

Parathyroid gland injury after total thyroidectomy in Fayoum University Hospitals, Egypt

Mohammed Ibrahim^a, Noha K.A. El Ghaffar^b, Mohamed Fathy^a

Departments of ^aGeneral Surgery, ^bClinical and Chemical Pathology, Faculty of Medicine, Fayoum University, Fayoum, Egypt

Correspondence to Mohamed Ibrahim, MD, Department of Surgical Oncology, Fayoum University, Fayoum, 63748, Egypt. Tel: 01002662279; e-mail: mohamedibrahim555@hotmail.com

M.I. and M.F. were responsible for the surgery and ongoing care of the patients in the hospital, and also collected the data and performed analysis of the results. N.K. researched, drafted and conceived the manuscript. All authors read and approved the final manuscript.

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Background/aim

The incidences of transient and permanent hypocalcemia range from 2 to 32% (1–3) and 0.2 to 13% (3, 4), respectively, in patients who have undergone total thyroidectomy. The aim of the present work is to determine the incidence of parathyroid gland injury in total thyroidectomy operations in Fayoum University Hospitals.

Patients and methods

This study was carried out as a prospective study on 50 patients who presented with goiter with formal surgical indication for a total thyroidectomy operation. They were evaluated, operated and included in this study in the period from April 2019 to November 2019. Patients were examined at our outpatient general surgery clinic in Fayoum University.

Results

About nine patients (18.0%) developed manifestations of hypocalcemia within the first 24 h postoperatively after thyroidectomy; there was a statistically significant relation between recurrence and hypocalcemia status, with $P=0.016$. The incidence of hypocalcemia in patients with recurrent goiter was much higher than in those with de-novo goiter (75 vs. 13%).

Conclusion

Post-thyroidectomy hypoparathyroidism due to parathyroid gland injury is believed to have a multifactorial background including the experience of the operator, the surgical technique and some risk factors of the patients (age and sex); all these factors have contributed to its incidence in the current study.

Keywords:

hypocalcemia, injury, parathyroid gland, thyroidectomy

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Introduction

Post-thyroidectomy hypocalcemia is one of the most prevalent morbidities; the incidences of transient and permanent hypocalcemia range from 2 to 32% [1–3] and 0.2 to 13% [3,4], respectively, in patients who have undergone total thyroidectomy. Hypocalcemia after thyroidectomy is caused by direct injury to the parathyroid gland or injury to its blood supplies. Postoperative hypocalcemia affects the physical and psychological health of the patient and increases hospital stay [5].

Hypocalcemia can be present with perioral numbness, numbness of the fingertips, and positive Chvostek's sign. There may be muscle spasms, cramping, seizures or cardiac arrhythmia in severe cases. Treatment of hypocalcemia consists of administering patients calcium supplements and vitamin D [6].

Although physical preservation of the parathyroid glands in situ is necessary, it does not ensure normal parathyroid function due to the glands' vascular injury. The success rate of autotransplantation of parathyroid

glands in preventing postoperative hypoparathyroidism in the literature is highly variable according to time, disease and tissue storage duration [7].

The aim of this study was to determine the parathyroid gland injury in total thyroidectomy operations in our institution.

Patients and methods

Patients

Informed consent was obtained from all study participants after the nature of the study was explained. The study was carried out as a prospective study on selected patients who presented with goiter with formal surgical indication for a total thyroidectomy operation. They were evaluated, operated on and included in this study in the period

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from April 2019 to April 2020. Patients were examined at our outpatient general surgery clinic in Fayoum University Hospitals and further medical evaluations were completed in our inpatient ward.

Ethical consideration

The present study was carried out on the basis of the Code of Ethics of the World Medical Association according to the principles of the Declaration of Helsinki [3]. This study has been approved by the local Ethics Committee of Faculty of Medicine, Fayoum University Hospitals, with approval number M408/95; a written informed consent was provided by all participants before their inclusion in the study.

Inclusion criteria

- (1) Patients aged 18 years or older.
- (2) Patients planned for total thyroidectomy.
- (3) Patients suitable for general anesthesia.

