



# THYROID SURGERY; HYPOCALCAEMIA FOLLOWING THYROID SURGERY: AN EXPERIENCE AT A TERTIARY CARE HOSPITAL OF SINDH

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#### Article received on:

29/03/2018

#### Accepted for publication:

15/09/2018

#### Received after proof reading:

03/12/2018

## INTRODUCTION

Tetany, myxedema and recurrent laryngeal nerve injury are historical complications of thyroidectomy reported as early as 1883. Initially tetany was considered of occurring due to thyroid gland deficiency until it was treated by extract of parathyroid gland by Moussu (1898). Fourman et al (1963) described the persistent parathyroid deficiency as cause of hypocalcaemia following thyroid surgery.<sup>1,2</sup> They reported a frequency of 24% of persistent parathyroid deficiency following thyroid surgery, and this was tested by low ionized calcium (Ca<sup>++</sup>) by EDTA (ethylene diamine tetra acetic acid) infusion test. They gave opinion of further exploration for solving the issue of delayed persistent parathyroid deficiency. Another study high frequency of clinically symptomatic patients but serum Ca<sup>++</sup> was not reported.<sup>3</sup> Recurring symptoms were reported at upto the two years after thyroid surgery.

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**ABSTRACT... Objectives:** The present prospective observational study was conducted to determine frequency and thyroid conditions as likely risk factors for hypocalcaemia following thyroid surgery. **Study Design:** Observational study. **Place and Duration:** Department of surgery, Liaquat University Hospital from December 2011 to December 2015. **Materials and Methods:** A sample of 201 patients, undergoing thyroid surgery with bilateral exploration, was selected according to criteria. Pre operative clinical work up was conducted for patient history, neck examination, thyroid hormone assay, serum calcium, Technetium<sup>99</sup> thyroid scanning, laryngoscopy and sonography. Serum Ca<sup>++</sup> was estimated before and after thyroid surgery. Hypocalcaemia was defined as calcium level <8 mg/dl. Data was analyzed on SPSS 22.0 (IBM, incorporation, USA) at 95% confidence interval. **Results:** Of 201 patients, male and female were noted as 93 (46.2%) and 108 (53.7%) respectively. Female to male ratio was 1: 0.86. Mean  $\pm$  SD age was noted as 42.3  $\pm$  7.4 years. Overall frequency of hypocalcaemia was identified in 23 (11.4%) of subjects. Mean  $\pm$  SD serum calcium in hypocalcaemia subjects was noted as 7.1  $\pm$  0.78 mg/dl. Symptomatic hypocalcaemia was noted in 11 (5.4%) of total subjects. **Conclusion:** In the present study, an overall frequency of hypocalcaemia was identified in 23 (11.4%) of subjects. Large goiters, recurrent goiter, retrosternal goiter, hyperthyroidism and Grave's disease were noted as risk factors.

**Key words:** Thyroid Surgery, Hypocalcemia, Grave's Disease, Hyperthyroidism.

**Article Citation:** Memon AS, Memon RA, Kumar B, Junejo A. Thyroid surgery; hypocalcaemia following thyroid surgery: an experience at a tertiary care hospital of Sindh. Professional Med J 2018; 25(12):1814-1818. DOI: 10.29309/TPMJ/18.4827

Immediate clinical manifestations of hypocalcaemia include nerve and muscle symptoms but occasionally psychotic symptoms may be observed. Ectodermal changes may occur as early as six months following thyroid surgery and include the; cataract, eczema, alopecia, etc. Cardiac arrhythmias and intra cranial defects may occur in those suffering from persistent hypocalcaemia. Persistent hypocalcaemia causes disability and a considerable financial loss due to adverse impact on health of patient. Delbridge et al described technique of capsular dissection of thyroid gland to reduce the chances of permanent hypocalcemia.<sup>4,5</sup> A previous study reported only 0.4% incidence of permanent hypocalcemia with a 2110 surgical operations which is very low incidences.<sup>6</sup>

Intra operative assay of parathyroid hormone (PTH) predicts risk of hypocalcemia successfully after thyroid surgery. Australian Society of

Endocrine Surgeons recommends performing intra operative assay of PTH.<sup>7,8</sup>

Noticeable risk factors of hypocalcemia following thyroid surgery include; large goiters, recurrent goiter, retrosternal goiter extension, hyperthyroidism, total thyroidectomy and experience of the surgeons.<sup>9,10</sup>

The present study was intended to evaluate the predisposing risk factors of hypocalcaemia after thyroid surgery. It was hypothesized that the large recurrent goiters with retrosternal extension, hyperthyroidism and total thyroidectomy were associated with high incidence of postoperative hypocalcemia.

