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PARATHYROID IDENTIFICATION AND PRESERVATION, WITH OR WITHOUT AUTOTRANSPLANTATION, AS A PREDICTOR OF HYPOCALCEMIC SYMPTOMS IN TOTAL THYROIDECTOMY

ABSTRACT

Objective:

To assess hypocalcemic symptoms following total thyroidectomy done with parathyroid preservation, with or without parathyroid autotransplantation.

Materials and Method:

Total of 31 patients who underwent total thyroidectomy with or without neck dissection were included in this study. The number of parathyroids identified and preserved or auto-transplanted on sternocleidomastoid muscle was recorded intra-operatively. Postoperative serum iPTH measured on 1st POD and corrected serum calcium were measured on 1st, 3rd and 5th POD. Clinical hypocalcemia was assessed by history, Trousseau's and Chvostek's sign.

Results:

Total of 31 patients underwent total thyroidectomy with or without neck dissection. Patients were divided into two groups – group A (parathyroid preservation and autotransplantation group) and group B (parathyroid preservation without autotransplantation group). There were five female and one male patient in group A, whereas there were 19 female and six male patients in group B. There was no statistically significant difference in terms of serum iPTH ($p=0.594$), corrected serum calcium on 1st POD ($p=0.65$), 3rd POD ($p=0.347$) and 5th POD ($p=0.175$) between two groups. There was no statistically significant difference in hypocalcemic symptoms between two groups (Pearson Chi-square test, $p = 0.363$).

Conclusion:

Effect of autotransplantation of parathyroid in total thyroidectomy on early post-operative hypocalcemia prevention was not significant in our study but needs further study with larger sample size to come to definitive conclusion.

Keywords: iPTH, Parathyroid Autotransplantation, Parathyroid Preservation, Total Thyroidectomy

INTRODUCTION

American thyroid association (ATA) recommends total or near-total thyroidectomy for the papillary and follicular carcinoma more than one cm in size and total thyroidectomy or completion thyroidectomy for medullary carcinoma thyroid.¹ Recognized complications of total thyroidectomy are transient hypocalcemia of around 13.1% and permanent hypocalcemia of around 2.5%.² Methods of preventing temporary hypocalcemia are preservation of parathyroids with intact pedicles, auto-transplantation of parathyroid in Sternocleidomastoid muscle (SCM) and post-operative supplementation of intravenous and oral calcium and oral activated vitamin D3.

There are two popular techniques for parathyroid autotransplantation; one method is to selectively autotransplant parathyroid glands that are difficult to dissect or have doubtful viability after dissection and another method is routine autotransplantation of at least one parathyroid gland during dissection. Later method is based on the concept that even if parathyroids that are preserved get devascularized after total thyroidectomy, autotransplanted parathyroid will function to prevent hypocalcemia.³ Parathyroid autotransplantation has been tried to reduce the incidence of transient and permanent hypocalcemia following total thyroidectomy, thus may reduce the significant morbidity associated with total thyroidectomy.⁴

MATERIAL AND METHODS

This prospective, observational, comparative study was done in the Department of Otorhinolaryngology and Head and Neck Surgery, Tribhuvan University Teaching Hospital, Kathmandu. All patients undergoing total thyroidectomy with or without neck dissection were included and parathyroid autotransplantation was done during operation if parathyroid found devascularized during the surgery or found detached from the surrounding tissue or vasculature. Total of 31 patients were enrolled in the study and study was conducted from January 2017 to December 2017. Ethical approval was taken from the Institutional Review Committee of Institute of Medicine.

All patients of age more than 15 year of both gender undergoing total thyroidectomy with or without neck dissection, those with completion thyroidectomy with known previous parathyroid status were included in the study. Patients taking exogenous calcium before enrollment in study, previous thyroid surgery with unknown parathyroid status and total thyroidectomy with removal of other viscera such as larynx, trachea or esophagus were excluded from study.

Patients meeting inclusion criteria were posted for surgical procedure, provided all pre-operative investigations were normal. In operation theatre capsule of the thyroid gland was exposed and superior pole of thyroid was exposed by using retractors and capsular dissection was carried out. Superior pole of the thyroid was divided either using clips, ties or bipolar cautery. Once the dissection proceeds in posterior aspect, careful search was made to identify parathyroid gland. Superior parathyroids were usually sought above the tubercle of Zuerkandl or adjacent to superior pole of thyroid. Inferior parathyroids were sought one cm radius to inferior pole and usually located anterior to recurrent laryngeal nerve. Terminal branches of thyroid arteries ligated close to thyroid capsule using bipolar diathermy, harmonic scalpel or 3-0 silk ties. The vessels were ligated distal to parathyroid gland, so that division of vessels allowed the parathyroid reflected off the thyroid. Identified parathyroid with intact vascular pedicle were preserved in situ. Thyroid gland was inspected during the dissection as parathyroid gland may be more superficial than expected, which might be inadvertently attached to thyroid capsule or its blood supply may be inadvertently ligated proximally. Identified parathyroids were

autotransplanted into sternocleidomastoid muscle at the end of dissection of thyroid. Neck dissection was carried out according to nodal stage of the disease. Intact parathyroid hormone was measured on 1st post-operative day at 6am. Serum calcium and albumin were measured on 1st POD and serum calcium was measured on alternate day till patient being admitted in the ward. Data were entered into SPSS version 21 and analysed

RESULTS

Among the enrolled patients, there were total of seven male patients (22.6%) and 24 female patients (77.4%). In group A (parathyroid preservation and autotransplantation group), there were five female and one male whereas in group B (parathyroid preservation without autotransplantation group), there were 19 female and six male. Most of the enrolled patients were diagnosed as papillary carcinoma thyroid (n=28) whereas follicular and medullary carcinoma were very few i.e. two and one respectively. Type of the surgeries performed is shown in table 1.

