ORIGINAL ARTICLE

Total versus sub-total thyroidectomy for multinodular goiter

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Abstract

Objective: The aim of the study was to compare total and subtotal thyroidectomy (STT) for benign bilateral multinodular goiter (BBMNG) in terms of the proportion of hypoparathyroidism and recurrent laryngeal nerve paralysis (RLNP).

Study Design: Quasi experimental

Place and duration of study: Department of Surgery, Khyber Teaching Hospital Peshawar, from 1st October 2007 to 30th September 2008.

Materials and Methods: A total of 60 patients with bilateral multinodular goiter, were divided in to two groups A and B (30 patients in each group). Group A patients were subjected to TT while group patients to STT. Sample technique used was non-probability purposive. Demographic details, biochemical findings, indications for operation, operating time and complications under study were noted for either group.

Results: There was no significant difference in the age, gender, hormonal status or duration of goiter between the two groups (P=0.123, P=0.74, P=0.509 and P=0.6, respectively). The mean operating time was longer (138 ± 30 min versus 112 ± 33 min, P=0.046) for TT vs STT. Either temporary RLNP or HPT occurred in 3 (9.9%) or 6 (20%) of the patients undergoing total compared with 2 (6.6%) or 3 (9.9%) of the patients undergoing STT (P=0.64 and P=0.278, respectively). Permanent RLNP was observed in none and HPT in one patient only in TT group compared with none of either complication in STT group (P=0.313 for permanent HPT).

Conclusions: The present study shows that TT can be performed without increasing risk of complications, and it is an acceptable alternative for benign MNG, especially in endemic regions, where patients present with a huge multinodular goiter.

Key words: Bilateral Benign Multinodular Goiter, Total Thyroidectomy, Sub-Total Thyroidectomy, Hypoparathyroidism, Recurrent Laryngeal Nerve Paralysis

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Introduction:

Goiter is a common problem, with women affected more than men and multinodular goiter (MNG) is the most common cause. The etiology of MNG is unclear and is thought to be multifactorial, involving hereditary factors, dyshormonogenesis, iodine deficiency, goitrogens and radiation exposure[1]. The disease is more prevalent in iodine deficient areas. According to World Health Organization (WHO), 5% of the world's population suffers from goiter and 75% of these people live in iodine deficient areas[2]. Pakistan and particularly N.W.F.P is a mountainous region having The Himalaya and The Karakurum mountain ranges, and a number of iodine deficient areas. In Pakistan, therefore, a good number of patients suffering from multinodular goiter, often long standing, are neglected.

Patients with benign goiter can be treated with medicine in early stages, but long standing cases develop complications in the form of MNG, toxicity and malignancy in addition to pressure symptoms due to huge size. MNG is an irre-

versible disease and surgery is the treatment of choice, though radioactive iodine is an option[3].

Thyroid surgery, like any other surgery, has a number of complications but hyporparathyroidism and recurrent laryngeal nerve palsy are the two main, serious, and debilitating complications of thyroid surgery [4]. The former causes carpopedal spasm and may result in dreadful consequences like laryngeal spasm and cardiac standstill, the latter causes hoarseness of voice when unilateral, and stridor and varying degree of dyspnea when bilateral, necessitating tracheostomy [5].

Appropriate surgical management of MNG has created an ongoing dilemma between radical resection i.e total thyroidectomy (TT) and partial resection i.e subtotal (STT), near total thyroidectomy. In past, fears of permanent hypoparathyroidism and recurrent laryngeal nerve palsy have led many surgeons to adopt STT as their standard procedure for treating MNG. However, it is increasingly recognized that TT rather STT is the optimal procedure for benign MNG and now in many centers of the world it has replaced bilateral TT as the preferred option for the management of bilateral benign MNG [6,7,8,9,10].

The present study compares the morbidity of total with that of subtotal thyroidectomy by comparing the two main complications of thyroid surgery i.e hypoparathyroidism and recurrent laryngeal nerve palsy for the two procedures and the rationale is to encourage total thyroidectomy for bilateral benign multinodular goiter.