Perioperative evaluation included the following:

- (1) History: besides the routine history that was obtained from all the patients, special attention was paid to accurate history of drug intake, previous surgeries and manifestations suggestive of hypoparathyroidism, hyperparathyroidism and malignancy.
- (2) General examination: routine general examination with careful examination of the signs suggestive of hypoparathyroidism, hyperparathyroidism and malignancy.
- (3) Neck examination: classic clinical neck examination with careful examination of the draining lymph nodes and retrosternal extension.
- (4) Laboratory investigations: routine preoperative labs with thyroid profile and serum Ca (within 24 h before and after surgery/reference range 8.8–10.6 mg/dl).
- (5) Imaging: neck ultrasound as a routine preoperative imaging for all cases. A thyroid scan was performed for all thyrotoxic patients who presented with a solitary or dominant thyroid nodule.
- (6) Pathological: fine needle aspiration cytology (FNAC) was performed for the patients who presented with positive cervical Lymph Nodes (LNs) either clinically or by ultrasound or with a history suggestive of malignancy.

Postoperative care

Postoperative care was made with careful clinical and laboratory assessment; clinical follow-up was directed within the first 24 h mainly for observation of

postoperative bleeding and voice changes and manifestations of hypoparathyroidism and hypocalcemia. These manifestations that were collected for all the patients by the researcher included the following:

- (1) Symptoms:
 - (a) Perioral paresthesia.
 - (b) Digital numbness.
 - (c) Muscles cramps.
- (2) Signs:
 - (a) Confusion, disorientation, delirium, and seizure.
 - (b) Chovstek sign.
 - (c) Trousseau sign.
 - (d) Electro Cardio Gram (ECG) (prolonged QT interval or arrhythmias).

Statistical analysis

The collected data were organized, tabulated and statistically analyzed using Statistical Package for the Social Science (SPSS) software statistical computer package version 22 (SPSS Inc., Chicago, USA). For quantitative data, the mean and Standard Deviation (SD) were calculated. Qualitative data were presented as number and percentages and the χ^2 test was used as a test of significance. For interpretation of results of tests of significance, significance was adopted at P less than 0.05.

Results

A total of fifty total thyroidectomy patients were included in this study according to the selection criteria, with age ranging from 28 to 63 years (mean 42.9 ± 7.7 years). Patient age ranged from 28 to 63 years, with a mean $\pm$ SD of 42.9 ± 7.7 , as shown. In terms of sex, most of the studied patients 34/50 (68.0%) were females and 16/50 (32.0%) were males. About one fifth of the studied patients, nine (18.0%), developed manifestations of hypocalcemia within the first 24 h postoperatively after thyroidectomy.

The most common type was multi nodular goiter (MNG), which was presented by the majority of patients 45/50 (90.0%). However, four patients (8.0%) had papillary carcinoma and only one patient (2.0%) had follicular carcinoma, as shown in Table 1.

Table 1 Number and percentage of different types of goiter

	N (%)
Follicular carcinoma	1 (2.0)
MNG	45 (90.0)
Papillary carcinoma	4 (8.0)

MNG, multi nodular goiter.

Table 2 Recurrent versus de-novo cases of goiter

	N (%)
De novo	46 (92.0)
Recurrent	4 (8.0)

Table 2 shows that the majority of studied patients, 46/50 (92.0%), had de-novo goiter, while 4/50 (8.0%) had recurrent goiter.

About one fifth of the studied patients, nine (18.0%), developed manifestations of hypocalcemia within the first 24 h postoperatively after thyroidectomy (Table 3).

As demonstrated in Table 4 and Fig. 1, there was a statistically significant relation between recurrence and hypocalcemia status, with $P=0.016$. The incidence of hypocalcemia in patients with recurrent goiter was much higher than that in those with de-novo goiter (75 vs. 13%).

Discussion

Hypoparathyroidism is found to be a common iatrogenic complication following surgical procedures to the neck, and commonly, to the thyroid gland [8,9]. Despite many improvements in the surgical techniques to avoid hitting and damaging the parathyroid glands, hypoparathyroidism remains a very significant postoperative morbidity after total thyroidectomy. This specific complication, as well as recurrent laryngeal nerve injury, is feared as it may give rise to significant and sometimes permanent disability for the patient [10].

The number of publications on postsurgical hypoparathyroidism suggests that this problem has a high impact on health and social life both for surgeons and for patients. Costs to society in terms of medical treatment, follow-up, including frequent and repeated laboratory testing, treatment and sick leave, are considerable [11].

Our study showed that about one fifth of the studied patients, nine (18.0%), developed manifestations of hypocalcemia within the first 24 h after thyroidectomy.

