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Original Research Article

Assessment between hypoparathyroidism and the number of parathyroid glands preserved during thyroidectomy: a record based study

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ABSTRACT

Background: Hypoparathyroidism is a major complication of thyroidectomy. The association between the number of parathyroid glands preserved and hypoparathyroidism is not well understood. The objectives of the study were to evaluate the clinical characteristics and the frequency of hypoparathyroidism during thyroidectomy, and to determine the minimum number of parathyroid glands that need to be preserved to prevent hypoparathyroidism.
Methods: A retrospective study was conducted in Department of Surgery in Tertiary care hospital from January 2016 to December 2017. Around 250 patients who underwent total thyroidectomy for papillary thyroid carcinoma were analysed. We evaluated the frequency of hypoparathyroidism according to the number of parathyroid glands preserved.
Results: Incidental parathyroidectomy occurred in 20% of the patients; one parathyroid gland in 16%, two in 1.5%, and three in 0.9%. Transient hypoparathyroidism was increased when incidental parathyroidectomy occurred (odds ratio 1.63, 95% confidence interval 1.07 to 3.13, p=0.03). There was no significant relationship between the number of parathyroid glands preserved and permanent hypoparathyroidism (p=0.16).
Conclusions: Conservation of all parathyroid glands decreases transient hypoparathyroidism equated with when three or fewer glands are preserved but does not affect permanent hypoparathyroidism.

Keywords: Hypoparathyroidism, Thyroidectomy, Parathyroid, Thyroid carcinoma, Hypocalcemia

INTRODUCTION

A major complication of thyroidectomy is hypoparathyroidism. Around 10 to 46% of the incidence of transient hypoparathyroidism after thyroidectomy is described whereas permanent hypoparathyroidism is as low as zero and as high as 43%.[1] The usage of medication and biochemical tests is increased by postoperative hypoparathyroidism and hospital stay is lengthy thus adding to the complete cost of thyroidectomy.[2-4] The way for minimizing hypoparathyroidism following thyroidectomy is preserving the parathyroid gland and its blood supply. However, the association between the hypoparathyroidism and the number of parathyroid glands preserved is not well understood. Therefore, the rationale behind the study was to evaluate the clinical characteristics and the frequency of hypoparathyroidism according to the number of parathyroid glands preserved during thyroidectomy and to determine the minimum number of parathyroid glands that need to be preserved to prevent hypoparathyroidism.

METHODS

A retrospective study was conducted in Department of Surgery in tertiary care hospital from January 2016 to December 2017. Patients who were admitted for trans cervical total thyroidectomy were included in the study. Patients who had undergone parathyroid gland auto-transplantation, patients who had preoperative alterations of parathyroid function, severe chronic renal insufficiency, and who underwent robotic or endoscopic thyroidectomy, or completion or revision thyroidectomy were excluded from the study. Purposive sampling technique was used for the selection of around 250 patients who underwent total thyroidectomy for papillary thyroid carcinoma. Written Informed consent was obtained from the study participants prior to the study. The study was approved by Institutional Ethics committee.

The patient details and tumour characteristics, extent of central and lateral neck dissection, number of para-thyroid glands preserved, number found incidentally in the surgical specimens, the need for administration of intravenous calcium supplements, hypoparathyroidism, and other surgical complications were analysed. The operative procedure included identification of the parathyroid glands and capsular dissection so that the parathyroid glands are preserved and its vasculature during the central neck dissection (CND). We identified all superior parathyroid glands, and inferior parathyroid glands were identified in cases when CND was needed. Generally, it is not always possible to identify all the parathyroid glands during thyroidectomy, the number of parathyroid glands preserved was obtained by subtracting the number of parathyroid glands in a given specimen from four. Parathyroid function was measured as intact parathyroid hormone (iPTH), so it was used as an index of parathyroid gland function. iPTH was estimated by the electro chemiluminescence immunoassay (ECLIA) on Elecsys immunoassay analyser. Baseline levels of iPTH, total calcium (Ca), and ionized Ca were evaluated preoperatively, and their postoperative levels were measured after 24 hours after skin closure, 1 week, and 6 months, and when necessary.

The decreased ratio of iPTH was calculated as: (preoperative iPTH-postoperative iPTH) × 100/ preoperative iPTH. All patients were followed up for at least six months after surgery.

Statistical analysis

Data were expressed in terms of percentages. Epi-info 7 software was used for analysis. P<0.05 is considered statistically significant.

RESULTS

As per Table 1 shows the male patients were 75 (30%) and female patients were 175 (70%) who were ranging from 16 to 80 years, with a mean age of 51.6. The tumour characteristics associated with the number of excised parathyroid glands which included tumour size was 11.6±8.7, tumour multiplicity was 72, tumour bilaterality was 90. Tumour was located mostly in the right, followed by left, bilateral and confined to isthmus. Age, tumour size and location were statistically significant (p<0.05).