## MATERIALS AND METHODS

The present observational study included 201 subjects from surgical wards of Liaquat University Hospital from December 2011 to December 2015. Inclusion criteria were those undergoing thyroid surgeries with bilateral exploration and adults of both genders who gave consent. Subjects receiving Ca++ supplements, multivitamins and multi mineral formulas were strictly excluded. Completion thyroidectomy following hemithyroidectomy, pre existing hypocalcemia, concurrent lymph node dissection, thyroid malignancy and those with parathyroid tissue auto transplantation were excluded. Pre operative clinical work up included patients history, neck examination, thyroid hormone profile, serum Ca++, and Technetium<sup>99m</sup>- thyroid scanning for hyperthyroidism. Sonography imaging of the thyroid gland was performed. Clinically suspicious solitary nodules were selected for fine needle aspiration cytology (FNAC). Hyperthyroidism was treated till euthyroid before surgery. Indirect laryngoscopy (IDL) was performed for vocal cord. Thyroid surgery was planned by surgical team under general anesthesia. Lateral mobilization was performed by capsular dissection technique for parathyroid glands and recurrent laryngeal nerve. Parathyroid glands were examined for ischemia before wound closure. In cases of suspected viability of parathyroid gland by color change, the auto-transplantation was performed within sternocleidomastoid muscle. Vocal cords

were re examined after extubation. Serum Ca++ was estimated before surgical operation. Serum Ca++ was again estimated at 6 hour postoperatively and each morning of at 7 am on postoperative days till patients were discharged. Hypocalcaemia was defined as calcium level <8 mg/dl.<sup>2</sup> If hypocalcemia was confirmed postoperatively, it was treated as per standard protocol. In severe cases intravenous calcium gluconate in normal saline was administered at doses of 1 mg calcium/kg body weight per hour.<sup>2</sup> Patients were asked for follow ups monthly for 12 months or more. Volunteers subjects were asked to sign the informed consent form. Data was collected on a pre structured proforma. Ethical approval was taken from institutional review committee.

Data was analyzed on SPSS 22.0 (IBM, incorporation, USA) at 95% confidence interval. Normality of numerical data was analyzed by Kolmogorov- Smirnov test. Numerical data was analyzed by student t- test and categorical by Chi square test. Statistical significance was defined as  $P < 0.05$  (95% CI).

## RESULTS

Of 201 patients, male and female were noted as 93 (46.2%) and 108 (53.7%) respectively ( $\chi^2 = 42.0$ ,  $p = 0.001$ ). Female to male ratio was 1: 0.86. This shows female were predominant in the present study. Mean  $\pm$  SD age was noted as  $42.3 \pm 7.4$  years (Range 35 – 51 years). Baseline finding of BMI, smoking, chest x-ray, hemoglobin, red blood cell, white blood cells, platelet counts, alkaline phosphatase, serum calcium and phosphate are shown in Table-I. Two pairs of parathyroid glands were noted in 161 (81.09%) of total subjects. Three parathyroid glands were identified in remaining 40 (19.9%) of subjects. Large goiters, recurrent goiter, retrosternal goiter extension, hyperthyroidism and Grave's disease were conditions identified as risk for hypocalcemia.

In present study, the overall frequency of hypocalcaemia was identified in 23 (11.4%) of subjects as shown in Figure-1. Mean  $\pm$  SD serum calcium in hypocalcemia subjects was noted as  $7.1 \pm 0.78$  mg/dl. Serum calcium and phosphate

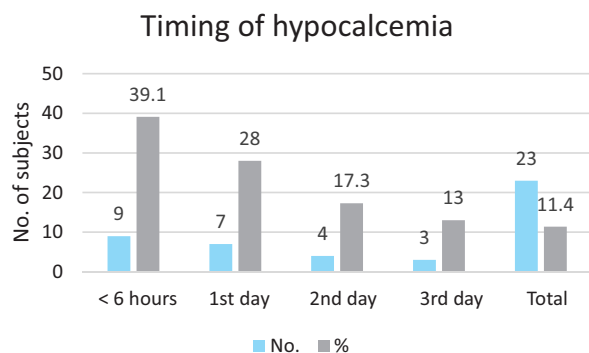
in hypocalcemia subjects is shown in Table-II. Symptomatic hypocalcaemia was noted in 11 (5.4%) of total subjects. Timing of hypocalcemia as <6 hour, first day, second day and on third day in hypocalcemia subjects is shown in Figure-1. Most hypocalcemia attacks were noted within 6 hours and on first day. Calcium supplements along with vitamin D were prescribed in symptomatic patients and successively on follow ups.