Also, Diez *et al.* [12] revealed that 62.7% of patients developed hypocalcemia (ionized calcium <0.95 mmol/l), but only 29.9% presented with symptoms. Another study by Paolo *et al.* [13] revealed that transient acute hypocalcemia was present in 43.3% of their patients. Nonetheless, the findings are relatively concordant with those of Di Renzo *et al.* [14], who found that 51% of

Table 3 Occurrence of manifestations of hypocalcemia within the first 24 h postoperatively

	N (%)
Yes	9 (18.0)
No	41 (82.0)

Table 4 Relation between goiter recurrence and hypocalcemia

	Hypocalcemia [N (%)]		P
	Yes (N=9)	No (N=41)	
De novo	6 (13.0)	40 (87.0)	0.016*
Recurrence	3 (75.0)	1 (25.0)	

χ^2 test. *Significant.

patients presented with biochemical values below the cutoff, but only 18% had symptoms clinically.

In addition, Angelo and Okatyevab [15] found that the incidence of post-operative hypocalcemia within the first 24 h was 32.2%. Another study of Košecab *et al.* [16] found that 36.4% had hypocalcemia on the fifth postoperative day. Also, Essawy *et al.* [17] found that post-thyroidectomy hypocalcemia was present in about 36.6% of patients.

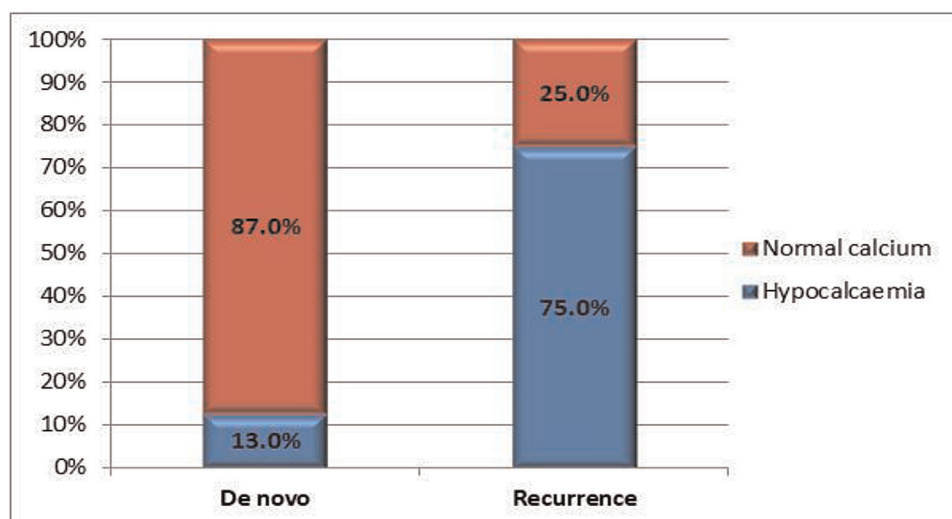
Moreover, in terms of postoperative pathology, in our study, the most common type was MNG, which was presented by the majority of patients, 45/50 (90.0%). However, four patients (8.0%) had papillary carcinoma and only one patient (2.0%) had follicular carcinoma.

Another study of Calvo *et al.* [18] found that the most common cause for thyroidectomy was multinodular goiter (75%), followed by papillary thyroid cancer (15%). Another study of Zhenga and Rios-Diazasimple [19] found that patients undergoing total thyroidectomy have simple goiter (7.42%), nodular goiter (70.92%), thyrotoxicosis (13.54%), thyroiditis (1.20%), and thyroid cancer (6.92%).

Conclusion

Post-thyroidectomy hypoparathyroidism due to parathyroid gland injury is believed to have a multifactorial background. There is almost consensus about the role of the operator experience ; moreover, age and sex of the patient and type of goiter remain controversial in terms of whether they have an effect or not. In our study, we concluded that sex and age group above 18 years old and type of goiter (on postoperative pathology) have no effect on the incidence of post-thyroidectomy hypocalcemia. We believe that the main limitation of our study is the small sample size; thus, further studies with larger sample sizes are required to

Figure 1



Hypocalcemia according to goiter recurrence.

obtain more robust data, and if this occurs, it will redirect our attention to the former mentioned category of patients who have developed hypocalcemia and not, for example, all the postoperative female patients.

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Conflicts of interest

There are no conflicts of interest.

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