Risk of Postoperative Hypocalcemia in Patients Underwent Total Thyroidectomy, Subtotal Thyroidectomy and Lobectomy Surgeries

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Abstract- The main objective of this study was to identify the incidence of post-thyroidectomy hypocalcemia in patients underwent lobectomy, subtotal thyroidectomy or total thyroidectomy. This randomized trial study was performed from May 2010 to July 2011 among 108 consecutive patients undergoing thyroidectomy. Patients were allocated into 3 groups based on the 3 common type of thyroidectomy. Pre and postoperative serum calcium levels were determined by using standard protocol for all patients. All patients' preoperative serum calcium levels were normal. Post-thyroidectomy hypoglycemia occurred in 0%, 8.3% and 8.3% of patients who underwent total hypocalcemia, subtotal thyroidectomy and lobectomy, respectively, which represents 5.6% of all patients who shown hypocalcemia (P=0.58). Serum calcium levels were fall in 93% patients, however within several days were returned to normal ranges. We did not find a significant relation between the hypocalcemia and thyroidectomy types. We recommended determination other alternative factors as a more effective prediction for postoperative hypocalcemia.

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Introduction

Postoperative hypocalcemia is one of the common complications after thyroidectomy and also known that postoperative hypocalcemia is a major morbidity in patients that undergone thyroidectomy (1-2). It often causes of longer hospitalization and the performance excessive tests, and it significantly because increased the health care costs of thyroidectomy. The incidence of post-thyroidectomy hypocalcemia among reports is considerably heterogeneous, but it is estimated between 1 to 15% (3). It seems that postoperative hypocalcemia may be due to different factors, such as injury; unintentionally remove of the parathyroid tissue or because of hungry bone syndrome. Based on previous reports the indicative prediction of postoperative hypocalcemia remains unknown, and furthermore this issue requires other studies with different designing methods (3-5).

The main objective of this study was to evaluate post-thyroidectomy hypocalcemia in relation with variables such as surgery types, age or gender of the patients.

Materials and Methods

Study population

This randomized trial study was conducted from May 2010 to July 2011 among 108 consecutive patients that underwent various types of thyroidectomy (subtotal, total and lobectomy) due to the different thyroid conditions on the surgery ward of the Shahid Sadughi training hospital in Yazd province.

For all patients with preoperative trials (clinical and paramedical) were approved the necessity of thyroidectomy. Patients with severe morbidities such as severe obesity, diabetes, infections, anesthesia and also patients on steroid or immunosuppressive medications; patients with goiters submerged in the thorax were not enrolled for this study. Of the 108 patients the female to male ratio was 5:1 with a mean age of 45 years and a range of 19–52±4 years. One hundred eight patients

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were allocated into three groups according to the different thyroid operations that were surveyed in this study; each group includes 36 cases equivalently. The mean age ± SD of patients with lobectomy, subtotal thyroidectomy and total thyroidectomy were 43.8 ± 17.3, 44.1 ± 11.4, and 48.1 ± 14.5 years, respectively.

Operations

Before the operation, calcium serum levels of the patients were measure and the results showed normal range for all patients. After operation patients were followed up for 2 weeks. Serum calcium level was calculated after the operations for all patients and the reference range of serum calcium levels depended on the standard protocol was considered 2.25 to 2.60 mmol/l (6). Temporary hypocalcemia was defined as calcium levels less than 2 mmol/l, occurring during in-hospital stay and or recovery within 3 months. To examine serum calcium level changes in 6 hours after surgery, serum calcium levels again were evaluated by routine laboratory tests. In addition, resected samples were sent to the pathology laboratory to check the parathyroid gland tissue presence.

In this study, to avoid the role of human error or differences among surgeon's skills on the post-operative complications, all of operations were performed only by an experienced general surgeon (By Dr. Shiryazdi), who is expert in all 3 thyroidectomy operations.

Statistical analysis

In this study the data were expressed as mean or median (range) and comparison result values. Statistical analyses were performed using SPSS and One-way ANOVA and chi-square tests were used to test differences between groups. The t-test was used to compare mean serum phosphate values on day 0 and day 1 within each group. The results Statistical significance was conventionally set at $P < 0.05$.

Result

A total of 108 patients were included in this study. Patient demographics and data for surgery are shown in table 1. Of 108 patients, 83 % (n=90) were female with mean age 44 ± 5.6 years and 17% (n=18) were male with mean age 42 ± 6.7 years. Pathology laboratory results showed that, 84 (77.7%) cases had a malignancy and 24 (22.3%) cases were benign. Of all resected samples that were sent to pathology lab, in only 6 cases parathyroid tissue were observed in the resected tissue.

Table 1. participants variables frequency

Variables	Frequency (%)
Gender	
Female	90 (83.3%)
Male	18 (16.7%)
Downfall	
Yes	93 (86.2%)
No	15 (13.8%)
Thyroidectomy	
Total	36 (33.3%)
Subtotal	36 (33.3%)
Lobectomy	36 (33.3%)
Pathology	
Begin	24 (22.3%)
Malignant	84 (77.7%)
Parathyroid tissue	
Present	6 (5.6%)
Not present	102 (94.4%)

Table 2 demonstrates the hypocalcemia incidence by considering the type of thyroidectomy. The overall post-thyroidectomy hypocalcemia in this study was 5.6%. Post-thyroidectomy hypocalcemia occurred in 0%, 8.3% and 8.3% of patients who underwent total thyroidectomy, subtotal thyroidectomy and lobectomy, respectively, which represents 5.6% of all patients who had shown hypocalcemia (P=0.58).

