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Brief Communication

Hypocalcaemia following total thyroidectomy: Experience at a tertiary care center

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Abstract

Introduction

Hypocalcaemia following thyroidectomy can cause life threatening complications such as laryngeal spasm and cardiac arrhythmias. Hypocalcaemia can be either transient or permanent.

Aim

To investigate the factors associated with the occurrence of hypocalcaemia in patients who undergo thyroidectomy.

Methods

A retrospective analysis of 240 patients who underwent total thyroidectomy in the professorial surgical unit, Teaching Hospital, Jaffna were included in this study. It was an institution-based, retrospective, descriptive cross-sectional study to identify the factors associated with the occurrence of hypocalcaemia after thyroidectomy.

Results

Hypocalcaemia occurred in 26 of the 240 patients (10.83%), among whom 24 developed transient hypocalcaemia and two had permanent hypocalcaemia. Factors that showed a significant association with post-operative hypocalcaemia were hyperthyroid state(p=0.01) and prolonged surgery (p=0.011). The occurrence of post-operative hypocalcaemia was least when a most experienced surgeon performed the thyroidectomy (p=0.03).

Conclusions

Hypocalcaemia following thyroidectomy was mostly transient and associated factors were toxic goitre and prolonged surgery. Occurrence was low when the most experienced surgeon performed the operation. Factors associated with occurrence of hypocalcaemia should be informed to surgeons for extra caution and preventive measures during thyroidectomy surgery.

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Introduction

Hypocalcaemia is a common complication in the immediate post-operative period of thyroidectomy. The early symptoms of hypocalcaemia are circumoral numbness, tingling sensation and carpopedal spasm. Life-threatening complications of hypocalcaemia include laryngeal spasm and cardiac arrhythmias [1]. The rate of transient hypocalcaemia following thyroidectomy is between 6.9% to 49% while that of permanent hypocalcaemia ranges from 0.4% to 33% [2,3,4]

Justification of research and objectives

Thyroidectomy is a common operation in all parts of Sri Lanka including the northern region. The indications for thyroidectomy include malignant thyroid lesions (6.1 per 100,000 women and 1.3 per 100,000 men) thyrotoxicosis, cosmetic reasons and obstructive goitres [3,5,6]. Hypocalcaemia is a well-known complication after thyroidectomy and needs urgent attention in the post-operative period. Knowledge on factors associated with the occurrence of hypocalcaemia following thyroidectomy can help to prevent parathyroid gland injuries sustained during thyroidectomy and thereby occurrence of hypocalcaemia.

Aim

Our aim was to describe the factors associated with the occurrence of hypocalcaemia following thyroidectomy.

Methods

This was an institution based, retrospective, descriptive cross-sectional study carried out at the professorial surgical unit, Teaching Hospital, Jaffna from 1st January 2011 to 1st July 2016. The study was designed as per STARD guidelines. A total of 240 patients who underwent total thyroidectomy in this unit were included. All patients were assessed for serum calcium levels daily for the first 05 post-operative days. Total serum calcium level was measured and was corrected for albumin method using Arsenazoll dry chemistry method by Vitros 250 analyzer. Patients were followed up monthly for seven months and serum calcium level was checked during their clinical visits. Patients with at least one post-operative total serum calcium level of <8.5mg/dl were considered to have hypocalcaemia.

The need for calcium supplements and calcitriol for more than six months was considered as permanent hypocalcaemia and others as transient hypocalcaemia. Data were collected from patient records and clinic records by 03 pre-intern doctors, trained by the principal investigators

The study assessed whether age, gender, type of goitre, hormonal status, operative time, experience of the surgeon or nodal dissection were associated with occurrence of hypocalcaemia following total thyroidectomy. This information was extracted from patient records and intra-operative notes. Chi-Square test was used to identify associations. A p value ≤0.05 was considered significant. The study was approved by the Ethics Review Committee, Faculty of Medicine, University of Jaffna.

Results

Of the 240 patients in this study, 43(17.92%) were male and 197(82.08%) were female with a male to female ratio of 1:4. The distribution of gender and occurrence of hypocalcaemia is shown in Table 1.

Table 1: Distribution of gender and post-operative hypocalcaemia

	Hypocalcaemia present N (%)	Hypocalcaemia absent N (%)	Total N (%)
Males	05(11.62)	38(88.38)	43(100.00)
Females	21(10.65)	176(89.35)	197 (100.00)
Total	26(10.83)	214(89.17)	240(100.00)

Five males (11.62%) and 21 females (10.65%) developed hypocalcaemia. There was no significant association between gender and the occurrence of post-operative hypocalcaemia.

