

Early Hypocalcemia after Sub-Total, Near-Total and Total Thyroidectomy: its Diagnosis and Treatment Options

TAHIR HAMID¹, AMIR USMAN², SAQIB UDDIN KHAN³, AHMAD RAZA NASR², JAVERIA USMAN², MANSAB ALI⁵, JAVED RAFIQUE MALIKI⁵

¹Assistant Professor, Department of Surgery, UCMD/UOL. Social Security Teaching Hospital Multan Road Lahore

²Associate Professor, Department of Surgery, University College of Medicine, The University of Lahore

³Assistant Professor, Department of Surgery, University College of Medicine, The University of Lahore

⁴Professor, Department of Surgery, University College of Medicine & Dentistry, The University of Lahore.

⁵Professor, Department of Surgery, UCMD/UOL. Social Security Teaching Hospital Multan Road Lahore

Correspondence to: Tahir Hamid, Email: tahir_surgeon@yahoo.com, Cell: 0300-6950310

ABSTRACT

Introduction: Hypocalcemia after thyroid surgery is most important and early complication¹. The main aim of this study is to diagnose early hypocalcemia after thyroid surgery and its treatment options

Method: 100 patients fulfilling inclusion criteria from December 2018 to February 2021 were included in this study who had undergone thyroid surgery (sub-total, near-total and total). Serum calcium less than 8.1 mg/dl, measured after 24 hours to 48 hours of surgery is taken as hypocalcemia. Following variables are assessed in this study, gender, age, pre-operative serum calcium levels and type of surgery. Hypocalcemia diagnosed by post-operative serum calcium levels, presence of numbness, Chvostek's sign or Trousseau's sign noted and analyzed by SPSS v20 was used for statistical analysis. p-value less than 0.05 was considered as statistically significant.

Results: Early post-hypocalcemia developed in 71 (71%) patients of them 13(18%) were males and 58 (82%) were females and female gender is significantly more associated with hypocalcemia (p=0.001) Type of surgery (sub-total, near-total and total) is not related to development of early hypocalcemia (p=0.169). Patients who developed early hypocalcemia divided into two groups- A and B respectively. Group A is treated with oral calcium alone and B with oral calcium combined with Vitamin D3. The patients followed up for 6 months. The patients who treated with oral calcium and vitamin D3 combined responded well as compares with oral calcium alone (p=.001).

Conclusion: This study suggests that female gender is associated with early hypocalcemia however there is no significant different type of surgery and patients who treated with oral calcium combined with vitamin D3 responded well as compared with oral calcium alone.

Keywords: Early Hypocalcemia, thyroid surgery, Goiter

INTRODUCTION

Early hypocalcaemia is the most common early and important complication of thyroid surgeries¹. For thyroid cancers surgery is the treatment of choice and also for benign ailments such as multinodular goiter causing pressure effects on neighboring structures². Temporary hypocalcaemia following thyroid surgeries occurs in 50-68% of the post thyroid surgeries patients³. Although perpetual hypocalcemia may occur in 3% of post-thyroidectomy patients⁴.

Hypocalcemia in Post-thyroidectomy patients arises due to parathyroid gland elimination, devascularisation and destruction which generate a state of temporary or perpetual hypoparathyroidism^{5,15}. Some contributory factors, for instance defalcation of Cholecalciferol, a sudden rise in serum calcitonin levels (due to thyroid gland manipulation intraoperatively), or a hungry bone syndrome are also responsible⁷. In some cases the hypocalcemia is without any symptoms some are calmly symptomatic and in some cases it may lead to major consequences like tetany and cardiac dysrhythmias^{8,16}. Consequently, it is essential to laminate this menace who developed hypocalcemia in post-operative period and to find those patients who need treatment either to calcium or with Vitamin D3 supplementation⁹. It is surgeons' competence to anticipate the commencement of post-thyroidectomy hypocalcemia is decisive for post-operative treatment¹⁰.

Early diagnosis of development of hypocalcemia will not only curtail the duration of hospital stay but also eradicate extraneous lab investigations

The main aim of this study is to detect early hypocalcemia and its treatment options with calcium supplements alone or combined with Vitamin D3.