Materials and methods:

This study was undertaken at surgical department, Khyber Teaching Hospital, Peshawar from October 2007 to September 2008 as part of a single center Quasi experimental study. The objective of the study was to compare the proportion of hypoparathyroidism and recurrent laryngeal nerve paralysis in total and sub-total thyroidectomy for bilateral benign MNG. Based on current literature findings, we hypothesized that there was no significant difference between the two procedures in terms of hypoparathyroidism and recurrent laryngeal nerve palsy. Approval for the study was obtained from the Ethics Committee of the hospital.

In this study a total of 60 patients presenting to outpatient department (OPD) with symptoms and signs suggestive of MNG with WHO grade III goiters were included. Any patient with thyroiditis, thyroid malignancy, recurrent goiter, nodular disease limited to one lobe was excluded from the study. All the patients were selected through non-probability consecutive technique. The patients were explained the risks and benefits of the two procedures and an informed consent regarding participation in the study was obtained.

The included patients, admitted to surgical department through OPD, were evaluated by history and physical examination, routine hematology and biochemistry profile, thyroid function tests, serum Ca++ concentration level and radiographs of the neck and thoracic inlet for retrosternal growth. Indirect larynogscopy (IDL) was done only in patients with voice problem. Ultrasonography was performed for the contralateral lobe when that was physically uninvolved and fine needle aspiration cytology (FNAC) in cases when there was strong suspicion of neoplasia. Hyper and hypothyroid patients were made euthyroid with medication. Non randomized division of total of 60 patients was made into two equal groups A & B. Group A patients were subjected to total thyroidectomy while group B patients to subtotal thyroidectomy. The decision regarding the type of procedure was finally made by the surgeon after consultation with the patient. The surgery was performed by a single experienced consultant surgeon. All patients were assessed for post operative hypocalcaemia clinically, signs of carpopedal spasm (Trauseau's signs) and muscular twitch (Chvostek sign), and biochemically on 1st and 2nd post operative day. Vocal card palsy was assessed clinically from the patient voice and indirect laryngoscopy was done in patients with dyspnea, hoarseness or loss of voice quality. Patients subjected to total thyroidectomy were started on 100 µg of thyroxin on 1st post operative and the data was

recorded on a designed proforma.

Hyperparathyroidism was defined as sustained symptomatic hypocalcaemia (S.Ca++ level < 8 mg %). Recurrent laryngeal nerve palsy was defined as hoarseness or loss of voice quality associated with vocal cord paralysis on indirect laryngoscopy.

All the patients were followed at interval of one week and patients with complications for 6 months at weekly intervals for first month and monthly intervals up till six months postoperatively. Clinical and biochemical assessment was made.

Statistical analysis:

Data was entered into SPSS version 10.0. Frequency and Percentage were computed for categorical variables where as mean and standard deviation was calculated for numerical variables. Difference between the two groups was analyzed. Chi-square test was performed for sex, hormonal status, complication rates and histopathological examination, and t-test was applied for age, duration of disease, hospital stay and operation time. P value equal or less than 0.05 (P≤0.05) was considered statistically significant.

Results:

A total of 60 patients with bilateral MNG, were divided into two groups A and B (30 patients each). The mean age of patients in group A and B was 29 ± 10.07 years and 42 ± 10.27 years, respectively, Table 1. As shown in Table 2, there were 6 (20%) males and 24 (80%) females in group A with a male to female ratio of 1:4. The corresponding figures in group B were 5 (20%), 25 (80%), and 1:5, respectively.

The mean duration of goiter was 10 ± 3.25 years in group A and 10 ± 2.9 years in group B. The indications for surgery were dominated by compressive and cosmetic symptoms, shown in Table no 3. Preoperatively in group A, USG neck, FNAC and IDL was performed in 4 (13%), 6 (20%) and 4 (13%) patients, respectively. The corresponding figures in group B were, 2 (6%), 2 (6%) and 3 (10%), respectively. In both the groups, the results were bilateral MNG on USG, follicular colloid goiter on FNAC and normal vocal cards on IDL in all these patients.

