

Is there any Relationship Between Serum Level of Vitamin D and Postoperative Hypocalcemia after Total Thyroidectomy?

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<http://dx.doi.org/10.13005/bpj/1099>

(Received: December 18, 2016; accepted: January 02, 2017)

ABSTRACT

Total thyroidectomy, is widely used as the selective treatment for benign and malignant thyroid diseases. Postoperative indication of Hypocalcemia was reported as 1-50%. Recently, the role of vitamin D in incidence of Hypocalcemia after thyroidectomy has been taken into consideration. This study was conducted on volunteered patients at Imam Khomeini hospital complex and it aimed at surveying the serum level of preoperative Vitamin D before total thyroidectomy surgery and its relationship with the incidence of postoperative Hypocalcemia after the surgery. The study was done on 57 patients after they had total thyroidectomy surgery. Preoperative Vitamin D, PTH and Albumin were measured in all the patients. Also, Calcium was measured on the first and second days after surgery and the results obtained were then analyzed. Average preoperative and intraoperative calcium were significantly different ($P < 0.001$). Moreover, a significant difference was observed between preoperative and postoperative (after 2 days) calcium ($P < 0.001$). Considering the cut-off point as 8.6, forty patients (72%) faced postoperative Hypocalcemia after one day and seventeen patients (29.7%) had normal calcium levels in blood. Preoperative calcium levels and postoperative PTH in people having Hypocalcemia were significantly less than in those with normal calcium levels. Thirty seven patients (64.9%) had normal preoperative Vitamin D and twenty patients (35.1%) had Vitamin D insufficiency. Of thirty-seven patients having normal vitamin D in serum, twenty-six people had postoperative Hypocalcemia on the first day. Also, of twenty patients with insufficient vitamin D, fourteen patients got Hypocalcemia, of which the difference was not statistically significant. There was no relationship between serum levels of Vitamin D and Hypocalcemia after total Thyroidectomy surgery.

Keywords: Vitamin D, Total thyroidectomy, Hypocalcemia.

INTRODUCTION

Recently, considering the growing trend of thyroid cancer, the need for Total thyroidectomy has also increased. The most common complications of Total thyroidectomy were obtained as Hypocalcemia and recurrent laryngeal nerve injuries. The incidence rate of hypocalcemia after surgery was reported as 1-50%¹. First in 1880, Emil Theodor, a Swiss surgeon, attached tetany to wound infections after goiter surgery on one of his patients². In 1891, Marcel Gley, a French physiologist

explained the relationship between the removal of parathyroid glands and the incidence of tetany³. Nowadays, it is believed that lack of secretion or low secretion of PTH by the parathyroid glands causes hypocalcemia after thyroid surgery. One of the common complications of Total thyroidectomy is parathyroid dysfunction that might result in hypocalcemia and prolonged hospitalization⁴. Some parameters including female gender, large and substernal goiter, autoimmune thyroid disease, hyperthyroidism and the extent of thyroidectomy are known factors that affect hypocalcemia

incidence after thyroidectomy. On the other hand, some researchers believe that Hypoparathyroidism incidence depends on the reason why thyroidectomy is done. As a matter of discussion, they believe that in case thyroidectomy is performed due to Graves, Hypoparathyroidism would have greater risks⁵⁻⁷. The extent of Hypoparathyroidism is one of the factors affecting the hypocalcemic incidence after surgery; eg., the removal of a lobe with smaller isthmus from total thyroidectomy either causes subtotal thyroidectomy or hypocalcemia after thyroidectomy⁸. After surgery, hypocalcemic can occur either without any sign or symptom or attached with tetany. Most patients have symptoms of numbness around their lips, muscle cramps and tingling in fingers. Acute hypocalcemia appears to be associated with cardiac signs of Torsade de pointes, heart blocks, hypocalcemic cardio myopathy and heart failure⁹.

In recent years, the role of Vitamin D in hypocalcemic indication after thyroidectomy has been taken into consideration. The calcium level in serum is adjusted by the effect of parathyroid hormone and vitamin D on kidney, bone and digestive system. Lack of calcium stimulates the secretion of PTH, and increased PTH results in Vitamin D production that affect the kidney, bone and gut and causes increase in calcium within the blood¹¹.

The aim of this study was to survey the relationship between serum levels of preoperative vitamin D and incidence of hypocalcemic after total thyroidectomy surgery on volunteered patients at Imam Khomeini hospital complex.

