

## Evaluation of Surgical Management of Multinodular Goiter

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**Abstract: Background:** Goiter is a worldwide problem, particularly predominant in areas with iodine deficiency?. It is still endemic in various parts of Iraq and endemic goiter most commonly found in the north and middle of Iraq and in the capital Baghdad<sup>3,4</sup>

Multinodular goiter is a relatively common condition with a marked female predominance. The etiology of this condition remains unclear but it is probably multifactorial : heredity, dysmorphogenesis, iodine deficiency, naturally occurring goiterogens and circulating thyroid growth factors are possible contributors. The thyroid gland is known to become more nodular with age.

**Aim:** The aim of study is to evaluate the mode of presentation, the surgical management, the complications and the incidence of malignancy among a cohort of patients with multinodular goiter.

**Patients and Methods:** This is a prospective study carried on 195 patient diagnosed as multinodular goiter for surgery and admitted to. Hilla General Teaching Hospital/Babel Health Directorate, between the first of Jan. 2010 to the first of Jan. 2013. The patients were divided into six age groups. The majority of them were in the second and third age group i.e. (21-30) ,31-40) years respectively with female predominance in both (P.value 0.001).

**Results:** Unsightly swelling in the neck was the most common presenting symptom (70% followed by toxic features (18%, obstructive features (8.5%) of patients. Most common indication of surgery was unsightly swelling of neck (65%), toxic changes (16.5%), pressure symptoms in (8.5%) • Subtotal thyroidectomy was the most common procedure (58%) followed by hemithyroidectomy (Right and Left followed by total and near total thyroidectomy Regarding postoperative complications were seroma (5%), superior Laryngeal nerve injury(5%) wound infection (1.5%), and, recurrent laryngeal nerve injury (1.5%) only. Malignancy was found in (6.5%) of patients.

They were papillary carcinoma (53.8%) and follicular carcinoma (30.7%).

**Conclusions:** Recurrent laryngeal nerve injury can be avoided without special dissection to identify the nerve and further studies should be conducted to prove this.

**Keywords:** Multinodular goiter, Thyroid stimulating hormone, Fine needle aspiration cytology, Recurrent laryngeal nerve

### INTRODUCTION

The term goiter is derived from the French word goiter, which in turn comes from Latin (Gutter) meaning "Throat". In general; the term is applied to any enlargement of the thyroid gland (<sup>1</sup>)

Goiter is a worldwide problem, particularly predominant in areas with iodine deficiency". It is still endemic in various parts of Iraq and endemic goiter most commonly found in the north and middle of Iraq and in the capital Baghdad <sup>3,4</sup>.

(MNG) is a relatively common condition with a marked female predominance. The aetiology of this condition remains unclear but it is probably multifactorial: heredity, dys-hormonogenesis, iodine deficiency, naturally occurring goiterogens and circulating thyroid growth factors are possible contributors). The thyroid gland is known to become more nodular with age<sup>5)</sup>

During development; a MNG is thought to pass through a series of stages including: hyperplasia of the parenchyma, colloid degeneration and formation of adenomatous structures<sup>(6)</sup>

This benign process most often attracts clinical attention because of cosmetic appearance or compression of adjacent structures, notably trachea, esophagus and large veins of the neck. Less frequently spontaneous hemorrhage within the goiter or toxic or malignant changes may supervene. Lailemant has categorized the indications for surgical treatment of MNG into 2 groups<sup>(6)</sup>

1. Strong indications include: compression and respiratory distress, thyrotoxicosis and suspected malignant changes.
2. Other indications are: cosmetics and potential for tracheoesophageal compression however the treatment of choice for (MNG) remains controversial.

The characteristic physical finding associated with an enlarged thyroid is a visible and palpable mass, which moves on deglutition. If the thyroid fails to move on deglutition, this may suggest an intrathoracic extension, carcinoma of the thyroid gland with invasion of surrounding structures or thyroiditis extending into adjacent structures.