Table 1: Patient characteristics of tumour associated with the number of excised parathyroid glands.

Variable		A (n=190)	B (n=50)	C (n=10)	P value
Age (in years)		50.1±10.6	51.6±12.6	48.6±6.4	0.001*
Gender	Male	50	20	5	
	Female	140	30	5	
Tumour size		11.6±8.7	12.2±6.4	13.4±8.6	0.01*
Tumour multiplicity		50/190	20/50	2/10	0.11
Tumour bilaterality		60/190	30/50	-	0.11
Tumour location					
Right		100	15	5	0.01*
Left		40	20	5	0.12
Bilateral		30	10	0	0.33
Confront to isthmus		20	5	0	0.11

N is number of parathyroid glands in resected specimen; *p<0.05 is significant.

Table 2: Malignant tumors staging.

Staging	A (n=190)	B (n=50)	C (n=10)	P value
	N (%)	N (%)	N (%)	
I	100 (53)	32 (64)	5 (50)	0.01*
II	45 (24)	10 (20)	2 (20)	0.11
III	30 (15)	5 (10)	2 (20)	0.44
IV	15 (8)	3 (6)	1 (10)	0.32

*p<0.05 is significant.

Table 3: Surgical extent and complications associated with the number of excised parathyroid glands.

Variable	A (n=190)	B (n=50)	C (n=10)	P value
Hypoparathyroidism				
Temporary	120	27	5	0.11
Permanent	50	21	2	0.12
Calcium admin IV	20	2	3	0.21
Vocal cord paralysis				
None	160	43	7	0.32
Temporary	5	4	1	0.44
Permanent	5	2	1	0.67
Haematoma	20	1	1	0.55

As per Table 2, there was no difference observed in patient and tumour characteristics, malignant tumors stage, extrathyroidal extension and complication of surgery with or without transient hypoparathyroidism.

According to Table 3, only incidental parathyroid was identified as independent risk factor for transient hypoparathyroidism. There was no relation between the number of preserved parathyroid glands and permanent hypoparathyroidism. There was a decrease observed in all the days i.e. from 24 hours, 1 week and 6 months in all the groups i.e. A, B and C.

DISCUSSION

In the present study Incidental parathyroidectomy occurred in 20% of the patients; one parathyroid gland in 16%, two in 1.5%, and three in 0.9%. Transient hypoparathyroidism was increased when incidental parathyroidectomy occurred (odds ratio 1.63, 95% confidence interval 1.07 to 3.13, p=0.03). Preservation of all parathyroid glands decreases transient hypoparathyroidism compared with when three or fewer glands are preserved but does not affect permanent hypoparathyroidism. Palazzo et al, directed a study in which parathyroid auto transplantation is a technique for confirming the continued function of parathyroid tissue at the time of total thyroidectomy.[1] Cavicchi et al study showed whose purpose was to recognize the risk factors for postoperative transient hypoparathyroidism in a group of patients undergoing thyroid surgery.[4] According to Sasson et al a retrospective study at tertiary referral cancer centre was done to identify any hazard for incidental parathyroidectomy and to outline its association with symptomatic postoperative hypocalcemia.[5] Patients who underwent procedures for locally advanced thyroid cancer requiring laryngectomy, tracheal resection, or esophagectomy were excluded. Thomusch et al, study between January 1 and December 31, 1998, bilateral thyroid surgery was achieved on 5846 patients for benign and malignant thyroid disease.[6] Recorded Observations were prospectively collected by questionnaires from 45 hospitals. The overall incidence of transient and permanent hypoparathyroidism was 7.3% and 1.5%, respectively. On logistic regression analysis, total thyroidectomy (odds ratio [OR], 4.7), female gender (OR, 1.9), Graves' disease (OR, 1.9), recurrent goiter (OR, 1.7), and bilateral central ligation of the inferior thyroid artery (OR, 1.7) constituted independent risk factors for transient hypoparathyroidism. Almquist et al, conducted a study in which permanent hypoparathyroidism, well-defined as continuing need for vitamin D medication at 1-year post-operatively, was examined in patients after total thyroidectomy.[7] Blood levels of calcium and parathyroid hormone were recorded intra-operatively, the day after surgery and at 1 month post-operatively.[8-10]

CONCLUSION

We conclude that it's not forcibly required to prevent permanent hypoparathyroidism, but the preservation of all the four parathyroid glands throughout thyroidectomy declines the incidence of transient hypoparathyroidism. When auto transplantation is not performed, to prevent permanent hypoparathyroidism, preserving at least one parathyroid gland with an intact blood supply is adequate.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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