

A comparative study of incidence of hypocalcemia following total, near total and sub total thyroidectomy

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Abstract

Introduction: Surgical resection is the treatment of choice for the majority of patients with benign multinodular goiter (MNG) and well differentiated thyroid carcinoma. Surgical options for the management of MNG include subtotal thyroidectomy, Near total thyroidectomy and Total thyroidectomy. Although there is debate about the optimal surgical procedure for these patients, the choice of surgical technique must take into account the potential benefits and complications of each procedure.

Aim: 1: To study the incidence of post-operative hypocalcaemia following thyroidectomy. 2: To compare the incidence of hypocalcaemia following Total thyroidectomy, Near total thyroidectomy and Subtotal thyroidectomy.

Materials and Methods: A Cross sectional study conducted in Department of General Surgery, Shadan Institute of Medical Sciences Hospital, Hyderabad from October 2018 to August 2019 in 50 consenting patients who had undergone Total / Near total / Subtotal thyroidectomy. Prior to the selection they underwent routine history taking, physical examination and investigation to exclude preexisting hypocalcemia. The levels of corrected serum calcium [Corrected calcium = Serum Calcium + (0.8 X {4.0 – albumin})] are measured preoperatively every 24 hours till discharge and the first post operative OPD visit and at sixth month.

Results: In the present study 17 patients underwent subtotal thyroidectomy, 17 patients underwent near total thyroidectomy and 16 patients underwent total thyroidectomy. Among subtotal thyroidectomy group 5 (29.4%) patients had transient hypocalcemia and 1 (5.8%) patient had persistent hypocalcemia. Among the Near total thyroidectomy group 9 (52.9) patients had transient hypocalcemia ,5 (29.41%) patients had persistent hypocalcemia and 2 (11.76%) patients had hypocalcemia symptoms. Among the Total thyroidectomy group 12 (70.05%) patients had transient hypocalcemia, 8 (47.05%) had persistent hypocalcemia and 6 (35.29%) patients had hypocalcemia symptoms.

Conclusion: There is an increased incidence of hypocalcemia in patients undergoing Total thyroidectomy and Near total thyroidectomy when compared to Subtotal thyroidectomy. When comparing Total thyroidectomy and Near total thyroidectomy, hypocalcemia incidence is more in Total thyroidectomy. Meticulous surgical dissection and preservation of parathyroid glands is essential to avoid this complication.

Keywords: Hypocalcemia, Transient Hypocalcemia, Persistent Hypocalcemia, Subtotal thyroidectomy, Near total thyroidectomy, Total thyroidectomy.

Introduction

Surgical resection is the treatment of choice for the majority of patients with benign multinodular goiter (MNG) and well differentiated thyroid carcinoma. Current indications for surgery for benign MNG are compression induced symptoms, suspected malignancy, hyperthyroidism and cosmesis. Surgical options for the management of MNG include subtotal thyroidectomy, near total thyroidectomy and total thyroidectomy. Although there is debate about the optimal surgical procedure for these patients the choice of surgical technique must take into account the potential benefits and complications of each procedure. Total thyroidectomy is done for well differentiated thyroid carcinoma.

The primary cause for hypocalcemia following thyroidectomy is secondary hypoparathyroidism

following damage or devascularization of one or more parathyroid glands during surgery.¹ The other causes of hypocalcemia might be attributed to many causes including calcitonin release from gland following thyroidectomy, hemodilution.² Hypocalcemia may be asymptomatic particularly if calcium levels are mildly reduced or symptomatic with typical manifestations like tingling numbness and paresthesia in circumoral area and in fingers and toes and Chvostek's sign and Trousseau's sign and carpopedal muscle spasm.

Post-operative hypocalcemia requires calcium and vitamin D supplementation (3) and serial serum calcium estimation thus prolonging hospital stay. Temporary hypocalcemia is defined as a fall of corrected serum calcium below 8.0 mg/dl. (4) Permanent hypocalcemia is hypocalcemia persisting

for more than six months following thyroidectomy. (2) It persists in some cases.