Simple and nontoxic nodular goiter rarely progress to hypothyroidism by contrast thyrotoxicosis develop in large percentage of patient with a long standing of MNG"

MNG of small or moderate size that produce no symptoms may not require any therapy<sup>&9</sup> If the goiter causes a cosmetic problem or symptoms due to compression of the surrounding neck structures, initial medical therapy usually consists of exogenous hormone to suppress (TSH) secretion. Although variable result have been obtained by different studies a controlled study has demonstrate a significant decrease in the size of MNG with this suppressive therapy<sup>10,11</sup> (suppression hormone therapy).

Patient receiving this therapy must be followed with care since the exogenous thyroid hormone in addition to the nonsuppressed endogenous thyroid hormone may result in thyrotoxicosis<sup>12,13,14</sup>

Surgical treatment is a valuable therapeutic alternative if there is one or more one of the following changes:

- Secondary thyrotoxicosis.
- Tracheal deviation or stenosis.
- Severe cosmetic deformity.
- Sudden or continued growth of the goiter
- Malignant changes.
- A hard nodule or a single nodule that continues to grow disturbing local structures.
- Retrosternal extension.

Preoperative assessment of Multinodular goiter include the followings:

- Proper history and physical examination.
- TSH and thyroid hormones estimation.
- Radioisotope scan of the gland.
- Ultrasound examination of the gland.
- S.calcium estimation.

- Vocal cords examination by an otolaryngologist.
- FNAC is useful in determining the optimal therapeutic approach in the patients with firm nodule (dominant nodule of MNG).

When nodularity is confined to one side, hemithyroidectomy is a sufficient therapeutic procedure even if small nodules remain in the other side of the gland's

- In bilateral MNG subtotal thyroidectomy is the preferred procedure maintaining a small amount of thyroid tissue in the area of recurrent laryngeal nerve and parathyroid glands (16) although some surgeons prefer doing total or near total thyroidectomy for MNG<sup>5,17,18,19</sup>

## PATIENTS AND METHODS

This is a prospective study based upon a consecutive sample of 195 patients, 163 (83%) were females and 32 (17%) males with MNG for surgery. The age range was 17-67 years with an average of 33.4 years. All patients were admitted to the same surgical unit in Hilla General Teaching Hospital over a period of 3 years from first of Jan. 2010 to first of Jan. 2013.

Patients who later proved to have a solitary thyroid nodule or a diffuse goiter were excluded from this study.

**Table: 1, Age and sex distribution**

Age groups	No. of patients	% of patients	Female	Male	P-value
10-19 Y	6	3.07%	6	0	< 0.001
20-29 y	92	47.1%	90	2	< 0.001
30-39 y	65	33.3%	51	14	< 0.001
40-49 y	21	10.7%	11	10	X
50-59 Y	8	4.1%	3	5	X
60-69 Y	3	1.5%	3	0	< 0.05
	195	100%	163	32	

A format was designed to include all variables to be assessed in this analysis using p-value which is the probability of obtaining a test statistic at least as extreme as the one that was actually observed. The patients were divided according to the age into six groups.

The majority of patients were in the second and third age groups, with a female predominance in both age groups. This was statically significant ( $P < 0.001$ ).

All patients were submitted to routine essential investigations (Complete blood picture and blood chemistry, chest X-ray, Electrocardiography). Thyroid hormone and TSH estimation was done in all patients. Ultrasound was done for all patients and FNAC was done for 60 patients especially for those with suspicion of malignancy. Vocal cords examination by an otolaryngologist was done for all patients preoperatively and by the anesthetist post-operatively. All specimens were submitted to histopathological examination.

All patients underwent thyroid hormones estimation postoperatively after 6 weeks and thyroxin was prescribed for those with evidence of low level thyroid hormones.

## Results

Variable presentations were found among those 195 patients;

138 (70.7%) presented with an unsightly swelling in the neck both visible and palpable with no other specific symptoms which on examination found to be diffuse nodularity in 122 (62.5%) of patients, right sided nodularity in 31 (15.89%) and left sided nodularity in 42 (21.5%) of patients. Thirty five (17.94%) patients presented with toxic features including palpitation, nervousness,

sweating and weight loss. 16 (8.2%) patients presented with features suggestive of compression. 6 (3.5%) patients with recent enlargement of an already large gland (Table 2).