The distribution of age and the occurrence of hypocalcaemia is shown in Table 2.

Table 2: Distribution of age and post-operative hypocalcaemia

Age	Hypocalcaemia present N (%)	Hypocalcaemia absent N(%)	Total N(%)
<19 years	05(7.35)	63(92.65)	68(100.00)
20-49 years	14(13.46)	90(86.54)	104(100.00)
>50 years	07(10.29)	61(89.71)	68(100.00)
Total	26(10.83)	214(89.17)	240(100.00)

There was no significant association between age and the occurrence of post-operative hypocalcaemia.

The distribution of post-operative days and occurrence of hypocalcaemia during the first five post-operative days is shown in the Table 3.

Table 3: Distribution of post-operative days and the occurrence of hypocalcaema

Post Op day	Number of patients with serum calcium<8.5mg/dl N (%)	Cumulative number of patients with hypocalcaemia N (%)
1	3(1.25)	3(1.25)
2	12(5.06)	15(6.25)
3	9(4.00)	24(10.00)
4	1(0.46)	25(10.4)
5	1(0.46)	26(10.83)

Hypocalcaemia was observed in 26 patients (10.83%), by the end of the 5th post-operative day. Highest occurrence of hypocalcaemia was on post-operative days 02 and 03 (5% and 4% respectively). Of the 26 patients who developed hypocalcaemia, 24 (92.31%) patients had transient hypocalcaemia while 2 (7.69%) developed permanent hypocalcaemia.

The distribution of the type of goitre and post-operative hypocalcaemia is shown in Table 4.

Table 4: Distribution of type of goitre and occurrence of hypocalcaemia

Classification of goiter	Hypocalcaemia present N(%)	Hypocalcaemia absent N(%)	Total N(%)
Simple multinodular	04(5.20)	73(94.80)	77(100.00
Toxic multinodular	06(23.10)	20(76.90)	26(100.00)
Malignant multinodular goitre	06(15.80)	32(84.20)	38(100.00)
Malignant solitary	03(5.20)	55(94.80)	58(100.00)
Grave disease	05(17.90)	23(82.10)	28(100.00)
Recurrent	02(15.40)	11(84.60)	13(100.00)
Total	26(10.83)	214(89.17)	240(100.00)

Among the 240 patients, 131(54.58%) presented with multinodular goitres (MNG), 58(24.16%) with malignant solitary goitre, 28(10.42%) with Grave disease and 13(5.41%) with recurrent goitres. There was no significant association with the type of goitre.

The distribution of malignancy and the occurrence of hypocalcaemia is shown in Table 5. There was no significant association between thyroid malignancy and the occurrence of post-operative hypocalcaemia.

Table 5: Distribution of malignancy and post-operative hypocalcaemia

Type of goitre	Hypocalcaemia present	Hypocalcaemia absent	Total
Malignant goitre	09(9.38)	87(90.62)	96(100)
Non-malignant goitre	17(11.80)	127(88.20)	144(100)
Total	26(10.83)	214(89.17)	240(100)

The distribution of hormonal status and the occurrence of hypocalcaemia is shown in Table 6.

Table 6: Distribution of hormonal status and post-operative hypocalcaemia

Classification of goiter	Hypocalcaemia present N(%)	Hypocalcaemia absent N(%)	Total N(%)
Euthyroid	15(8.06)	171(91.94)	186(100.0)0
Hyperthyroid	11(20.37)	43(79.63)	54(100.00)
Hypothyroid	-	-	-
Total	26(10.83)	214(89.17)	240(100.00)

When considering hormonal status, 186 were euthyroid, while 54 were hyperthyroid, there were no hypothyroid patients. Of the 54 hyperthyroid patients, 11(20.37%) developed hypocalcaemia, while 15 of the 186 patients (8.06%) with euthyroid state developed hypocalcaemia. Hyperthyroid state was significantly associated with higher occurrence of hypocalcaemia compared to euthyroid state (p= 0.010).

The distribution of operative time and the occurrence of hypocalcaemia is shown in Table 7.

Table 7: Association of operative time and post-operative hypocalcaemia

Operative time	Hypocalcaemia present N(%)	Hypocalcaemia absent N(%)	Total N(%)
119min or less	19(9.60)	179(90.40)	198(100.00)
120-179min	5(13.16)	33(86.84)	38(100.00)
180 min or more	2(50.00)	2(50.00)	4(100.00)
Total	26(10.83)	214(89.17)	240(100.00)

There was no significant association between the operative time and the development of hypocalcaemia.