The main reason for performing subtotal thyroidectomy is a presumed lower incidence of post-operative complications, including recurrent laryngeal nerve palsy, hypoparathyroidism and an attempt to achieve post-operative euthyroid status. However, there is a risk that goiter will recur and increased surgical morbidity during re operation. Furthermore, a number of patients treated by subtotal thyroidectomy will still require thyroxine replacement following surgery.

Need for the study

Several studies have shown that there is an increase in the incidence of transient hypocalcemia in near total thyroidectomy as compared to subtotal thyroidectomy.²

Limited data is available regarding the comparison of the status of calcium levels after thyroid surgeries. Hence this study was taken up to assess the incidence of hypocalcemia after subtotal thyroidectomy, near total thyroidectomy and total thyroidectomy.

Objectives

1. To study the incidence of postoperative hypocalcemia following thyroidectomy.
2. To compare the incidence of post-operative hypocalcemia following total thyroidectomy, near total thyroidectomy and subtotal thyroidectomy.

Materials and Methods

Place of study

The study was conducted in the Department of General Surgery, Shadan Institute of Medical Sciences hospital. It is a tertiary care centre in Hyderabad.

Study design

Cross sectional study.

Study period

October 2018 To August 2019.

Study population

All the patients who were admitted as in patients for undergoing Total thyroidectomy, Subtotal thyroidectomy and Near total thyroidectomy for various thyroid diseases in the department of department of General Surgery, Shadan Institute of Medical Sciences.

Study sample Size

A total of 50 patients were enrolled in the study.

Methodology

A total of 50 patients who were satisfying the inclusion criteria were enrolled into study.

Inclusion criteria

1. Patients who are willing to give an informed written consent.
2. Patients undergoing thyroidectomy.

Exclusion criteria

1. Patients who are not willing to participate in the study.
2. Patients who were having hypocalcaemia prior to thyroid surgery.
3. Patients who have previously undergone thyroid surgery.

Procedure

All the patients meeting the inclusion criteria were taken into the study. A pre-designed, pre-tested, semi structured and pre-coded proforma was used for recording all the findings. The questions were partially closed ended. After obtaining Ethical clearance from the Institutional Ethical Committee, study was conducted. The duration of the interview, on an average was 20 minutes for each participant.

The questionnaire had the questions regarding the following:

1. Demographic information: Details like age, gender, were obtained.
2. Clinical Data: Details about the diagnosis of the thyroid conditions, physical examination and investigations to exclude pre-existing hypocalcaemia.

The levels of corrected serum calcium are calculated with the given formula:

Corrected Calcium= Serum calcium + (0.8 X (4.0 – Albumin))

They are measured pre operatively and post operatively every 24 hours till discharge and the first post operative OPD visit and at sixth month.

Data Entry and Analysis

The data was entered in Microsoft Excel 2010 version. Data was analyzed using Microsoft Excel 2010 and Epi Info 7.2.0. Descriptive and inferential statistical analysis were used in the present study. Results on continuous measurements were presented on Mean \pm SD (Min-Max) and results on categorical measurements were presented in Number (%). Significance was assessed at 5% level of significance.

Ethical clearance

Ethical clearance was obtained from the Institutional Ethical Committee, Shadan Institute of Medical Sciences, Hyderabad

The study was conducted in the Department of General Surgery, Shadan Institute of Medical Sciences hospital. It is a tertiary care centre in Hyderabad. The results of the study are as follows:

Results

Table 1: Showing the diagnosis of study population

Diagnosis	Frequency	Percentage
Multi Nodular Goitre	39	78
Papillary Carcinoma	7	14
Follicular Carcinoma	2	4
Medullary Carcinoma	1	2
Hurthle cell carcinoma	1	2
Total	50	100

Table 2: Showing the type of surgery according to gender of study population:

Type of Surgery	Male	Percentage	Female	Percentage	Total	Percentage
Sub Total Thyroidectomy	3	6	14	28	17	34
Near Total Thyroidectomy	2	4	15	30	17	34
Total Thyroidectomy	5	10	11	22	16	32
Total	10	20	40	80	50	100

Table 3: Showing the Incidence of hypocalcemia:

Hypocalcaemia	Frequency	Percentage
Detected	26	52
Not detected	24	48
Total	50	100

Table 4: Showing the incidence according to the diagnosis performed:

