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Original Research Article

Is serum phosphorous level an early indicator of post-operative hypocalcemia after total thyroidectomy? A prospective analysis

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ABSTRACT

Background: Total thyroidectomy is a commonly performed surgery. Postoperative hypocalcemia is a worrisome complication which can be treated if recognized early. We analysed serum phosphorous as a potential marker of postoperative hypocalcemia.
Methods: The study was a cross-sectional study done in our tertiary care hospital. We analysed the serum phosphorous levels of 50 patients who underwent total thyroidectomy at our institution. The incidence of hypocalcemia was documented and analysed with respect to serum phosphorous.
Results: In the study, 18 (36%) had hypocalcaemia on third postoperative day and 32 (64%) had no hypocalcaemia. There was no relation between post thyroidectomy day one serum phosphorus value and post-thyroidectomy day three serum calcium value (p=0.709).
Conclusions: The study did not find any statistically significant association between serum phosphorous and post-thyroidectomy serum calcium levels.

Keywords: Total thyroidectomy, Serum phosphorus, Hypocalcaemia

INTRODUCTION

Total thyroidectomy is one of the commonly performed treatment modality for various thyroid disorders like thyroid cancer, indeterminate thyroid nodules, multinodular goiter, Grave's disease, toxic adenoma and toxic multinodular goiter.[1] Besides these, total thyroidectomy is also performed for cosmesis and pressure symptoms.[2] Hypocalcemia remains a major post-operative complication of total thyroidectomy causing potentially severe symptoms and anxiety in affected patients and increasing the hospitalization time.[3] The major reason for hypocalcemia is due to post thyroidectomy parathyroid insufficiency caused mainly by vascular injury or due to accidental removal of the parathyroid glands. The incidence of hypocalcemia presents dramatically 2-5 days after operation and very rarely the onset is delayed for 2-3 weeks or a patient with marked hypocalcemia may be asymptomatic.[2] 80% of the cases resolves in a period of 12 months.[4] However, permanent hypoparathyroidism can occur in less than 2% of the cases.[5]

To anticipate and minimize complications postoperatively and for an early discharge we must be able to identify patients who are likely to develop symptoms of hypocalcemia.

Patients at risk needed to be monitored carefully and if symptoms arise, need to be treated accordingly. In this background this study was done to find out the proportion of hypocalcemia in post thyroidectomy patients, and to evaluate level of serum phosphorus on post thyroidectomy day one as an early indicator of hypocalcemia.

METHODS

This study was a cross-sectional study conducted in the Department of General Surgery at our hospital. The data collection for the study was done between August 2018 to November 2020. All patients admitted in the Department of General Surgery, who underwent total thyroidectomy during the study period, were included.

The following patients were excluded from this study:

Patients who underwent hemi- thyroidectomy. Patients who underwent completion thyroidectomy. Patients in chronic renal failure. Patients who were known case of Vitamin D deficiency, hypocalcemia, rickets. Patients with past history of parathyroid surgeries. Patients not willing to give informed consent

All the eligible subjects were recruited into the study consecutively by convenient sampling till the sample size of 50 is reached. A pretested semi-structured proforma on sociodemographic, clinical and laboratory variables was be filled by the principal investigator after checking the patient's clinical records. Consecutive patients undergoing total thyroidectomy satisfying the inclusion and exclusion criteria were enrolled into the study. A semi-structured proforma was used to collect patient's details and history relevant to the study. The blood samples were collected under aseptic precautions and the post thyroidectomy level of serum phosphorus on day-1 and serum calcium on day-3 was collected.

Statistical analysis

After entering the data into Microsoft excel sheet and the data was analyzed using the statistical package for social sciences (SPSS) software [trial version]. Qualitative variables were expressed as proportions and quantitative variables as mean and standard deviation. Spearman's Correlation coefficient was done to check the correlation between serum phosphorus (day 1) and serum calcium (day 3) values. $P<0.05$ was considered statistically significant. The study was approved by the institutional human ethics committee. Written informed consent in English and local language from all the study participants was obtained. Privacy and confidentiality of the data and study subjects was be maintained during all stages of study.

RESULTS

A total of 50 subjects satisfying the eligibility criteria participated in the study were included in the analysis.

Table 1: Demographic and clinical parameters of patients involved in the study.