MATERIALS AND METHODS

This Cohort study was done by simple random sampling on 57 patients who volunteered for total thyroidectomy following the Helsinki medical ethics at Imam Khomeini hospital complex during 2013-2014. Patients either had preoperative, hypocalcemia, intraoperative parathyroid injuries (indicated by the surgeon or autotransplant) existence of pre, intra, and post operative parathyroidic adenoma, any underlying disease that deteriorates the levels of Ca, Alb, Vit-D, and PTH (such as kidney chronic underlying

diseases or well-known indigestion and malabsorption diseases). Having had a surgery like total laryngectomy, being treated with prophylaxis osteoporosis including calcium supplements and Vitamin D were excluded from the study.

Total thyroidectomy surgery was done in all patients using a standard technique of exploring the Recurrent Laryngeal Nerve (RLB) and autotransplantation of each intraoperative injured parathyroid gland. The entire process was supervised by an experienced surgeon or a surgical resident under the supervision of an experienced surgeon.

Survey of PTH was done based on ELISA [Parathyroid Hormone] Intact-PTH biomerica laboratory kit. Serum level of vitamin D was measured by immune-diagnostic systems. The sensitivity of the laboratory kit was 5 nmol/lit and the value below 25 was considered as deficient, 25-74 as insufficient, 75-250 as sufficient, and more than 250 was an indication of a potential intoxication. Pre and post-operative PTH, serum Ca and Vitamin D were surveyed in all patients. In order to modify the total serum calcium, Albumin was measured before the surgery. Normal Albumin was considered to be 4.4 gr/deciliter. Finally, data obtained were analyzed using SPSS version 16.

RESULTS

The study population included 57 patients with the average age of 13.3 ± 42.1 . Nineteen patients (33.3%) were females and thirty-eight (66.7%) were males. Average amount of preoperative calcium and vitamin D and on the first and second days after surgery, preoperative PTH and Albomin have been presented in Table 1. Results of statistical surveys show that the average preoperative calcium and postoperative calcium on the first day were significantly different ($P < 0.001$); also, the average preoperative calcium and postoperative calcium on the second day were significantly different ($0 < 0.001$).

Considering 8.6 as the cut-off point, forty patients (70.2%) had postoperative Hypocalcemia after a day and 17 patients (29.7%) had normal Ca in blood. Moreover, forty-nine patients (86%) had

postoperative Hypocalcemia on the second day and 8 patients (14%) had normal calcium.

Results showed that preoperative Ca and postoperative PTH in patients with Hypocalcemia on the first day after surgery, were significantly lower than in those with normal Ca (P-Value= 0.05 and 0.03, respectively); nevertheless, the difference in PTH was only significant on the second day (P-Value=0.02).

Thirty seven patients (64.9%) had normal preoperative Vitamin D and twenty patients (35.1%) had Vitamin D insufficiency. Of thirty-seven patients having normal Vitamin D, 26 (70.3%) had postoperative hypocalcemia on the first day; also, of twenty patients who had Vitamin D insufficiency, fourteen patients (70%) had postoperative Hypocalcemia on the first day, and this was not statistically significant. Furthermore, this survey continued on the second day after surgery and results showed that thirty-one patients (83.8%) with normal Vitamin D had postoperative Hypocalcemia on the second day; and of twenty patients who had Vitamin D insufficiency, eighteen patients (90%) had

postoperative Hypocalcemia on the second day, which was not statistically significant.

Correlations analysis was done between the average preoperative and postoperative PTH; also, between preoperative and postoperative Vitamin D and Ca. Correlation coefficient between preoperative and postoperative Vitamin D and PTH was surveyed and its results have been illustrated in Table 2.

DISCUSSION

Hypocalcemia is the most common complication after Thyroidectomy. Vitamin D has a key role in Calcium Homeostasis. Unlike some previous studies' results that indicated that Vitamin D affects calcium levels after Thyroidectomy, the present study showed that it did not affect Hypocalcemia after Thyroidectomy (on the first and second days after surgery). Our results are in line with Godazandeh *et al's* study results in which the same ineffectiveness occurred between Vitamin D and Hypocalcemia¹².

