

Outcome of Total Thyroidectomy and Subtotal Thyroidectomy in Non Toxic Multinodular Goiter: Hospital Universiti Sains Malaysia Experience

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ABSTRACT

Introduction: Thyroid enlargement is one of the common surgical presentations in the Department of Surgery, Hospital Universiti Sains Malaysia (HUSM). Among them, benign non-toxic multinodular goiter constitutes one third (30%) of patients who underwent thyroidectomy. Common complications of thyroidectomy include recurrent laryngeal nerve (RLN) injury, hypocalcaemia, and recurrence of the thyroid lesion. **Objective & Methods:** This is a retrospective study of patients diagnosed with multinodular goiter treated in HUSM between January 1996 and December 2005. A total of 111 patients were studied and 52 of them underwent subtotal thyroidectomy while 59 underwent total thyroidectomy. The outcome in terms of RLN injury, hypocalcaemia and mass recurrence were analyzed. **Results:** Post operative complications were studied in both groups. Permanent recurrent laryngeal nerve injury occurs in 2.4% (1 case) in subtotal thyroidectomy group compared to total thyroidectomy group (3.6%, 2 cases). Five cases from total thyroidectomy group suffered from permanent hypocalcaemia but none in the other group. 70.7% (29 cases) from subtotal thyroidectomy group have functional remnant of thyroid tissue. Recurrence rate post subtotal thyroidectomy after 5 years is only 4.9% (2 cases). **Conclusion:** The post operative outcome in patients who underwent subtotal thyroidectomy in HUSM from January 1996 to December 2005 was better than total thyroidectomy with significant functional thyroid remnant.

Keywords: Thyroidectomy, subtotal, complication, benign

INTRODUCTION

Goiter is one of the common surgical presentations in the general surgical unit. In an 8-year review (1996-2003) in HUSM, a total of 492 thyroidectomies were performed. The diagnosis of multinodular goiter (MNG) was established in 149 patients (30%).

MNG affects 5% of the general population of non endemic areas and 15% in endemic area.^[1, 2] Although the pathogenesis of MNG is still controversial, the possible aetiologies are association with increased sensitivity of the thyroid follicular cells to thyroid stimulating hormone (TSH), growth stimulating antibodies and thyroid stimulating peptides. The other causative factors associated with goiter are goitrogens, iodine deficiency and excess, genetic factor, angiogenesis, dyshormogenesis and radiation exposure in head and neck in childhood.^[3, 4]

The treatment options for non toxic multinodular goitre include thyroidectomy, radio-iodine therapy, and L-thyroxine therapy.^[5] The type of thyroidectomies for MNG include hemithyroidectomy, bilateral subtotal, near total and total thyroidectomy is still controversial.^[6-9]

The advantages of performing total thyroidectomy in MNG are minimizing the risk of goiter recurrence thus avoiding completion thyroidectomies which possess more complications and simultaneously treating an occult primary in the thyroid that is missed during pre-operative work-up. The incidence of incidental finding of thyroid carcinoma could be as high as 6.2%.^[10] Although total thyroidectomy carries few drawbacks such as long term thyroxine replacement therapy with its side effects,^[11, 12] the advantages outweigh the risk of complications and in expert hand, total thyroidectomy for MNG becomes a preferable option in many centres.^[10, 13, 14]

On the contrary, subtotal thyroidectomy retains thyroid function and some authors revealed 70-80% of remnants are functioning.^[15-17] Though these remnants can result in recurrence of up to 10-30% in non toxic MNG,^[6, 18] the recurrence rate following STT demonstrate dependency on extent of resection, and risk factors such as very young age

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and presence of gross multinodules.^[16, 19] One of techniques to reduce the recurrence and to preserve the function in remnant thyroid is to retain the remnant thyroid volume (critical volume) of 4-5 ml on each side.^[20, 21]

METHODOLOGY

All patients diagnosed as MNG and who underwent subtotal and total thyroidectomy were included in the study. The study duration was 10 years, from January 1996 to December 2005. Only patients with non-toxic goiter were included. Serum calcium and thyroid function tests results must be available in every patient as inclusion criteria.

The exclusion criteria are :

1. Thyroid malignancy or other form of thyroiditis .
1. Follow-up period of less than one and half years
2. Patients who had not undergone indirect laryngoscopy or 70⁰ laryngoscopic findings documented before and after operation by Otorhinolaryngologist.

Serum calcium level and RLN function were checked for 24 hours after the operation. After that, serum calcium was rechecked at interval of one month, 3 months, 6 months & 18 months. Low calcium level (< 1.9 mmol/l), hoarseness of voice less than 6 months were considered as temporary and more than 6 months were regarded as permanent lesion.