**Table2, Clinical presentations**

Complaint	No. of patients
Unsightly swelling of the neck	138 (70.79%)
Toxic features	35 (17.94%)
Obstructive features	16 (8.2%)
Recent enlargement of the gland	6 (3.07%)
	195 (100%)

The toxic clinical features have been encountered in 35(17.9) patients including: palpitation, nervousness, heat intolerance and weight loss (Table3).

**Table 3, Toxic symptoms**

Number of patients related to toxic symptoms

Symptoms	No. of patients	%
Palpitation	35	100
Nervousness	28	80
Heat intolerance	22	62.8
Sweating	17	48.5
Wt. loss	12	34.2

in the current study the most common indication of surgery was cosmetic disfigurement of the neck in 128 patients (65.8%), obstructive symptoms in form of ayspnea mainly in 14 patients (8.2%), toxic MNG in 35 patients (17.9%), malignancy in 12 patients (6.5%) and recent enlargement of the gland in 6 patients (3.5%) (Table3)

**Table 4, Indication of surgery related to sex**

Indication of surgery	Male	Female	Total	%
Cosmetic	13	115	128	65.6
Toxic MNG	6	27	33	17.9
Compression	7	7	14	8.2
Malignancy	4	9	13	6.1
Rapid enlargement of already present MNG	2	5	7	3
Total	32	163	195	100

The most common operation performed was subtotal thyroidectomy followed by hemithyroidectomy, total thyroidectomy and finally near total thyroidectomy • (Table5)

**Table 5, Types of operation in MNG**

Type of operation	No. of patients
Subtotal thyroidectomy	115 (58%)
Left subtotal lobectomy + isthmectomy	42 (21.5%)
Right subtotal lobectomy + isthmectomy	31 (15.8%)

Total thyroidectomy	8 (4.1%)
Near total thyroidectomy	3 (1.5%)

Seromarequire aspiration by needle and Superior laryngeal nerve injury were the most common complications (5.1%), Tetany was the third complication (3%), recurrent laryngeal nerve injury and simple wound infection or abscess was encountered in 3 patients only (1.5%). Tension hematoma occurred in (1.5%). (Table6)

**Table, Postoperative complication**

Complication	NO.	%
Wound infection	3	1.5
Seroma	10	5.1
Sup. Laryngeal N. injury	10	5.1
Tetany / Hypocalcaemia	6	3
Tension hematoma	3	1.5
Recurrent laryngeal N. injury	3	1.5

The most common pathology encountered was adenomatous colloid goiter in 151 patients (79.5%), toxic nodular goiter in 32 patients (16.43%) and malignancy in 12 patients (5.6%). (Table 7)

**Table7, Pathology of 195 cases**

Pathology	No. of Patients	%
Adenomatous colloid goiter	<b>151</b>	<b>77.4</b>
Toxic nodular goiter	<b>32</b>	<b>16.4</b>
Malignancy	<b>12</b>	<b>6.1</b>
	<b>195</b>	<b>100</b>

In FNAC, the most common finding is follicular goiter 20 patients (33.3%), non-diagnostic in 15 patients (25%), suspicious of malignancy in 13 patients (22% and malignant in 12 patients (20%). (Table 8).

**Table: 8, FNAC results**

FINAC finding	No. of patients	%
Non-diagnostic	<b>15</b>	<b>25</b>
Follicular	<b>20</b>	<b>33.3</b>
Malignant	<b>12</b>	<b>20</b>
Suspicious of malignancy	<b>13</b>	<b>22</b>
	<b>60</b>	

Of those malignant lesions, 7 patients were found to have papillary carcinoma, 4 patients follicular carcinoma and 1 patient had medullary carcinoma (Table 9)

**Table: 9, Types of malignancy**

Type of malignancy	No. of patients	%
Papillary	7	58.3
Follicular	4	33.3
Medullary	1	8.3
	12	

## Discussion

The majority of the patients were around the age of 30 years which denotes the endemicity of goiter in our country as compared to non-endemic area in which the age incidence is around the 4th and 5th decades.<sup>17,20, 21</sup>

In the current study, female patients were more commonly subjected to surgery than males, a finding consistent with most studies reviewed.