MATERIAL AND METHODS

From December 2018 to February 2021, 100 patients who underwent subtotal, near-total and total thyroidectomies at Social Security teaching hospital, Multan road Lahore were included in

this study. Hospital ethical committee approved this study. The Inclusion criteria for this study were multinodular goiter, controlled thyrotoxicosis and thyroid carcinoma. Patients who underwent previous thyroid surgery, or known case of hypo or hyperthyroidism or on calcium supplements and patients require lobectomy were excluded from study. Preoperative levels of serum calcium were obtained and patient's age and gender and type of surgery (subtotal, near total or total thyroidectomy) were analyzed. In this study all operations were performed by experienced surgeons. Early hypocalcemia in post-operative period is defined as serum calcium level less than 8.0 mg/dl measured after 24 hours and 48 hours after surgery. Patients who developed hypocalcaemia in early postoperative period may be asymptomatic (serum calcium <8.1 mg/dl) or developed symptoms e.g. Numbness, Chvostek's sign or Trousseau's sign. Patients who developed hypocalcaemia after surgery were administered two intravenous doses of serum calcium (1000mg) 12 hours apart. Early hypocalcaemia patients divided randomly into two groups. One group is supplemented with oral calcium alone (1500-3000 mg daily) in daily divided doses for two weeks and other group supplemented with oral calcium (1500-3000 mg daily) daily divided doses with oral Vitamin D3 (50 mcg) once daily dose for two weeks.

The data obtained were computerized and analyzed using SPSS v20 using descriptive (mean, standard deviation) and analytic statistics. Qualitative data were concise as frequency percentages. The chi-square test or the fissure exact test was used to establish the association between categorical variables. Level of statistics significance was determined at (p < 0.5).

RESULTS

From December 2018 to February 2021, 100 patients who underwent thyroid surgeries, (64%) were subtotal-thyroidectomies, (28%) were near-total and total thyroidectomies and (08%) were total thyroidectomies. There were 29(29%) males and 71(71%) females respectively and mean age was 43 ± 10.3 years. Post-operative early hypocalcaemia developed in 71(71%) patients out

of them 13(18%) were males and 58(82%) were females. Pre-operative serum calcium levels were 9.0 ± 0.5 mg/dl. Post-operative serum calcium levels were measured at 24 hours and 48 hours respectively and were 8.29 ± 4.69 mg/dl ($p=.44$). Of them 31 (44%) patients developed asymptomatic hypocalcaemia and 40 (56%) patients developed symptoms out of them 40 (56%) developed numbness along with Chvostek's sign and Trousseau's sign. Patients who developed early hypocalcaemia, asymptomatic and symptomatic both were administered two intravenous doses of serum calcium (1000mg) 12 hours apart and were divided randomly into two groups. One group was supplemented with oral calcium alone (1500-3000 mg daily) and other group supplemented with oral calcium (1500-3000 mg daily) combined with oral Vitamin D daily for two weeks. Patients were followed up at second, sixth week, three months and six months. Only 01(1%) patient develop permanent hypoparathyroidism. Statistical analysis revealed that female gender is associated with early hypocalcaemia as compared with males ($p= .001$). However, there is no significant difference of type of surgery (subtotal, near total or total thyroidectomy) in early post-operative hypocalcaemia ($p=0.169$). Patients who developed post-operative early hypocalcaemia are supplemented with oral calcium combined with VitaminD3 responded well than those who were supplemented with oral calcium alone ($p=.001$).

DISCUSSION

Post-operative early hypocalcemia is a most common and important complication after thyroid surgery and may be symptomatic or asymptomatic¹. The development of post-thyroidectomy hypocalcemia is multi factorial; for instance, malignancy, hyperthyroidism, surgical technique, iatrogenic injury to parathyroid gland, extent of thyroid surgery, patient's gender, thyroiditis, diabetes mellitus and number of identified parathyroid glands during surgery maybe etiological factors^{3,16}.

Surgeon's experience is also a significant factor¹⁰.

In most of studies, female sex was found to have significant risk factor for hypocalcemia, in fact females are more incline to develop this complication¹².

In this study, 71 (71%) patients developed post-operative early hypocalcemia in which 58(82%) were females and 13 (18%) were males. Most of the studies tried to explain why female gender is more prone to develop post-operative early hypocalcemia. But the distinct mechanism underscores this sex characteristic is only an assumption. The sex distinction may be associated to sex steroids on PTH secretion, genetic variation among cell signaling pathways or anatomic differences in serum calcium drop^{12,13}.