Table 1: *Age distribution (N=60)*

		Surgical Procedure	
		Group A	**Group B**
Age (Years)	Min	16	27
	Max	50	67
	Mean	29	42
	Standard Deviation	10.07	10.27

P Value=0.123

Table 2: *Gender Distribution (N=60)*

		Surgical Procedure		
		Group A n (%)	**Group B n (%)**	**Total**
Gender	Male	6 (20%)	5 (16.6%)	11 (18.3%)
	Female	24 (80%)	25 (83.3%)	49 (81.6%)
Total		n=30	n=30	n=60

P=0.74

Table 3: *Indications for surgery (N=60)*

		Surgical Procedure		
		Group A n (%)	**Group B n (%)**	**Total**
Indication for Surgery	Compressive Symptom	15 (50%)	9 (30%)	24 (40%)
	Cosmetic	12 (40%)	17 (56.6%)	29 (48.3%)
	Toxic MNG	2 (6.6%)	1 (3.3%)	3 (5%)
	Fear and anxiety	1 (3.3%)	3 (9.9%)	4 (6.6%)
Total		n=30	n=30	n=60

P=0.509

Preoperative serum Ca++ levels revealed all the patients in both groups were normocalcemic. In group A, mean serum calcium level was 9.12 ± 0.42 mg/dl. In contrast the figure in group B was 9.0 ± 0.44 mg/dl. Operation time was analyzed among the two groups. In group A, mean operating time was 138 ± 30 minutes while in group B the mean operating time was 112 ± 33 minutes, proving to be statistically significant, (P=0.046) (shown in Table no 4) .

Table 4: *Duration of operation (N=60)*

		Surgical Procedure		
		Group A n (%)	Group B n (%)	Total
Operation time	60 Minutes – 90 Minutes	3 (3.3%)	16 (53.3%)	15 (25%)
	90 Minutes – 120 Minutes	5 (16.6%)	12 (40%)	21 (35%)
	120 Minutes – 150 Minutes	9 (30%)	2 (6.6%)	11 (18.8%)
	150 Minutes – 180 Minutes	13 (43.3%)	00	13 (21.6%)
Total		n=30	n=30	n=60
Mean ± SD (minutes)		138 ± 30	112 ± 33	

P=0.74

Table 5: *Post operative complications (N=60)*

		Surgical Procedure			
		Group A n (%)	Group B n (%)	Total	P Value
Post Op Complication	Temporary RLN Palsy	3 (9.9%)	2 (6.6%)	5 (8.33%)	0.640
	Permanent RLN Palsy	0 (0%)	0 (0%)	0 (0%)	
	Temporary Hypoparathyroidism	6 (20%)	3 (9.9%)	9 (15%)	0.278
	Permanent Hypoparathyroidism	1 (3.3%)	0 (0%)	1 (1.66%)	0.313

Histopathological examination of thyroid specimen revealed incidental thyroid cancer in 2 patients in group A (1 follicular and 1 papillary). In group B only one patient was found to have incidental carcinoma which was of follicular variety.

Complications under study in the treatment groups are summarized in Table no 5. Temporary RLN palsy occurred in three (9.9%) patients in group A and two (6.6%) patients group B, which was statistically insignificant (P=0.64). Permanent RLN palsy was observed in none of the patients in either group. Temproary hypoparathyroidism was observed in six (20%) and three (1.9%) patients in group A and B, respectively, proving to be statistically insignificant (P=0.278). Only one patient had permanent hypoparathyroidism in the total group A against no patient in the group B, which was insignificant statistically (P=0.313).

Discussion:

MNG is an irreversible disease and needs surgical treatment. Current indications for surgery include compressive symptoms, malignancy, hyperthyroidism and cosmetic reasons[1,4]. In our study the indications for surgery were dominated by compressive and cosmetic symptoms. Most of the patients with compressive symptoms were subjected to TT, 15 (50%), than STT, 9 (30%). This made the study considerably biased as patients having larger goiters, causing compression and difficult to be operated, were treated with TT, yet the results were comparable. In Australia and New Zealand, 90% of benign bilateral MNGs are currently treated by TT as the primary operative procedure of choice[11]. However, in Pakistan, due to presumed higher rates of complications associated with TT the standard surgical procedure for treating MNG is still STT despite the fact that most of our patients present with huge, neglected goiter virtually having no normal thyroid tissue.

It is accepted that when the entire gland is diseased in patients with MNG, STT, although reducing the bulk of the diseased tissue, is not an optimal treatment[12]. In the surgical management of MNG, surgeons should aim to remove all nodular tissue without increasing morbidity as any remaining nodular tissue is regarded as the main cause of recurrent disease. Recurrence rates as high as 45%, uninfluenced by thyroxine therapy, have been reported[13,14]. Recurrence has been found to be highest in iodine deficient regions[15]. Rates of recurrence are inversely proportional to the extent of surgery, and the average interval to recurrence is just over 10 years[11,13,14,15]. In general about 50% patients with recurrence undergo secondary thyroidectomy; carrying a ten folds increased risk of permanent complications[13,14,15].