Male : female ratio was 1:5 as compared to other studies in Al-Yemen 1:3.9<sup>20</sup> or in Germany 1:5<sup>17</sup>.

The female predominance of MNG surgery is probably due to :

Unightly swelling of the neck will cause much concern in female

A relatively weak strap muscle which predisposes to the early appearance of enlargement of thyroid gland in contrary to males who got stronger strap muscle.

Psychologically females are more worried about this abnormality than males.

Physiological demands of thyroid hormones in females is much more in the males.

There was a positive family history in 35 (17.9% of our patients in comparison to another study that was conducted in Iraq involving nearly the same number of patients in which family history was positive in (8.3% of the patients. This differences is statically significant (p-value <0.001). this is probably due to exposure to the different environmental, dietary and geographical factors<sup>36</sup>

The chief complaint in this study was a visible unsightly neck swelling without additional symptoms, a finding that is comparable with the other studies? 16 patients (8.2%) in our study presented with pressure symptoms as dyspnea, mainly due to tracheal deviation, compression and dysphagia, besides the neck swelling led to disfigurement. This result was less than reported by Steintet al'and more than what is reported by Antonio Alfonso?.

patients who presume with sudden enlargement of thyroid swelling were 6 patients (3%), which is most probably due to hemorrhage into one of cysts, and usually such a rapid enlargement will be painful making the patient seeking medical advice.

Regarding nodularity of gland for either side of the gland for the involvement with nodules. 122 patients included in this study were presented with bilateral diffuse nodularity while the remaining patients presented with predominant nodule in one lobe, right 31 patients (15%) and left 42 patients (22.7%) which later proved to be part of MNG involving single lobe. This goes with previous study on the same concept (5,6,12). This must be taken in consideration when examining a patient with a clinically solitary nodule and multinodularity should be excluded before attempting surgery since the incidence of malignancy in solitary thyroid nodule is around 15% and this will be reduced to less than 5% if the nodule is found to be part of MNG.

This will certainly affect the policy of operative procedure<sup>36</sup>

The most common toxic symptoms in our patients who had toxic nodular goiter were palpitation, nervousness, tremor and Wt. loss, which are similar to the presentation described in other studies<sup>7</sup>

Regarding indications of surgery, In our study the presence of unsightly swelling disfiguring the neck was the main indication for surgical intervention (65.6%) as compared with other studies conducted in Iraq where it was 44%<sup>23</sup> while in other countries as Italy it constituted only 8%<sup>22</sup>

The main cause of this differences is increased awareness for cosmetics.

Toxic MNG was the second indication for surgery (17.9%). In other study in Iraq<sup>23</sup>, it was 10% while in Mexico it was 7%<sup>24</sup>

In agreement with previous studies, surgery was the main method for managing toxic nodular goiter, due to high percentage of recurrence of toxic symptoms associated with the use of antithyroid drugs as soon as these drugs are stopped even after prolong periods of treatment.

Pressure symptoms, in the form of dyspnea and/or dysphagia, was the third indication for surgery (8.2%). In other study in Iraq it was (27%<sup>33</sup> and in Mexico it was (33%)<sup>24</sup>

➤ This difference is mainly due to environmental factors.

Malignancy was ranking the fourth indication (6.1%) which is comparable with other studies that were around 8 %<sup>5,24</sup>

Sudden enlargement of the gland was the indication for surgery in only 3% of patients as compared to 10% in other studies<sup>23</sup>

Bilateral subtotal thyroidectomy was the most commonly performed procedure, it was done in 115 patients (58%). Left sided total lobectomy and isthmectomy were performed in 42 patients (22.7%) where the nodularity was confined to the left side while right total lobectomy and isthmectomy was performed in 31 patients (15%).