In some studies, total-thyroidectomies incidence of hypocalcemia is significantly more as compared with sub-total thyroidectomies. In recent meta-analysis, total thyroidectomy is one of the significant predictors of hypocalcemia¹⁴. But in our study there is no difference ($p=.169$)

Group A treated with oral calcium alone (1500-3000mg) in divided doses for two weeks and group B with oral calcium (1500-3000mg) in divided doses combined with 1 daily dose of Vitamin D3 (50mcg) for two weeks and both groups followed up at second week, sixth week 3 months and 6 months. Patients in group B responded well as compared with Group A ($p=0.001$). The

explanation why group A responded well is related to high prevalence in general population of Vitamin D deficiency which is an independent contributor to hypocalcemia following thyroidectomy¹⁷.

CONCLUSION

This study suggests that female gender is associated with early hypocalcemia however there is no significant different type of surgery and patients who treated with oral calcium combined with vitamin D3 responded well as compared with oral calcium alone.

REFERENCES

1. Wingert D, Friesen S, Iliopoulos J, et al. Post-thyroidectomy hypocalcemia: incidence and risk factors. *Am J Surg.* 1986;152:606–10.
2. Ho TW, Shaheen AA, Dixon E, Harvey A. Utilization of thyroidectomy for benign disease in the United States: a 15-year population-based study. *Am J Surg.* 2011;201:570–4.
3. Rosato L, Avenia N, Bernante P, De Palma M, Gulino G, Nasi PG, Pelizzo MR, Pezzullo L: Complications of thyroid surgery: analysis of a multicentric study on 14,934 patients operated on in Italy over 5 years. *World J Surg.* 2004, 28 (271): 6.
4. Abboud B, Sargi Z, Akkam M, et al: Risk factors for post-thyroidectomy hypocalcemia. *J Am Coll Surg.* 2002, 195: 456-61.
5. Kakava K, Tournis S, Papadakis G, et al. Posturgical hypoparathyroidism: a systematic review. *In vivo.* 2016;30:171–80.
6. Eeve T, Thompson NW: Complications of thyroid surgery: how to avoid them, how to manage them, and observations on their possible effect on the whole patient. *World J Surg.* 2000, 24: 971-5. 10.1007
7. Watson C, Steed D, Robinson A, et al. The role of calcitonin and parathyroid hormone in the pathogenesis of post-thyroidectomy hypocalcemia. *Metabolism.* 1981;152:606–10.
8. Glinoeer D, Andry G, Chantrain G, et al. Clinical aspects of early and late hypocalcemia after thyroid surgery. *Eur J Surg Oncol.* 2000;26:571–7.
9. Roh JL, Park CI: Routine oral calcium and vitamin D supplements for prevention of hypocalcemia after total thyroidectomy. *Am J Surg.* 2006, 192: 675-678.
10. Tomusch O, Machens A, Sekulla C, Ukkat J, Brauckhoff M, Dralle H. The impact of surgical technique on postoperative hypoparathyroidism in bilateral thyroid surgery; a multivariate analysis of 5846 consecutive patients. *Surgery.* 2003;133:180–5.
11. Adams J, Andersen P, Everts E, Cohen J: Early postoperative calcium levels as predictors of hypocalcemia. *Laryngoscope.* 1998, 108: 1829-31.
12. Sands NB, Payne RJ, Côté V, Hier MP, Black MJ, Tamilia M. Female gender as a risk factor for transient post-thyroidectomy hypocalcemia. *Otolaryngol Head Neck Surg.* 2011;145(4):561–4.
13. McHenry C, Speroff T, Wentworth D, et al. Risk factors for post-thyroidectomy hypocalcemia. *Surgery.* 1994;116:641–7.
14. Edefe O, Antakis R, Laskar N, et al. Systemic review and meta-analysis of predictors of post thyroidectomy hypocalcemia. *Br J Surg.* 2014;101:307-20.
15. Ozemir IA, Buldanli MZ, Yener O, et al. Factors affecting postoperative hypocalcemia after thyroid surgery: importance of incidental parathyroidectomy. *North Clin Istanbul.* 2016;3(1):9–14.
16. Kalyoncu D, Gonullu D, Gedik ML, et al. Analysis of the factors that have effect on hypocalcemia following thyroidectomy. *Ulusal Cer Derg.* 2013;29:171–6.
17. Holick MF. The vitamin D deficiency pandemic: Approaches for diagnosis and treatment and prevention. *Rev Endocr Metab Disord.* 2017, 18 :153-65.