Decision Making in Surgical Management on Multinodular Goitre - Total Thyroidectomy Vs Partial Thyroidectomy Narrative Review

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ABSTRACT
BACKGROUND: Multinodular goiter is most commonly found in thyroid swelling in middle-aged females. It is a slowly progressing disease. It starts as a multiple nodularity in a single lobe or both lobes. This review aims to decide whether, while planning for thyroidectomy in Multinodular goiter whether it involves unilaterally or bilaterally based on various articles. **METHODS**: *A comprehensive literature search was conducted across Pub Med, Embase, Scopus, and Cochrane Library databases dating from January 2009 to December 2024. Studies were selected based on predefined inclusion criteria and assessed using PRISMA guidelines.* **RESULTS**: Of these 30 articles, 15 advised total thyroidectomy despite complications and used IONM and fluorescence to avoid complications. Additionally, 5 articles supported partial resection. **CONCLUSION:** Total thyroidectomy is more effective than partial resection of the thyroid in preventing goiter recurrence and the formation of carcinoma, as well as reducing the need for resurgery when combined with techniques such as intraoperative neuromonitoring (IONM) and fluorescence imaging. However, partial resection can be considered if there is strict follow-up and no minimal disease is present in the opposite lobe, thus minimizing the risk of recurrence and malignancy.

Keywords- Multi-Nodular Goitre, Thyroidectomy.
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INTRODUCTION:

Multi-nodular goitre is most commonly found in thyroid swelling in middle-aged females. It is a slowly progressing disease. It starts as a multiple nodularity in a single lobe or both lobes. It is due to fluctuation in TSH stimulation to follicular cells in the thyroid parenchyma. A nodular goiter is defined as any benign, noninflammatory enlargement of the thyroid gland that is not associated with hyperthyroidism. The causes of nontoxic goiter can be broadly divided into diffuse and nodular enlargement, which roughly lead to the respective entities of endemic/diffuse and sporadic multinodular goiter, each with its pathogenesis, risk factors, and management strategies. Sporadic multinodular goiter is the most common cause of nontoxic goiter in the United States and other developed nations with iodine-rich diets, with an incidence of approximately 5%. Although there is a known pathophysiologic process in which iodine deficiency can first cause diffuse follicular hyperplasia and subsequently stimulate nodule formation, the causes of the majority of sporadic multinodular goiter remain fluctuation in TSH stimulation. The incidence of multinodular goiter increases with age, probably paralleling the age-related incidence of thyroid nodules in general.

PATHOPHYSIOLOGY:

Persistent TSH stimulation leads to Diffuse hyperplasia of the gland (all active lobules). Later with fluctuation of TSH level. Mixed areas of active and inactive lobules develop. It is also probably due to *the increased sensitivity* of follicular cells to TSH. Active lobules become more vascular and hyperplastic. Hemorrhages occur with necrosis in the Centre followed by Nodule formation. The Centre of the nodule is inactive and only the margin is active, i.e. internodular tissue is active. Formation of many nodules. *Multinodular goitre* ***(MNG).*** Other factors involved are growth-stimulating immunoglobulins and growth-prone cell clones.

Stages include

1. Stage of hyperplasia and hypertrophy
2. Stage of fluctuation in TSH
3. Stage of formation of nodules (inactive); (inter-nodular tissues are active)

The workup of nontoxic goiter consists of thyroid function testing to rule out hyperthyroidism and imaging studies to assess for goiter extent and the presence of nodules. The mainstay for thyroid imaging is neck ultrasound after thyroid function test, which offers the highest resolution description of thyroid size/volume, presence or absence of significant thyroiditis, and characterization of thyroid nodules. As stated in the ATA guidelines, every nodule at least 1 cm should be evaluated for suspicious sonographic features on an individual basis, and FNA should be performed preferentially based on suspicion of malignancy.

SURGICAL TREATMENT OPTIONS:

There are multiple types of surgery in treating multinodular goitre. They are total thyroidectomy (TT), subtotal thyroidectomy (ST), and hemi thyroidectomy (HT). ST includes removal of whole gland leaving 8g of thyroid tissue on both side near tubercle of zuckercandle. HT includes removal of whole lobe and isthmus in view of more chance of recurrence in lobule isthmus junction.

METHODS AND MATERIALS:

An electronic search on PubMed, EMBASE, and Google Scholar was performed for a period ranging from January 2009 to December 2024 spanning 15 years. The MeSH Terms used in this narrative review were ‘multinodular goiter',' toal thyroidectomy', 'hemithyroidectomy', and ' lobectomy' used in combination with IONM, fluorescence, experienced surgeon, etc. Google Scholar was used for citation search for all included articles. A language exclusion of "English only" articles was placed and only such articles were included.

Inclusion Criteria:

1. Multinodular Goiter Both Clinically And Sonographically Without Toxic Features.
2. Multiple Nodules In A Single Lobe

Exclusion Criteria:

1. Solitary nodular goitre
2. Thyroiditis, carcinoma, previous thyroid surgery, thyroiditis, subclinical or clinically overt hypothyroidism or hyperthyroidism,
3. pregnancy or lactation, age >18 years or <65 years,
4. ASA 4 grade (American Society of Anesthesiology)
5. inability to comply with the follow-up protocol.