In the present study, the incidence of occult carcinoma was 3.3 % (n=1) in STT group and 6.6% (n=2) in TT group, with overall incidence of 4.95%. Out of these three patients two had follicular carcinomas and one papillary carcinoma. This finding is consistent with the observation made by Pezzullo L et al, that follicular carcinomas are more common in MNG in iodine deficient areas[16]. In such patients STT may prove to be a suboptimal treatment modality. The cur-

rent evidence suggests that the incidence of occult malignancy ranges from 3% to 16.6%[17,18,19]. Under these circumstances, TT offers complete initial treatment eliminating the need for completion thyroidectomy while STT, inadequate surgery, would mandate a completion thyroidectomy, steeply increasing the morbidity by fifteen folds[20,21]. The principle advantage of TT, however, is the ability to use I131 for the detection and ablation of metastasis, and the utility of thyroglobulin as a tumour marker. Moreover, malignant transformation in the thyroid remnant after subtotal resection ranges from4% to 17% [22].

The potential benefits of TT include adequate removal of the disease, prevention of recurrence, and avoidance of completion surgery in the presence of occult malignancy[11]. In the present study, TT group showed permanent RLN palsy and hypoparathyroidism in none (0%) and one (3.3%) patients, respectively, the difference being insignificant statistically. There were no complications in STT group. Koyuncu et al[23] in a study comparing different modalities of thyroidectomies, did not find any complication in TT, in contrast to our results. Compared to our results a substantially low rate of complications for nerve injury (0.8%) and hypoparathyroidism (1.6%) was reported by another study[24]. Others corroborate our results with findings of permanent HPT in TT in 0.7-3.5%[1,11]. The acceptable rate of these crucial complications, in the view of experts, is between 1% and 2% [25]. This study confirms the reports of previous studies that performing total thyroidectomy does not result in a higher rate of permanent complications, and that total thyroidectomy can be performed with a morbidity rate comparable to that of lesser procedures.

Transient or temporary RLN paralysis was observed in three (10%) patients in TT group as compared to two (6.6%) patients in STT. This is in concordance with the results given by others [11]. Previous studies have reported that the incidence of temporary hypoparathyroidism ranges from 1.6% to 22% after subtotal theyroidectomy and from 24% to 35% after total thyroidectomy[13,24]. In the present study, the proportion of temporary hypoparathyroidism was 3 (10%) and 6 (20%) in subtotal and total thyroidectomy, respectively. These results are within the aforementioned reported ranges and the difference between the two groups, though apparently large, is statistically not significant (P=0.278). Transient hypocalcemia or HPT after TT, however, is seen more as a sequel rather than a complication. Delbridge et al[11] state that transient hypocalcemia should be an acceptable outcome of bilateral thyroid surgery rather a complication. Moore recommended that all patients undergoing TT should have routine calcium supplements prior to discharge from the hospital[26].

Conclusion:

Total thyroidectomy is a safe and effective procedure for benign MNG. Total thyroidectomy completely removes abnormal thyroid tissue and eliminates the possibility of future recurrence and the necessity for secondary thyroidectomy associated with additional risk of morbidity. Total thyroidectomy also obviates the need for completion thyroidectomy which increases thyroidectomy related complications by many folds. The complication rates of total thyroidectomy are acceptably low and are comparable with that of sub-total thyroidectomy as is evident from the results of this study.

Subtotal thyroidectomy on the other hand is associated with significant recurrence of goiters, inadequate treatment of incidentally detected thyroid cancers, and insignificant advantages over TT. However the increased risks of secondary or completion thyroidectomy outweigh any potential advantages in terms of lower complication rate.

Contrary to the situation in the West, where most of the thyroid nodules are discovered incidentally, our patients have larger goiters grossly involving both lobes with virtually no normal thyroid tissue. Total thyroidectomy should be offered to all such patients with BBMNG. Younger patients with BBMNG, having longer life expectancy and greater chances of recurrent

disease should initially be treated with total thyroidectomy.

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