	Cases	P-value
Age (years)	42.3 ± 7.4	0.08
Male	93 (46.2%)	0.001
Female	108 (53.7%)	
Obesity	81 (40.29%)	0.04
BMI (kg/m <sup>2</sup> )	29±2.5	0.09
Smokers	97 (48.2%)	0.043
Chest X-ray	Normal	-
Hemoglobin (g/dl)	11 ± 4.9	0.031
RBC counts (x10 <sup>9</sup> /μl)	3.8±3.9	0.035
WBC counts (/μl)	7308±86	0.10
Platelets (x10 <sup>9</sup> /μl)	3.78±2.13	0.09
Erythrocyte sedimentation rate	10± 1.7	0.0001
Alkaline phosphatase (IU)	110.9±12.3	0.01
Serum calcium (mg/dl)	9.7±1.2	0.01
Serum phosphate (mg/dl)	2.45±0.56	0.09

**Table-I. Baseline characteristics of study population (n=201)**

	Mean	SD
Calcium	7.1	0.78
Phosphate	2.35	0.52

**Table. 2. Serum calcium and phosphate in hypocalcemia subjects (n=23)**



**Figure-1. Timing of hypocalcemia**

**DISCUSSION**

The present study is one of the recently conducted and reported studies on frequency of

hypocalcemia after thyroid surgery form Liaquat University Hospital. Reports from tertiary care hospitals showed 76% of thyroid surgeries are conducted for the benign thyroid disorders such as nodular goiters, recurrent nodular goiters, retrosternal goiters, toxic multinodular goiter and Grave`s disease.<sup>2</sup> A previous study debated that improvement in surgical techniques has resulted in few complications following total thyroidectomy.<sup>11</sup> However, post operative hypocalcemia is a frequently encountered complication, clinically presenting as Tetany post operatively. Frequency of hypocalcemia varies from 0.5% to 75% following thyroid surgery.<sup>12</sup> Post operative hypocalcemia may turn into a serious complication requiring close monitoring and calcium infusions to get rid of the clinical symptoms. Symptoms of post operative hypocalcemia usually occur in the first 24 to 48 hours.<sup>13,14</sup>

In the present study, an overall frequency of hypocalcaemia was identified in 23 (11.4%) of subjects. Mean± SD serum calcium in hypocalcemia subjects was noted as 7.1 ± 0.78 mg/dl. Hypocalcemia with clinical symptoms was identified in 11 (5.4%) of total subjects. Transient hypocalcemia has been reported in to 50% of subjects by few observational.<sup>15,16</sup>

However, a recent study by Nair et al<sup>2</sup> has reported a frequency of 23% which is in keeping with the present study. Nair et al<sup>2</sup> further reported onset of hypocalcaemia within 6 hours in 11.05% patients and was delayed up to 3<sup>rd</sup> post operative day in 6.84%. In the present study noted 39% hypocalcemia within 6 hours and only 13% at 3<sup>rd</sup> postoperative day. Iqbal et al<sup>17</sup> reported hypocalcemia in 16 (21.6%) patients after total thyroidectomy. The finding of hypocalcemia is consistent with present study but the study population of Iqbal et al was different i.e. carcinoma thyroid which was an exclusion criterion in the present study, however, the finding of hypocalcemia is a consistent finding. Hypocalcaemia was transient in all patients in the present study which is also in agreement with Iqbal et al.<sup>17</sup>

Transient hypocalcaemia after total thyroidectomy

occurred in 26.77% in euthyroid patients and 11% with thyrotoxicosis which is also a consistent finding.<sup>18</sup> Transient hypocalcaemia is a frequent complication of total thyroidectomy but in present study it was comparatively low and transient which is similar to reported.<sup>19</sup>

In the present study, 39% hypocalcemia occurred within 6 hours and 13% at 3<sup>rd</sup> postoperative day. The finding is consistent to previous studies.<sup>17,20</sup> Risk factors for hypocalcemia in the present study were noted as large goiters, recurrent goiter, retrosternal goiter extension, hyperthyroidism, thyroidectomy and experience of the surgeons which is similar to previous studies.<sup>9,10,21</sup>

We found more frequent hypocalcemia in hyperthyroid subjects which is in agreement with previous study.<sup>3</sup> Hypocalcaemia was significantly noted in surgeries for Grave's disease similar to previous studies.<sup>22,23</sup> The present has limitations such as vitamin D status and parathyroid hormone were not detected due to cost and funding issues. The strength of present study is the prospective designs and inclusion and exclusion criteria. The present study provides important clinical information on the hypocalcemia associated with thyroid surgery which may prove fatal in surgical wards.

## CONCLUSION

In the present study, an overall frequency of hypocalcaemia was identified in 23 (11.4%) of subjects. Large goiters, recurrent goiter, retrosternal goiter, and hyperthyroidism were noted risk factors for hypocalcemia in the present study. Thyroidectomy in Grave's disease patients showed high incidence of hypocalcaemia.

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*Good things happen when you distance yourself from negative people.*

– Unknown –



**AUTHORSHIP AND CONTRIBUTION DECLARATION**

Sr. #	Author-s Full Name	Contribution to the paper	Author=s Signature
1	Abdul Salam Memon	Concept, Patient search, Data compilation, Data analysis, Performas.	
2	Riaz Ahmed Memon	Performa design, Data collection, Patient care.	
3	Bheesham Kumar	Proof reading, literature review.	
4	Afzal Junejo	Staistical analysis, outdoor check, Manuscript check & Proof reading.	