Table 2. Calcium status based on thyroidectomy surgery

Operation	Normocalcemia	Hypocalcemia
Total thyroidectomy	36 (100%)	0 (100%)
Subtotal thyroidectomy	33 (91.7%)	3 (8.3%)
Lobectomy	33 (91.7%)	3 (8.3%)

P=0.58

Table 3 shows post-thyroidectomy serum calcium fall regarding to the age (P=0.73) and gender of patients. Nearly 83.3% of patients were shown fall of serum calcium levels, however all patients calcium levels returned to the normal range during 10 days after surgeries without any calcium therapy. Our study showed that all cases affected by transient hypocalcemia. Of 18 male patients no cases showed a fall in serum calcium level. In 90 female patients, 75 cases showed reduced serum calcium levels (P=0.56). In the 6 cases that the presence of the parathyroid tissue was confirmed, 3 cases showed the fall. But Among the 102 cases that did not undergo parathyroid resection, 90 patients were falling. There was no significant relationship between serum calcium levels fall with pathology results (P=0.56) and parathyroid presence (P=0.58).

Table 3. Calcium fall status between participants

Variables	Fall	Not	*P*-values
Age	45.9		
Mean	11.92		
± SD	11.92		0.73
	18.34		
Gender	75 (83.3%)		
Female	15 (16.7%)		0.56
Male	18 (100%)	0	
	33 (91.7%)		
Operation	3 (8.3%)		
Total	30 (83.3%)		
Subtotal	6 (16.7%)		0.79
lobectomy	30 (83.3%)		
	6 (16.7%)		
Pathology	69 (82.1%)		
Begin	15 (17.9%)		0.56
Malignant	24 (100%)	0	
	3 (50%)		
Parathyroid tissue	90 (88.2%)		
Present	3 (50%)		0.58
Not present	12 (11.8%)		

Discussion

Post-thyroidectomy hypocalcemia as a multifactorial phenomenon is the most serious clinical problem in patients who have undergone thyroid surgery. Several studies have tried to find a significant relationship between hypocalcemia and different factors.

Our results showed that the overall post-thyroidectomy hypocalcemia occurred in 0%, 8.3% and 8.3% of patients who underwent total thyroidectomy, subtotal thyroidectomy and lobectomy, respectively, which represents 5.6% overall frequency between patients. We did not find a relation between type of thyroidectomy and hypocalcemia and low calcium levels. In almost studies the frequency of postoperative hypocalcemia was reported heterogeneously. It seems that the frequency of it is nearly 2% to 33% (7). It seems that, there is an Urgent need for uniformity and standardization in the definitions used for reporting hypocalcemia rates (12).

Some studies have shown that the type of thyroidectomy can be as a risk factor for postoperative hypocalcemia. In a prospective study the frequency of post total thyroidectomy hypocalcemia between patients was reported 68% and in this study was mentioned that the type of thyroidectomy can be had relation with postoperative hypocalcemia (9). In a study that was conducted to identify postoperative hypocalcemia risk factors, was founded that total thyroidectomy significantly increased the incidence of permanent hypocalcemia, whereas lobectomy or subtotal thyroidectomy were low risk for hypocalcemia (10).

In addition, the overall frequency of postoperative low calcium levels in this study was found nearly 83% of patients, also we did not find a significant relation between postoperative hypocalcemia and calcium low levels with possible risk factors such as the patient gender (*P*=0.56), age (*P*=0.73), thyroid pathology (*P*=0.56), the presence or not presence of parathyroid tissue (*P*=0.58) or the type of thyroidectomy (*P*=0.79).

Despite of our results it seems that the presence of parathyroid section and surgical technique had a greater effect on the frequency and incidence of postoperative hypocalcemia (11). There are studies that have focused on parathyroid resections as the major cause of postoperative hypocalcemia, and suggested that the presence of parathyroid tissue in resected parts may also have a deleterious effect (12,13).

Based the results of this study it doesn't seem that this type of variables are effective indicators for predicting post-thyroidectomy hypocalcemia. Several studies have reported heterogeneous results, similar and different results with our study. Stavros *et al.* reported that among 2043 patients, the age of participants (*P*=0.84) and their gender (*P*=0.67) had no significant relationship with calcium level changes after thyroidectomy (8). But in other studies that were examined the relationship between gender and age post-thyroidectomy hypocalcemia, suggested that being female is likely a risk factor for transient post-thyroidectomy hypocalcemia (1,3). Even a descriptive study has shown that male gender and old age were associated with increased complication rate (2). Other similar studies reported heterogeneous results (13,14). We recommended determination other alternative more effective prediction factors for post-thyroidectomy hypocalcemia in future studies.

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