Table 1: Average of measured preoperative and postoperative variables

Variable	Mean±standard deviation	Variable	Mean±standard deviation
Age	13.3±42.1	Preoperative Alb	0.45±3.9
preoperative Ca	0.77±9.2	postoperative Ca on the first day	0.79±8.1
postoperative PTH	14.4±41.4	postoperative Ca on the first day	0.75±7.8
preoperative Vit D	12.1±24	postoperative PTH	14±30.7

Table 2: Analysis of the Correlation between means of preoperative and postoperative PTH and Vitamin D with preoperative and postoperative Ca, and correlation coefficient between preoperative and postoperative Vitamin D and PTH

	Preoperative PTH		Postoperative PTH		Vitamin D	
	Correlation coefficient	P-Value	Correlation coefficient	P-Value	Correlation coefficient	P-Value
preoperative Ca	-0.091	0.501	-0.291	0.028	0.28	0.838
postoperative Ca	-0.075	0.58	-0.272	0.041	0.186	0.166
Vitamin D	0.346	0.008	0.313	0.018		

In this study, the level of preoperative Vitamin D was normal in 37 patients (64.9%) and 20 patients (35.1%) had Vitamin D insufficiency as a major health problem in Iran^{13, 14}.

Of 37 patients having Normal preoperative Vitamin D, 26 got postoperative Hypocalcemia on the first day and among 20 patients with Vitamin D insufficiency, 14 people had postoperative Hypocalcemia on the first day that this was not statistically significant. Furthermore, among 37 patients who had normal preoperative Vitamin D, 31 people got postoperative Hypocalcemia on the second day and of 20 patients with Vitamin D insufficiency, 18 people got postoperative Hypocalcemia on the second day and this was not statistically significant. These results show that Vitamin D level has no relationship with postoperative Hypocalcemia

In James- Krikby *et al's* study, incidence of Hypocalcemia in patients with preoperative Vitamin D levels of more than 20 ng/ml was significantly less than in patients with Vitamin D levels of less than 10 ng/ml and hence, Hypocalcemia incidence was assigned with prolonged hospitalization¹⁵.

In Khatibetal's study, 213 patients who had Thyroidectomy surgery were assessed on preoperative Vitamin D and postoperative Hypocalcemia. Laboratory and clinical Hypocalcemia were 19.7% and 17.8%, respectively. However, in individuals with little Vitamin D inefficiency, they were 54% and 33.9%, respectfully and in individuals with vitamin D insufficiency of less than 50, they were 10% and 18% respectively and in people with vitamin D insufficiency of less than 75, they were 2.9, and 11.6%, respectively; and in people whose vitamin D exceeded 75, they were 3.1% and 0%, respectively¹⁶.

Ebril *et al's* study results indicated that if vitamin D level decreases below 15ng/ml, Hypocalcemia risk after Thyroidectomy operation will

rise 15 times⁵ and, it is the only individual preoperative factor affecting incidence of postoperative Hypocalcemia. Another study by Pradeep *et al* showed that preoperative Vitamin D level before Thyroidectomy can affect postoperative Hypocalcemia¹⁷, which is inconsistent with our findings.

In Chia *etal's* study results, there was no relationship between preoperative vitamin levels and postoperative Hypocalcemia¹⁸; and this is consistent with Lin *etal's* study results which indicated that 51% and 20% of patients had vitamin D levels of <30ng/ml and <20ng/ml, respectively and there was no significant relationship between vitamin D levels and postoperative Hypocalcemia (19) as both studies were in line with this study.

Diez *et al's* study was conducted on 113 patients. The levels of preoperative serum vitamin D, Alb and Ca and serum parathyroid hormone were determined. Sensitivity, characteristics, positive and negative values of vitamin D and Parathyroid hormone were respectively used for the diagnosis of postoperative Ca reduction. Finally, it was concluded that vitamin D insufficiency is a great risk factor for Hypocalcemia incidence after goiter-caused-total Thyroidectomy²⁰.

Different studies have indicated different findings about the role of vitamin D in incidence of postoperative Hypocalcemia. It might come from different study populations, different size and different lab techniques as well as doing single center studies etc,. Considering the disagreement concerning the role of vitamin D in the incidence of Hypocalcemia after Thyroidectomy, conducting a more expanded single- method study using lab kit is recommended.

Of all, the present study's results have shown that preoperational vitamin D before total Thyroidectomy surgery had no relationship with the incidence of postoperative Hypocalcemia.

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