Diagnosis	Transient hypocalcaemia	Percentage %	Persistent hypocalcaemia	Percentage %
MNG	20	40	6	12
Papillary Ca	4	8	3	6
Follicular Ca	1	2	3	6
Medullary Ca	0	0	0	0
Hurthle cell Ca	1	2	2	4
Total	26	52	14	28

Table 5: Showing incidence according to the surgery performed:

Type of surgery	Transient Hypocalcaemia	Percentage %	Persistent Hypocalcaemia	Percentage %	Symptomatic Hypocalcaemia	%
STT	5	10	1	2	0	0
NTT	9	18	5	10	2	4
TT	12	24	8	16	6	12
Total	26	52	14	28	8	16

Subtotal thyroidectomy: Out of 17 patients who underwent STT, 5 (29.41%) patients (1 male & 4 female) developed immediate post-op hypocalcemia. 1 (5.8%) out of 5 patients had persistent hypocalcemia on

biochemical investigation after 6 months of surgery, but was asymptomatic. Total incidence of hypocalcemia for STT is 5 (10%).

Near total thyroidectomy: Out of 17 patients who underwent NTT, 9 (52.94%) patients (1 male & 8 female) developed immediate post-op hypocalcemia. 5 (29.41%) out of 9 patients had persistent hypocalcemia, 2 (11.76%) of them had hypocalcemia symptoms. Total incidence of hypocalcemia for NTT is 9 (18%).

Total thyroidectomy: Out of 16 patients who underwent TT, 12 (75%) patients (3 male & 9 female) developed immediate post-op hypocalcemia. 8 (50%) out of 12 patients had persistent hypocalcemia, 6 (37.5%) of them had hypocalcemia symptoms. Total incidence of hypocalcemia for TT is 12 (24%).

Table 6: Incidence of Transient hypocalcemia and type of surgery:

Type of surgery	Transient Hypocalcaemia Present	Percentage %	Transient Hypocalcaemia Absent	Percentage %	Total	Percentage %
STT	5	10	12	24	17	34
NTT	9	18	8	16	17	34
TT	12	24	4	8	16	32
Total	26	52	24	48	50	100

P value after comparing Transient Hypocalcemia and different surgeries is 0.03 and it is statistically significant.

Table 7: Incidence of persistent hypocalcemia and type of surgery:

Type of surgery	persistent Hypocalcaemia present	Percentage %	Persistent Hypocalcaemia Absent	Percentage %	Total	Percentage %
STT	1	2	16	32	17	34
NTT	5	10	12	24	17	34
TT	8	16	8	16	16	32
Total	14	28	36	72	50	100

P value after comparing permanent hypocalcemia and different surgeries is 0.01 and it is statistically significant.

Table 7: Incidence of symptomatic hypocalcemia persisting after six months and type of surgery:

Type of surgery	Symptomatic Hypocalcaemia	Percentage %	Asymptomatic Hypocalcaemia	Percentage %	Total	Percentage %
STT	0	0	17	34	17	34
NTT	2	4	15	30	17	34
TT	6	12	10	20	16	32
Total	8	16	42	84	50	100

P value after comparing symptomatic hypocalcemia and different surgeries is 0.01 and it is statistically significant.

Discussion

The present study was conducted to know the incidence of hypocalcaemia after the thyroid surgery in the Department of General Surgery, Shadan Institute of Medical Sciences hospital. It is a tertiary care centre in Hyderabad.

The results of the study are discussed below:

Incidence of Hypocalcemia

Postoperative hypocalcemia is a relatively common complication of thyroid surgery and is known as a major cause of postoperative morbidity but most often it is a transient event that occurs after extensive thyroid surgery.

In the present study, the majority (78%) of the cases were of MNG. 34% of the study population underwent STT, 34% of the study population underwent NTT, 32% of the study population

underwent TT. 50% of them had developed hypocalcemia.

Out of 17 patients who underwent STT, 2 (11.76%) patients developed symptomatic hypocalcemia. 1 (5.88%) patient developed persistent hypocalcemia. Total incidence is 17.64%.