Low thyroxine level (Total T4 < 60 mmol/l, Free T4 < 7.7 pmol/l and TSH > 5 mIU/l) more than 6 months are regarded as hypothyroidism or non functioning thyroid remnant. Any visible thyroid mass after 6 months to one year are regarded as recurrence.

Some patients (13) had no documented result of T4 and TSH post operatively to determine functional thyroid remnant. We contacted these patients and sent questionnaires to enquire if they were on medication (thyroxine, calcium) or have symptoms and signs of hypothyroidism and if recurrent thyroid swelling were present. The patients who took no medication and had no symptoms and signs of hypothyroidism and no recurrent thyroid swelling were considered as having functional remnant.

The complications and other observed outcomes were recorded based on the type of operation category, subtotal thyroidectomy (STT) and total thyroidectomy group (TT).

RESULTS

During the 10-year period, a total of 111 patients with MNG were operated, 52 underwent STT and 59 underwent TT. Among these patients, 96 fulfilled the criteria. Fifteen patients (11 patients from STT group and 4 patients from TT group) were excluded from the study. After 6 months to 1 year, 25 patients defaulted from the clinic follow up. We followed up the patients by questionnaire or contacted them by phone. Eleven patients from STT group were not contactable and excluded from the study.

Table 1. Demographic distribution (sex & age) of patients in STT and TT groups

Frequency Distribution Of Sex And Age In Patients Subjected For Subtotal And Total Thyroidectomy				
Type of operation	Number of Patients	sex		Age group
		Male	Female	
Subtotal Thyroidectomy	41	3 (7.3%)	38 (92.7%)	11-20 yo= 2
				21-30 yo=10
				31-40 yo=12
				41-50 yo=13
				51-60 yo= 6
				Mean = 36.2
Total Thyroidectomy	55	4 (7.3%)	51 (92.7%)	11-20 yo= 4
				21-30 yo=5
				31-40 yo=11
				41-50 yo=24
				51-60 yo=5
				61-70 yo=6
				Mean = 42.7

Female patients predominate the study sample in both groups, of more than 90% (Table 1). Mean age of patients were 36.2 years and 42.7 years in subtotal and total group respectively. Mean follow up of study was longer in subtotal group.

Transient RLN injury occurred in 2 STT patients (4.9%) and 4 TT patients (7.27%). Permanent RLN injury occurred in 1 STT patient (2.4%) and 2 TT patients (3.6%).

Transient hypocalcaemia developed in 7 STT patients (17%) and 9 TT patients (16.4%). None of the STT patient (0%) and 5 TT patients (9.1%) developed permanent hypocalcaemia (Table 2). Functioning thyroid remnants in STT were observed in 29 patients (71%).

Table 2. Frequency of RLN injury, hypocalcaemia, functional remnant & recurrence in subtotal and total thyroidectomy

Type of Operation	Number of Patients	RLN Injury		Hypocalcaemia		Functional Remnant		Recurrence	
		Transient	Permanent	Transient	Permanent	No	Yes	No	Yes
Subtotal Thyroidectomy	41	2 (4.9%)	1 (2.4%)	7 (17%)	0	12 (29%)	29 (71%)	39 (95.1%)	2 (4.9%)
Total Thyroidectomy	55	4 (7.3%)	2 (3.6%)	9 (16.4%)	5 (9.1%)	55 (100%)	0	55 (100%)	0

Two STT patients (4.9%) developed recurrence in subtotal group and none in TT group. Incidental malignancy was detected in 3 (2.7%) patients: 2 papillary carcinoma and 1 micropapillary carcinoma. There were no patients with carcinoma in STT group.

DISCUSSION

Total thyroidectomy (TT) is adopted as the standard treatment for non-toxic MNG cases in our centre since 2002. In this study, the mean follow up of the patients was 62 months in STT group and 24.2 months in TT group because the majority of the STT patients were operated earlier in the period of study (1996-2005).

In the past 20 years, total thyroidectomy is gradually replacing the subtotal thyroidectomy because of some advantages such as avoidance of recurrence, no need for completion surgery and simultaneously treating incidental thyroid carcinoma.^[22] However the patients have to bear the disadvantages of life long thyroxine therapy and its side effects.^[11, 12] Despite the emerging evidences, the ideal surgical treatment for non toxic multinodular goitre remain controversial. The exact nature and aetiology of the disease is still unknown.^[6-9]

In this cohort retrospective study we compared the outcome of both procedures applied to non toxic MNG. As this study extended to 10 years, some limitation need to be considered, for example multiple surgeons involved (as compared to a single surgeon/operator study) and the follow up.