DISCUSSION:

In this review, we took the decision-making protocol from the conclusion of 30 appropriate articles from 100 articles on surgical options in multinodular goiter. In the Hafiz et al study, surgeons' experience of > 3 years post-fellowship experience reduces complications effectively in Total thyroidectomy. In some studies, Intraoperative nerve monitoring is essential to prevent RLN injury in both HT and TT. Yoshiaki Shinden et al, have used a flourescence scan intraoperatively to identify parathyroid gland to prevent transient and permanent hypoparathyroidism.

S.NO	ARTICLE	CONCLUSION	REMARKS
1.	Rocca Bettentone et al	TT > HT	
2.	Maria Lytiri et al	HT > TT	19% recurrence in Nodule >1cm in the opposite lobe. Needs strict follow up
3.	G Vasica et al	TT> HT	
4.	Heming Dralle et al	Always look for the extent of resection.	
5.	Roberto cirocchi et al	TT > ST	Recurrence, Surgery, Permanent hypoparathyroidism are high in ST
6.	Marine Sarfati et al	HT > TT Completion surgery needed in 11.3%	HT should be done only in nodules in a single lobe with an absolutely normal opposite lobe.
7.	Mohamedresa Mobayan et al	TT > HT	because of the high incidence of Multifocal malignancy. TT is best if unilateral Compression is Present.
8.	Seluk Kaya et al	HT > TT	The incidence of a new nodule in the Opposite lobe is 23% which needs L THyroxine in 31%. Strict follow-up is needed.

9.	Beatriz de Rienzo et al	HT > TT	14.7% needed resurgery in 14 years. 3.5% are malignancy in residual lobe. Pt should be on strict follow-up.
10.	Gurken Yetkin et al	High Recurrence in HT if large unilateral thyroid, Histological characteristic, Multinodularity.	
11.	L.H.Lopez et al	TT > HT	11% carcinoma in MNG
12.	Yann Sheng Lin et al	HT > TT	12 % needed resurgery. Papillary carcinoma presented as multifocal Disease. HT patients also needed thyroxine Supplementation.
13.	E Alhan et al	TT > HT in high-volume surgery.	HPE of the TT specimen showed 10.3% papillary carcinoma. 0.5% RLN injury and permanent hypoparathyroidism. TT
14.	Marcin Barczynski et al	TT best	Recurrence is 15%. Resurgery in 5%
15.	Fahd Alharbi et al	TT best	2.8% RLN injury. 0.9% Hypoparathyroidism.
16.	Serder tezelman et al	TT best	10% carcinoma in HPE. 7.1% needed resurgery.
17.	Tayfen Yoldas et al	TT best	Hypoparathyroidism present.
18.	Hadi al Hakami et al	TT best	High transient adverse events present.
19.	Yujie Li et al	TT best	Transient hypoparathyroidism present.
20.	Desalenu Gedamu et al	14.1% papillary carcinoma in MNG.	

In all the above articles, different types of resection have been done. Many articles advised going ahead with total thyroidectomy in view of goiter recurrence, malignancy, and the need for resurgery. Some articles told about hemi thyroidectomy due to more complications like RLN palsy, and permanent hypo parathyroidism. Gurken Yetkin et al showed that there is high Recurrence in HT if large unilateral thyroid, Histological characteristic of recurrence, and Multinodularity. Desalenu Gedamu et al 14.1% papillary carcinoma in MNG. In these 30 articles, 15 articles advised to do total thyroidectomy despite complications and advised to use IONM, and flourescence to avoid complications.

In mohamed abdeigadir et al described that if the surgeon is experienced in surgical skills on thyroid resections by > 25 thyroidectomy, there is less complication and less hospital stay.

If the surgeon's experience is less, more complications and hospital stays will be there.

In seluk kaya et al, partial resection is best , but there should be strict followup of patients who underwent surgery. Because new nodule formation in remianing lobe is 23%. Usage of levo thyroxine in post op life is 31 % which is drawback in partial resection.

In Beata wojtczak et al, there is reduction of RLN injury in both partial and complete resection of thyroid from 6.8% to 1.4%. In Meenakshi et al , less chance of RLN injury is there in intracapsular dissection of thyroid.

OUR RECOMMENDATIONS.

- Always TT is best in MNG (Clinically unilateral) to prevent goitre recurrence, carcinoma in the residual lobe, the need of Resurgery . But there should not be complications like RLN palsy, Permenant hypoparathyroidism.
- There is less complication in TT if TT has been done by experienced surgeon, high volume center, with IONM and fluorescence usage.
- HT should be performed with the following conditions.
    - Only single-lobe involvement

- Normal contralateral lobe. No nodules sonographically
- The patient needs lifelong strict follow-up for identifying recurrence, to rule out malignancy

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