Table 1: Types of surgeries performed

Types of surgeries performed	Number of the patients (n=31)
Total thyroidectomy	5
Total thyroidectomy with CCND	14
Completion thyroidectomy	2
Completion thyroidectomy with CCND	4
Total thyroidectomy with CCND and LND	4
Total thyroidectomy with CCND and MRND	2
Total	31

Mean iPTH of group A patients was found to be 28.14 pg/ml whereas of group B was found to be 22.82 pg/ml, which was statistically not significant (Student's t-test, $p = 0.594$). Likewise, mean corrected serum calcium of group A patients was found to be 2.2 mmol/L, 2.06 mmol/L, and 2.08 mmol/L on 1st, 3rd and 5th post-operative days respectively whereas of group B patients was found to be 2.04 mmol/L, 1.93 mmol/L and 1.96 mmol/L on 1st, 3rd and 5th post-operative days respectively which was also statistically not significant (Student's t-test, $p = 0.65$, $p = 0.347$, $p = 0.175$ respectively) (Table 2).

Table 2: Comparison of iPTH and corrected serum calcium between autotransplantation and without autotransplantation groups

Parameters (mean)	Group A (n=6)	Group B (n=25)	P value
iPTH	28.14 pg/ml	22.82 pg/ml	0.594
Serum Ca- 1 st POD	2.20 mmol/L	2.04 mmol/L	0.65
Serum Ca- 3 rd POD	2.06 mmol/L	1.93 mmol/L	0.347
Serum Ca-5 th POD	2.08 mmol/L	1.96 mmol/L	0.175

In this study, relationship of hypocalcemic symptoms between group A (autotransplantation) and Group B (without autotransplantation) was analyzed. It was found that nine out of 16 patients developed hypocalcemic symptoms in group B whereas one out of five patients developed hypocalcemic symptoms in group A. Although result was statistically not significant ($p = 0.363$, Chi-square test) between the two groups, tendency to develop hypocalcemic symptoms was seen more in group B (Table 3).

Table 3: Relationship of hypocalcemic symptoms between parathyroid preservation and autotransplantation group and parathyroid preservation without autotransplantation group

Study groups	Hypocalcemic symptoms Absent	Hypocalcemic symptoms Present	Total
Group A (Preservation and autotransplantation group)	5	1	6
Group B (Preservation without autotransplantation group)	16	9	25
Total	21	10	31

($p = 0.363$, Chi-square test)

DISCUSSION

Parathyroid ischemia following total thyroidectomy is main cause of postoperative transient hypocalcemia. It can occur due to devascularization of parathyroid preserved in situ or could be due to inadvertent parathyroidectomy. If parathyroid glands are found devascularized during surgery or located in difficult location where dissection of RLN is difficult, then such parathyroid glands are removed and autotransplanted into SCM muscle. Total number of male was seven (22.6%) and that of female was 24 (77.4%). On

analysis using Pearson's Chi-square test, there was no statistically significant difference in the sex distribution between two groups ($p=0.149$)

Our study shows no statistically significant difference in terms of biochemical and clinical hypocalcaemia between the two groups. Kirdak et al, in 2017, conducted a study on outcomes of parathyroid autotransplantation during total thyroidectomy. In their study, 34 patients needed parathyroid autotransplantation and 16 patients didn't need parathyroid autotransplantation. They found that patients needing parathyroid autotransplantation had lower post-operative PTH level ($p = 0.001$) but there was no significant difference between two groups in terms of post-operative hypocalcaemia. They concluded that rate of transient hypocalcaemia was not different between two groups.⁵ Sitges-Serra et al conducted a review of literatures on parathyroid autotransplantation in total thyroidectomy and concluded that parathyroid autotransplantation may increase post-operative transient and permanent hypocalcaemia.⁶ Testini et al, in 2007, conducted a multicenter study on the impact of single parathyroid gland autotransplantation during total thyroidectomy on postoperative hypoparathyroidism. Patients were divided into two groups: patients undergoing parathyroid autotransplantation during thyroidectomy ($n=79$) and patients not undergoing parathyroid autotransplantation during total thyroidectomy ($n=81$). They found that transient hypocalcemia was less in parathyroid autotransplantation group compared to control group ($p=0.002$) but there was no significant difference in permanent hypocalcemia between two groups.⁷ Wei et al, in 2014, conducted a retrospective cohort study on autotransplantation of inferior parathyroid glands during central neck dissection for papillary carcinoma thyroid. A total of 477 patients with papillary carcinoma thyroid who underwent total thyroidectomy with central compartment neck dissection were included in that study. Patients were divided into two groups: 321 patients underwent inferior parathyroid autotransplantation and 156 patients had inferior parathyroid gland preserved in situ. They found that rate of post-operative transient hypocalcemia was not statistically significant between two groups ($p=0.73$) but rate of permanent hypoparathyroidism ($p=0.028$) and central neck lymph node recurrence ($p=0.003$) was less in parathyroid autotransplanted group.⁸

There was no statistically significant difference in the rate of transient hypocalcemia between two groups, however, the effect of parathyroid autotransplantation on transient hypocalcemia needs further study with larger sample size.

In our study, hypocalcemia occurred in ten patients and recovered in all patients except for one patient who was readmitted with hypocalcemic symptoms two weeks after discharge.

Small sample size and inclusion of completion thyroidectomies could be potential source of bias in our study. Most of the cases were papillary cell carcinoma who underwent central compartment neck dissection, which might have affected on parathyroid identification and preservation.

CONCLUSION:

Parathyroid preservation and autotransplantation was found to have some tendency to reduce hypocalcemic symptoms but it was statistically not significant. To derive definitive conclusions, study of larger sample size is needed.

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