RLN injury & hypocalcaemia

The prevalence of transient RLN injury in our study was lower in STT group. However this difference is not statistically significant (p=0.49). In comparison with other studies, transient RLN injury varies from 3-3.8% for STT group and 3-6.9% for TT group.^[23, 24] Thus, our local data is comparable with those studies.

Permanent RLN injury occurred in 2.4% in STT group and 3.6% in TT group in our study. However its difference was not statistically significant (p=0.6). In comparison with other studies, permanent RLN injury varies from 0.8-1% for subtotal group and 1.4-2.3% for total group.^[13, 23, 24] The overall incidence of transient RLN injury in other series were 2.5-4% and 0.5-2% for permanent RLN injury following all types of thyroidectomy (subtotal ,total and completion thyroidectomy).^[25-30]

In our study, the incidence of transient hypocalcaemia was not statistically significant (p=0.92) for both studied groups (17% in STT group and 16.4% in TT group). Permanent hypocalcaemia only occurred in TT group comprised of 9.1% and none in STT group. This difference is borderline significant in statistically (p=0.057).

Overall reported incidence of temporary hypocalcaemia in other series were 1.6% to as high as 53.6%,^[28] and 0-8%

for permanent hypocalcaemia following thyroidectomy.^[31] However, these results were not comparable to our finding because those operations included non toxic multinodular goiter and other pathologies.

Functional Remnant

Following subtotal thyroidectomy, functioning thyroid remnant was observed in 29 patients (71%). This is the desired outcome of STT for non toxic MNG and in our study was highly significant ($p < 0.001$). Data from other centers showed 70-80% of thyroid remnants are functioning following STT.^[15-17]

However, out of these 29 post STT with functioning remnant, only 16 patients had T4 and TSH values more than 6 months. Thirteen patients had no biochemical documentations and defaulted clinic follow up. They were contacted by phone and questionnaires. All 13 patients admitted that they were not on thyroxine following the operation. They had no symptoms and signs of hypothyroidism, no recurrent thyroid swelling up to at least 2 years post operation. These patients were also considered as functioning remnant.

One of the drawback of STT is recurrence, thus the extent of resection and volume of remnant following thyroidectomy is important. The standard volume (critical volume) in order just to maintain function should be 4-5 ml on each gland.^{20,21} In our study, the long term thyroxine therapy and its side effects was achieved in more than 70% of patients who underwent subtotal thyroidectomy.

Recurrence

Among the 41 patients of STT group, 2 patients (4.9%) developed recurrence during the 10 years period and 62 months of means follow up. Other studies reported that the recurrent rate following STT varies from 10-30% in long term period follow up of more than 15-20 years.^[6, 18] Although our study showed lower rate, the follow-up period was very much less as compared to their studies.

Recurrence is significant when revision surgery is considered. This is because fibrosis and disruption of normal anatomical landmarks will impose additional risk to the RLN to be injured. Besides that, the risk of hypocalcaemia are also increased in reoperative surgery.^[13, 32] However not all patient need a reoperation or a completion surgery. The rate can be as low as 4% from 21% of recurrent cases following non total thyroidectomy and it can be without additional morbidity.^[18] Furthermore, this complication can be avoided in cases of early stage of recurrence non toxic MNG by radioiodine (I131) treatment and thyroxine therapy.^[5, 33-34]

Incidental finding of Thyroid Carcinoma

Out of total 111 thyroidectomies, 3 patients (2.7%) had incidental carcinoma in their histopathological specimens (2 papillary and 1 micropapillary). In other studies, incidental finding of occult carcinoma in the thyroid gland specimens varies from 4.6-10%.^[10, 35, 36] These undetected carcinoma at pre operative stage is an advantage if total thyroidectomy is performed. However, incidental finding of occult malignancy is higher rate in endemic area of MNG.

CONCLUSION

RLN injuries from subtotal and total thyroidectomy were not statistically significant ($p=0.48$ and $p=0.61$). There was borderline significance in the difference of permanent hypocalcaemia ($p=0.05$) which was better in STT group. A highly significant functioning remnant thyroid gland was achieved in STT group but at the risk of recurrence of less than 5%. The incidental finding of thyroid carcinoma was 2.7%.

From this study, STT can be considered in non toxic MNG in view of less post operative morbidities, acceptable recurrence rate and avoidance of lifelong thyroxine therapy in more than 70% of patients. However, risk stratification should be applied in the selection of patient in order to reduce the possibility of needing a revision or completion surgery.

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