Parameter	Mean±SD	Median	Minimum	Maximum	95% C.I	
					Lower	Upper
Age	44.58±13.55	43	24	69	40.73	48.43
Gender		**Frequency**		**Percentages**		
Male		10		20		
Female		40		80		
Comorbidity						
Diabetes Mellitus		14		43.75		
Hypertension		19		59.37		
Dyslipidemia		17		53.12		
Preoperative diagnosis						
Multinodular Goiter		15		30		
Solitary Nodular Thyroid		5		10		
Thyroid malignancy		13		26		
Toxic MNG/SNG		7		14		
Cosmesis		5		10		
Pressure symptoms		5		10		
Thyroid function status						
Euthyroidism		27		54		
Hyperthyroidism		7		14		
Hypothyroidism		16		32		

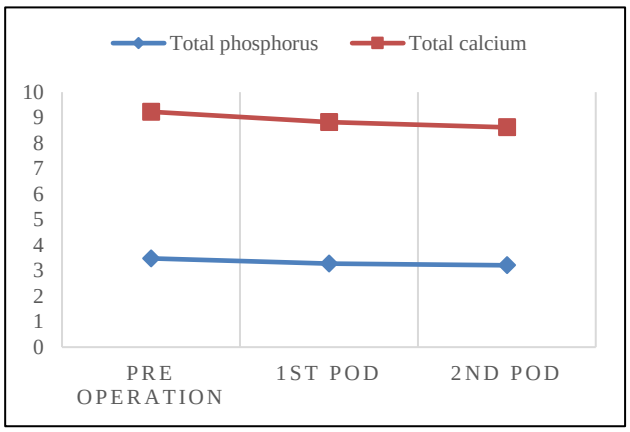

Figure 1: Mean total calcium and phosphorus levels before the surgery and on the first and second postoperative days among patients without hypocalcemia after the surgery.

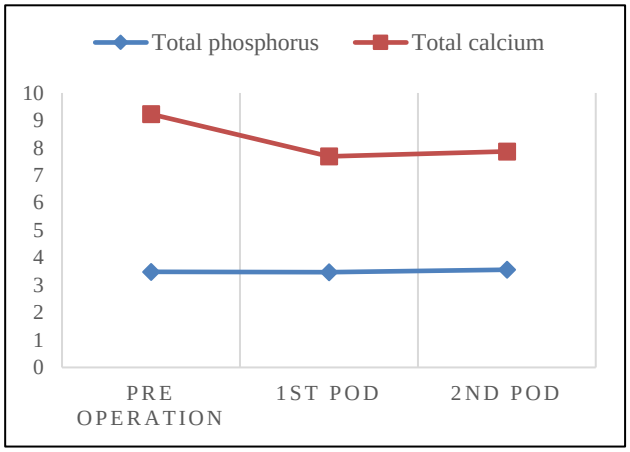

Figure 2: Mean total calcium and phosphorus levels before the surgery and on the first and second postoperative days among patients with hypocalcemia after the surgery.

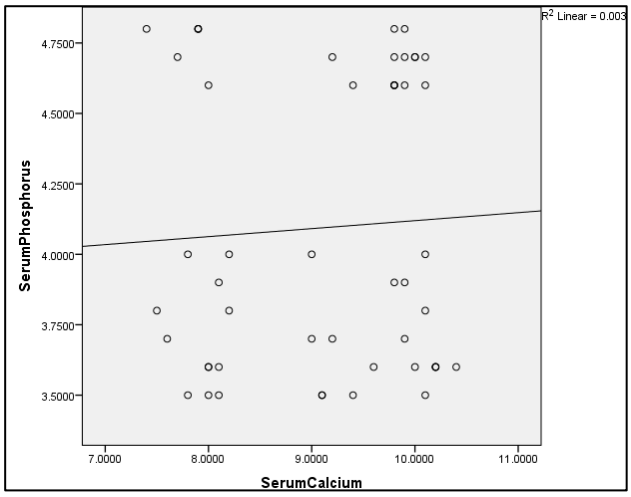

Figure 3: Scatter plot showing correlation between serum phosphorus value and serum calcium value.

The results of the study were discussed as the descriptive analysis of the study population, the proportion of hypocalcemia after total thyroidectomy in the study setting, clinical signs and symptoms of hypocalcemia, the correlation between post thyroidectomy day 1 serum phosphorus value and post thyroidectomy day 3 serum calcium values.

