

Hypocalcemia and Hoarseness Following Total Thyroidectomy for Benign Disease: Relationship of Incidence to the Size of the Gland

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ABSTRACT

Introduction: Total thyroidectomy is considered as the standard surgical procedure for most malignancies and benign disease involving both lobes of the thyroid gland. Postoperative complications are likely to be commoner when the thyroid gland is large in size due to the alteration of structural anatomy.

Methods: Postoperative complications of 102 patients who underwent total thyroidectomy for benign disease, by the same surgeon, were analyzed. Patients were prospectively followed up and presence of hoarseness and hypocalcemia, both transient and temporary, were compared with the weight of the gland.

Results: Fourteen patients developed hypocalcemia of which 12 (11.7%) had transient and 2 (1.96%) had permanent deficiencies. Eight patients developed hoarseness following surgery of which seven (6.86%) had transient and only one (0.98%) had permanent hoarseness. A mean thyroid weight of 91.78 gm was observed in the uncomplicated group. Those who developed postoperative hypocalcemia and transient hoarseness had a mean thyroid weight over 100 gm. One patient, who had a thyroid weighing 195 gm developed permanent hoarseness due to RLN injury.

Conclusion: There is no statistically significant difference in the incidence of transient RLN and transient or permanent hypocalcemia. With increased size of the thyroid gland increased rate of complications was observed with a mean thyroid weight above 100 gm. There may be a significant risk of permanent RLN injury when the thyroid gland is enlarged over 10 times (closer to 200 gm) its normal size.

Keywords: Thyroidectomy, Complications, Size of the gland.

INTRODUCTION

Total thyroidectomy is considered the standard surgical procedure for most malignancies and benign disease involving both lobes of the thyroid gland.¹ Although concerns are raised with regard to postoperative complications, with experience and appropriate surgical technique, the morbidity of total thyroidectomy can be minimized.^{2,3} Several factors, such as malignancy⁴ of the thyroid, thyrotoxicosis,⁵ recurrent disease⁶ and retrosternal extension⁷ have been identified as risk factors for the development of postoperative complications. The two main complications associated with thyroid surgery are hoarseness due to recurrent laryngeal nerve (RLN) injury and hypocalcemia. Other complications encountered are postoperative bleeding, seroma formation, thyroid storm, infection, sympathetic nerve injury and chylous fistula.

Weight of the normal thyroid gland is 20 gm. Postoperative complications are likely to be commoner when the thyroid gland is large in size due to the alteration of structural anatomy. Perusal

of literature did not reveal much information endorsing the above fact. A prospective study was undertaken to assess whether the size of the gland has a relationship to the occurrence of postoperative hypocalcemia and hoarseness.

METHODS

All patients who underwent total thyroidectomy, for benign disease, at the University Surgical Unit of the North Colombo Teaching Hospital, from June 2005 to May 2009 were included in the study and prospectively followed up. Approval of the ethics committee of Faculty of Medicine, Kelaniya was obtained. Data collection was proforma based. Preoperative vocal cord function was assessed with indirect laryngoscopy and serum calcium levels were measured as a baseline value. The operative procedure was same in all patients where attempt was made to identify all recurrent laryngeal nerves, parathyroid and the external branch of the superior laryngeal nerve (EBSLN). All RLNs were identified. The technique was nerve

encountering rather than dissection of the nerve. EBSLN was classified at surgery as two if seen and one if not seen. Weight of the resected specimen was weighed using a standard scale in the operating theater. Patients were assessed 48 hours after surgery and followed up in clinics at the end of one week, one month and then at three monthly intervals. Serum calcium levels were measured 48 hours after surgery and a level < 8 mg/dl was considered low. Calcium supplementation was started if the calcium level was low or in the presence of symptomatic hypocalcemia. Those requiring supplementation after 6 months were considered as permanent hypocalcemia.

Hoarseness persisting for over 6 months was regarded as permanent¹ and such patients were subjected to indirect laryngoscopy. Significance of differences in goiter size (weight) between those with and without the above complications was assessed using Student's t-test with a probability (p) of < 0.05 regarded as significant.