Out of 17 patients who underwent NTT, 4 (23.52%) patients developed symptomatic hypocalcemia and 1 (5.88%) patient developed persistent hypocalcemia. Total incidence is 29.4%

Out of 16 patients who underwent TT, 7 (43.75%) patients developed symptomatic hypocalcemia and 3 (18.75%) patients developed persistent hypocalcemia. Total incidence is 62.5%

The findings of the present study are in line with observational studies done by Shaha et al.⁵ and Demeester-Mirkin N et al.,⁶ who had noted up to 50% of transient and 4% permanent hypocalcemia after thyroidectomy.

The study done by C. Gopalakrishnan Nair⁷ showed that the overall incidence of hypocalcaemia was 23.6% ($n = 190$) and that of permanent hypocalcemia was 1.61% ($n = 13$). Symptomatic hypocalcaemia occurred in 10.91% ($n = 88$) patients. Hypocalcaemia was detected in the first 6 hours after operation in 21 patients (11.05%) and delayed up to 3 postoperative day in 13 patients (6.84%). One hundred and forty-four (75.78%) patients required calcium supplementation for 4 weeks while 2 patients required 20 weeks.

In the study done by Senthil Arumugam,⁸ around 25% of 12-30 years patients' experienced post-operative hypocalcemia, 27% of 31-40 years experienced hypocalcemia, and 25% of 41-50 years experienced hypocalcemia and 71% of more than 50 years experienced post-operative hypocalcemia. Patients underwent total thyroidectomy with pre-operative diagnosis of malignancy experienced 75% of post-operative hypocalcemia and approximately 46% of patients with toxic features experienced post-operative hypocalcemia, only 20% of patients with swelling or goiter are reported with post-operative hypocalcemia. The overall incidence of post-operative hypocalcemia was approximately 35%.

A study done by Sunil Kumar APV,⁹ in Mysore Karnataka, showed that hypocalcemia developed in 3 subjects (6%). The incidence of hypocalcemia following total thyroidectomy varies from 1%-50% which is the commonest complication reported.

In the study done by Chahardahasumi,¹⁰ overall, 152 cases (74.5%) were with postoperative complications of thyroidectomy, in which the most common complication was hypocalcemia with a

frequency of 54.4%. In many previous studies, hypocalcemia is identified as the most common postoperative complication.

Association of hypocalcemia with type of surgery

In the present study, the overall incidence of hypocalcemia is associated with the type of surgery performed was statistically significant. There was statistically significant association between transient hypocalcemia, persistent hypocalcemia and symptomatic hypocalcemia with the type of surgery performed.

In the study done by Erbil Y, et al.¹¹ the incidence of hypocalcemia was significantly higher following Total thyroidectomy (13.5%) then Near total thyroidectomy (2.5%) ($P < 0.05$).

In the study done by Ashwini Padhur et al.¹² the incidence of transient hypocalcemia is higher after total thyroidectomy than after subtotal thyroidectomy, but the incidence of other complications is not significantly different between these two procedures. The prevalence of postoperative hypocalcemia following thyroidectomy which may be temporary or permanent ranges from 0% to 83%, with the highest incidence seen in patients undergoing total thyroidectomy for cancer (28%). On the other hand, the incidence of hypocalcemia is found to be lowest in patients undergoing subtotal thyroidectomy for other diseases (1.5%).

In another study done by Ozbas S et al.,² after bilateral subtotal thyroidectomy 14 patients (14/170-8.2%) developed transient hypocalcemia. In NTT group, 39 patients (39/320 - 12.2%) developed transient hypocalcemia. None of the patients in this group experienced permanent complications. However, in TT group 78 patients (78/260 - 30%) had transient hypocalcemia whereas only one patient suffered permanent hypoparathyroidism.

Conclusion

It was concluded that post-thyroidectomy hypocalcemia is relatively common phenomenon, especially after extensive thyroid surgery. Refined surgical techniques can lower the incidence of post-thyroidectomy hypocalcaemia. Preservation of parathyroid glands is essential to avoid this complication. Thyroidectomy for Grave's disease has higher incidence of hypocalcaemia and so may be resorted to selected patients only. Post-thyroidectomy transient hypocalcemia can be prevented with pre-operative preparation of patients with extreme caution and intra-operative meticulous dissection, prompt identification of parathyroids and post-operative

frequent monitoring of serum calcium and early treatment can prevent significant morbidity.

Source of funding

None.

Conflicts of interest

None.

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