Table 2: Postoperative parameters analysed in the study.

Postoperative hypocalcaemia	Frequency	Percentages
Present	18	36%
Absent	32	64%
Symptom and signs	**Frequency**	**Percentage**
Parasthesia/numbness (extremity and perioral area)	18	100%
Muscle spasm	7	38.88%
Chvostek's sign	6	33.33%
Trousseau's sign	5	27.77%
Arrhythmia	1	5.5%
Correlation	**Spearman 's rho**	**P value**
Serum phosphorus value and serum calcium value	-0.054	0.709

DISCUSSION

A hospital-based cross-sectional study was done among 50 patients to estimate the proportion of hypocalcemia after total thyroidectomy and to find the correlation between post thyroidectomy day 1 serum phosphorus value and post thyroidectomy day 3 serum calcium values.

Majority of the study population 40 (80%) were females and 10 (20%) were males. This was similar to the finding of a study done by Nair et al. In that study the male:female ratio was 1:4.92.[6] Another study done in Brazil by Ade et al among 333 patients 91.3% were females and 8.7% were males.[7] The percentage of females was higher when compared with our study. In this study, 32 (64%) had any one of the comorbidities and the rest 18 (36%) had no comorbidities. This was higher when compared with a study done in Bengaluru, Karnataka (37.03%).[8]

Among those with comorbidities, 14 (43.75%) had Diabetes Mellitus, 19 (59.37%) had Hypertension and 17 (53.12%) had Dyslipidemia. These results were higher when compared with the study done by Deepadarshan et al in which, only 25% had hypertension, 16.7 % had Diabetes Mellitus.8In a study done in Mumbai, it was found that 77.84% were euthyroid, 13.68% had both overt and subclinical hypothyroidism, 8.47% were had both overt and subclinical hyperthyroidism.[9] These results were almost comparable with our study results.

A study done in Thailand by Harris et al it was found that Postoperative hypocalcaemia developed in 66.67% (20 of 30 patients).[10] This result was higher when compared with our study. Another prospective multicentre study done in Lithuania, out of the 400 patients, post-operative hypocalcemia developed in 257 patients (64.2%).[11]

In this study among those who had postoperative hypocalcaemia (N=18), 18 (100%) had paraesthesia or numbness in the extremities and perioral area, 7 (38.8%) had muscle spasm, 6 (33.33%) had a positive Chvostek's sign, 5 (27.77%) had a positive Trousseau's sign and 1 (5.5%) had Arrhythmia. No patient had manifested bronchospasm, laryngeal stridor, tetany and seizures. In a retrospective study on 108 patients who had undergone total- thyroidectomy in Iran, the earliest clinical feature of hypocalcaemia was perioral numbness reported in 27.8% patients, parasthesia of extremities were noted in 17.6% cases whereas 12% patients had muscle spasms, seizures were reported in 2.8% patients, Trousseau and Chvostek's signs were elicited in 15.7% and 8.3% patients respectively.[12]

In this study, it was found that there was no correlation between post thyroidectomy day 1 serum phosphorus value and post thyroidectomy day 3 serum calcium value (Spearman's rho -0.054, p value 0.709). The results were similar to a study done by Khafif et al which concludes that despite the postoperative changes, neither magnesium nor phosphorus ion levels had any role in post-thyroidectomy hypocalcaemia.[13,14] But in a study done by Sam et al. it was found that serum Phosphorus ions are inversely related to calcemia and monitoring of phosphorus on post-operative day one and two gives an early prediction of hypocalcaemia.[15] This result was contradictory when compared with our study results and several other studies.[16]

There are several limitations in our study. As the study results are based on a small sample from a single hospital, further large series are needed to confirm its findings. The study did not analyse other factors like serum protein which can influence serum levels of calcium. Inter-observer variation in serum levels of calcium and phosphorous cannot be excluded.

CONCLUSION

The current hospital-based cross-sectional study was done among 50 patients to estimate the proportion of hypocalcemia after total thyroidectomy and to find the correlation between post thyroidectomy day one serum phosphorus value and post thyroidectomy day 3 serum calcium value. This study concludes that post thyroidectomy day one serum phosphorus value cannot be used as a predictor for postoperative hypocalcemia. Measurement of serum phosphorous can be safely avoided in post thyroidectomy patients till further concrete evidence emerges in the future.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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