The relationship between the level of experience of the surgeon and the occurrence of hypocalcaemia is shown in Table 8. Experience of surgeon was classified as 'less experienced' (<5 years as surgeon and/or <100 thyroidectomies), 'more experienced' (6 - 10 years as surgeon and/or 101-200 thyroidectomies) and 'very experienced' (>10 years as surgeon and/or >200 thyroidectomies).

Table 8: Distribution of experience of surgeon and post-operative hypocalcaemia

Classification of goiter	Hypocalcaemia present N(%)	Hypocalcaemia absent N(%)	Total N(%)
Less experience <5 yrs. as surgeon (01) <100cases of thyroid (01)	6(20.00)	24(80.00)	30(100.00)
More experience 6 -10yr as surgeons (02) 101 -200 cases of thyroid (02)	12(17.14)	58(82.86)	70(100.00)
most experience >10 yrs. (01) >200 cases of thyroid	8(5.71)	132(94.29)	140(100.00)
Total			240(100.00)

The occurrence of hypocalcaemia was significantly lower (p=0.003) when a most experienced surgeon performed the operation compared to the other two levels of experience.

Table 9: Distribution of status of nodal dissection and occurrence of hypocalcaemia

Status of nodal dissection in malignant lesions	Hypocalcaemia present N(%)	Hypocalcaemia absent N(%)	Total N(%)
Nodal dissection carried out	4(18.18)	18(81.82)	22(100.00)
Nodal dissection not carried out	05(6.75)	69(93.25)	74(100.00)
Total	09(9.38)	87(90.62)	96(100.00)

Lymph node dissection was performed on 22 of 96 patients with malignant goitres. Development of hypocalcaemia had no association with whether or not lymph node dissection was performed although the results show a higher percentage of hypocalcaemia when nodal dissection was performed.

Discussion

The occurrence of hypocalcaemia following total thyroidectomy has been reported as 6.0% to 49.0% [2,3,4,**Error! Reference source not found.**]. Hypocalcaemia following thyroidectomy can be due to unintentional removal of the parathyroid glands or compromised blood supply to the glands. In our study, hypocalcaemia was observed in 26 patients (10.3%). 24 had transient hypocalcaemia. Two patients developed permanent hypocalcaemia due to unintentional removal of three parathyroid glands, later confirmed by histology.

Gender had no significant effect on development of hypocalcaemia after thyroidectomy in some studies [5,8]. Other studies revealed that rates of transient and permanent hypocalcaemia were higher in women than in males [9]. Our study did not reveal any statistically significant difference in the occurrence of hypocalcaemia between males and females.

Malignant lesions, toxic goitres and recurrent goitres (42.9% - 44.4%) are associated with post-operative hypocalcaemia [8,9] in most studies. Our study also revealed a higher occurrence in toxic goitres but no significant association with malignant goitres and recurrent goitres. Nodal clearance and extensive nodal dissection in malignant lesions and hungry bones in toxic goitres play a role in causing post-operative hypocalcaemia in these patients [6,7,9]. However, in our study, nodal dissection had no significant association with the development of hypocalcaemia, perhaps due to the small number of patients involved.

Experience of the surgeon had an impact on the development of hypocalcaemia in our study as in most other studies [2,5,7]. In our unit, large goitres (WHO Grade 3) recurrent goitres, toxic goitres, and malignant goitres, which needed lymph node dissection, are operated on by the most experienced surgeon. When considering the complexity and technical difficulties of total thyroidectomy, experience of the surgeon was a significant determinant of post thyroidectomy hypocalcaemia in our study as well as other studies [3,7,9].

Transient hypocalcaemia in the majority of our patients could be due to ischaemia or venous oedema of the parathyroid glands, in the absence of intra-operative or histopathological evidence of accidental removal of the glands [5].

Conclusions

Hypocalcaemia is one of the most well recognized complications of total thyroidectomy. Our study showed the highest occurrence of hypocalcaemia on postoperative days 2 and 3. We recommend routine checking of serum calcium levels daily from 1st to 5th day of the post-operative period for early detection and treatment.

As hyperthyroid state is associated with high occurrence of hypocalcaemia, these goitres should be operated with utmost care.

The most common cause for post-operative hypocalcaemia is transient hypocalcaemia due to ischaemia to the parathyroid. Parathyroid ischaemia and oedema can be avoided by meticulous surgical technique to prevent morbidity due to transient hypocalcaemia. Routine examination of the specimen to detect accidental dissection of parathyroid gland and immediate auto transplantation into either the sternocleidomastoid or brachioradialis muscles gives good functional recovery preventing permanent post thyroidectomy hypocalcaemia. The factors associated with occurrence of hypocalcaemia should be informed to surgeons for extra caution and preventive measures during thyroidectomy surgery.

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