy group developed a complication of incidental carcinoma in histopathological finding and in one patients (4%) of the subtotal thyroidectomy group, that need reoperation for completion thyroidectomy.

5. Conclusion

The goal of surgical treatment in MNG should be to eliminate the disease with a low complication rate and to minimize the necessity for reoperation because the risk of permanent complications has been found to be higher in reoperations for recurrent disease than in primary operations with extensive disease. If a surgeon leaves abnormal thyroid tissue in a patient with MNG, subsequent reoperation might be required.

The study pointed out that subtotal thyroidectomy is safe despite the complication of incidentally diagnosed thyroid carcinoma which required reoperation for completion thyroidectomy. There is an obvious decrease in the rate of complications associated with total thyroidectomy, especially with increasing experience and refinement of surgical technique.

Total thyroidectomy is a safe and highly effective procedure in most patients, with acceptable transient postoperative complications.

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