RESULTS

A total of 102 patients (median age 42, range 18-79, female—64%) were included in the study. Fourteen patients developed hypocalcemia of which 12 (11.7%) had transient and two (1.96%) had permanent deficiencies. Eight patients developed hoarseness following surgery of which seven (6.86%) had transient and only one (0.98%) had permanent hoarseness. All four parathyroid glands were found in 68% of patients and at least three seen in others. A mean thyroid weight of 91.78 gm was observed in the uncomplicated group. Those who developed postoperative hypocalcemia and transient hoarseness had a mean thyroid weight over 100 gm. One patient, who had a thyroid weighing 195 gm developed permanent hoarseness due to RLN injury (Table 1).

DISCUSSION

Thyroid volume is an important factor that is liable to affect the outcome of thyroidectomy surgery. Information in literature regarding the fact is scarce. Karabeyoglu M et al⁸ prospectively analyzed the thyroid volume preoperatively ultrasonically and reported that patients with smaller thyroid volumes (< 50 mL) had an increased risk of hypocalcemia, whereas in those with larger thyroid volume the risk of RLN damage and peroperative bleeding was high. In this study, the gland size was objectively measured by weighing and the two main complications were seen with increasing gland size (Table 2). McHenry et al⁹ showed an increase in postoperative hypoparathyroidism in large (> 100 gm) goiters which is in concordance with our observation. Antonio Rios-Zambudio et al,¹⁰ in a series of 301 patients observed an increase in both hypocalcemia and RLN injury when the resected specimen weighed over 110 gm. They reported one patient with permanent RLN when the gland weight was 200 gm.

Incidence of transient hypocalcemia varies between 35 and 10% in world literature.^{6,11-13} The cause of transient hypocalcemia after surgery is not clearly understood. It may be attributable to transient hypoparathyroidism caused by

reversible ischemia to the parathyroid glands, hypothermia to the glands, or release of endothelin-1. Endothelin-1 is an acute-phase reactant known to suppress PTH production, and levels have been elevated in patients with transient hypoparathyroidism.¹⁹ Our study population had a 11.7% (n = 12) incidence of transient hypocalcemia. This group had a mean thyroid weight of 103.57 gm, which was about 12 gm higher compared to the mean weight of the uncomplicated group (91.78 gm), but was not statistically significant difference. All four parathyroid glands were demonstrated in 68% of the patients and this did not make a difference to complication rate.

The incidence of transient RLN palsy is reported to be around 10%.^{14,15} Transient hoarseness was observed in 6.86% (n = 7) amongst the study population. The mean thyroid weight of this group (103.88 gm) was also not significantly different from the uncomplicated group.

Recent studies of total thyroidectomy for benign disease have reported an overall incidence of 0.3 to 1.7% and 0.7 to 3% respectively for permanent RLN injury and hypocalcemia.¹⁶⁻¹⁸ Capsular dissection technique, which reduces damage to parathyroid glands and protects RLN, has reduced the morbidity in comparison to the complication rates described earlier.²⁰ This study demonstrated a 1.96 (n = 2) and 0.98% (n = 1) incidence of permanent hypocalcemia and RLN injury, all in patients with goiters with a mean weight of over 100 gm. One patient who had permanent RLN injury had a gland weighing 195 gm which showed a statistically significant difference. Considering the weight of the normal thyroid gland (20 gm), this is an enlargement of up to 10 times the normal size. It was a highly vascular gland and was significantly distorting the regional anatomy causing difficulty in localizing the nerve. Indirect laryngoscopy of this patient revealed right recurrent laryngeal nerve palsy. Similar result was reported by Antonio Rios-Zambudio et al who had one patient with permanent RLN injury with a gland weighing 200 gm (n = 301).¹⁰

Table 1: Postoperative complications in relation to the weight of the gland

Complication	Mean thyroid weight	p-value
Transient hypocalcemia	103.57 gm	> 0.05
Permanent hypocalcemia	103.62 gm	> 0.05
Transient hoarseness	103.88 gm	> 0.05
Permanent hoarseness	195.00 gm	< 0.05

Table 2: Weights of the thyroid gland in relation to complications

Weight (gm)	Transient hoarseness	Transient hypocalcemia	Permanent hoarseness	Permanent hypocalcemia
0-24	0	1	0	0
25-50	0	2	0	0
50-99	2	1	0	1
100-150	4	3	0	0
> 150	1	5	1	1
Total patients	7	12	1	2

CONCLUSION

There is no statistically significant difference in the incidence of transient RLN and transient or permanent hypocalcemia with increased size of the thyroid gland. However, an increase in incidence of these complications was seen with a mean thyroid weight over 100 gm. Permanent RLN injury may occur when the gland is enlarged up to 10 times its normal size (closer to 200 gm in weight).

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