Total thyroidectomy was done for 12 patients only (4.1%) for malignant goiter (7 papillary (58.3%), 4 follicular (33%) and 1 medullary (8.3%)).

3 patients (1.5%) with toxic MNG underwent near total thyroidectomy (include unilateral total lobectomy + isthmectomy + subtotal lobectomy of contralateral lobe).

The preferred primary treatment for well-differentiated thyroid carcinoma was surgical excision.

When the disease had clinically involved both thyroid lobes or when distant metastasis are present, the majority of authors will agree that total or near total thyroidectomy is required. However when the disease is apparently confined to one lobe and the other one is grossly normal at operation there is less agreement on the extent of thyroid resection when indicated<sup>36</sup>

We performed total thyroidectomy for malignant goiter as this allows follow up by radioisotope scanning in the future and the use of radioactive iodine in the management of metastasis later on.

Toxic MNG was treated by subtotal thyroidectomy in the believe that this type of surgery is a sufficient procedure, carrying less complications and the incidence of recurrent thyrotoxicosis is not high<sup>27</sup>

The proximity of thyroid gland to certain important structures makes this operation interesting and challenging In properly planned surgery, this complication rate could be minimized by meticulous dissection and careful attention to surrounding structure. There is no doubt that the complication rate is inversely proportional to the experience of operating surgeon (27).

In our study wound infection was encountered in 1.5% of patient, tension hematomas in 1.5% parathyroid insufficiency in 3%, and unilateral recurrent laryngeal nerve injury in 1.5% of the patients.

Regarding hematomas, which developed postoperatively and were managed immediately by exploration of the wound, the cause was oozing from small vessels. and were dealt with accordingly.

The incidence of Tetany in this study was 3% and this may be due to<sup>7</sup> :

1. Hypoparathyroidism resulting from accidental removal of parathyroid glands or interference with blood supply, since we used to ligate inferior thyroid artery bilaterally in the majority of patients.
2. Due to the state of bone hunger in patients with toxic MNG.  
This complication was seen with different types of surgery (total thyroidectomy, near total thyroidectomy, subtotal thyroidectomy ) which could be due to operative technique rather than the extent of surgery and might encourage some surgeons to perform radical surgery for malignant and toxic goiters without additional fear of development of hypoparathyroidism (26,27,28,29,30)

The most troublesome complication of this type of surgery is recurrent laryngeal nerve palsies. Although no specific dissection was made searching for R L.N. in our study only 3(1.5%) patients developed unilateral weakness of vocal cords detected by the anesthetist during recover phase of anesthesia .

This result is compared with other studies in which the incidence RLN injury was ranging between 1-2.5%<sup>32,33,34</sup> with overall incidence of recurrent laryngeal nerve injury 1%<sup>1,33</sup>

Exploration of both nerves was routine procedure in cases of total thyroidectomy for large MNG. Two of our patients recovered completely later on.

Superior laryngeal nerve was noted in 10(5%)patients, which is properly due to ligation of superior thyroid arteries as a pedicle. This complication was manifested by reduce tone of the voice or fatigue of voice in prolonged speaking(4 teachers,3 houswives,2 employees and 1 worker).

### Conclusions

1. Multinodular goiter is a common thyroid disease in our country with female predominance.
2. The relatively high percent of positive family history is most probably due to the exposure to the same environmental and dietary factors.
3. Cosmetic disfigurement is the main presenting symptom of MNG.
4. Subtotal thyroidectomy remains the standard operative procedure with minimal morbidity for patients, even in those with thyrotoxicosis. Total or near total thyroidectomy should be reserved for those with thyroid cancer.
5. Hypocalcaemia following surgery for MNG is probably multifactorial and no specific operation can be blamed for occurrence.
6. Recurrent laryngeal nerve injury can be avoided without special dissection to identify the nerve and further studies should be conducted to prove this.
7. Thyroid cancer in our country may be less prevalent as compared to Western countries, and further studies should be conducted to prove this.

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