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# Assessment of Hypocalcemia Following Total Thyroidectomy for Benign Thyroid Lesions: To Be Continued or Not?

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**ABSTRACT**

**Background:** Thyroidectomy is one of the most common operations performed worldwide by various surgeons whether general or endocrine surgeons. The rate of complications following thyroidectomy has been progressively decreasing yet it still carries significant morbidity if preoperative preparation and patient as well as procedure selection were not optimized.

**Objective:** This study was designed to evaluate the problem of hypoparathyroidism following thyroid surgery and to assess the use of parathyroid hormone (PTH) level to predict patients with risk of postoperative hypocalcemia. Through this study, it was sought that we could reach a recommendation to rely on the routine technique of total thyroidectomy and utilization of PTH assay to allow for a safe and timely discharge of patients with normocalcemia and for the early identification of patients requiring treatment of post thyroidectomy hypocalcemia.

**Patients and Methods:** This prospective study included 50 patients from two different hospitals undergoing total thyroidectomy to evaluate the efficacy of postoperative serum PTH and calcium (Ca) levels as an early and accurate predictor of post-thyroidectomy hypocalcemia. Ionized serum calcium as well as PTH were measured for each patient preoperatively, intraoperatively (just after skin closure), at every day postoperative when patient admitted and after one month in patients with hypocalcemia.

**Results:** Our results showed an overall incidence of 18% of hypocalcemia after total thyroidectomy. Of them, only 6% developed symptomatic hypocalcemia. Transient hypocalcemia occurred in 4% of patients while permanent hypocalcemia affected 2%.

**Conclusion:** Serum calcium concentrations have been the basis of identification of post-operative hypocalcemia, however this has been replaced by PTH levels being more sensitive and specific to the early prediction of transient as well as permanent hypocalcemia. Postoperative PTH; also known as quick PTH assay, level of < 12 pg/ml was found to have an overall accuracy of 98% in early prediction of permanent hypocalcemia in our study.

**Keywords:** Hypocalcemia Post Total Thyroidectomy, Benign Thyroid Lesions.

## INTRODUCTION

During the 1800s, the mortality rate from thyroid surgery was approximately 40%. Most deaths were caused by infection and hemorrhage. Sterile surgical areas, general anesthesia, and improved surgical techniques have made death from thyroid surgery extremely rare today **(1)**.

An important disadvantage of total thyroidectomy is the high incidence of hypocalcemia due to parathyroid gland devascularization. A low complication rate is the advantage of subtotal thyroidectomy, but secondary thyroidectomy may be necessary because of recurrence after subtotal thyroidectomy and is associated with increased morbidity and related to recurrent laryngeal nerve injury and hypoparathyroidism resulting from parathyroid gland devascularization **(2)**.

By developing a thorough understanding of the anatomy and of the ways to prevent each complication, the surgeon can minimize each patient's risk. The surgeon's experience is a significant contributor to various complications during thyroid surgery **(3)**.

In general, the essential objectives for thyroidectomy are sparing the parathyroid glands, avoidance of injury to recurrent laryngeal nerves (RLN), an accurate hemostasis and an excellent cosmesis **(4)**.

Hypoparathyroidism is another feared complication of thyroid surgery. The parathyroid glands produce parathyroid hormone (PTH), which is intimately involved in the regulation of serum calcium. PTH increases serum calcium levels by causing bone resorption, increasing renal absorption of calcium. PTH also increases renal excretion of phosphorus. Therefore, low PTH levels result in high serum phosphorus levels **(5)**.

Inadequate production of PTH leads to hypocalcemia. Hypoparathyroidism, and the resulting hypocalcemia, may be permanent or transient. The rate of permanent hypoparathyroidism is 0.4-13.8%. The condition may be due to direct trauma to the parathyroid glands, devascularization of the glands, or removal of the glands during surgery **(6)**.

The rate of temporary hypocalcemia is reportedly 2-53%. The cause of transient hypocalcemia after surgery is not clearly understood. It may be attributable to temporary hypoparathyroidism caused by reversible ischemia to the parathyroid glands, hypothermia to the glands, or release of endothelin-1.



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Endothelin-1 is an acute-phase reactant known to suppress PTH production, and levels have been elevated in patients with transient hypoparathyroidism [(7)].

Other hypotheses have been put forth to account for transient hypocalcemia not caused by hypoparathyroidism. These include calcitonin release and hungry-bone syndrome. Calcitonin is produced by the thyroid and inhibits bone breakdown while stimulating renal excretion of calcium. Its effects on calcium metabolism oppose those of PTH [(7)].

Most patients who show hypocalcemia after thyroidectomy are initially asymptomatic. Symptoms and signs of hypocalcemia include circumoral paresthesias, mental status changes, tetany, carpopedal spasm, laryngospasm, seizures, QT prolongation on ECG, and cardiac arrest [(8)].

Hypocalcemia may also be indicated by presence of the Chvostek sign or the Trousseau sign. The Chvostek sign is elicited by tapping the region of the facial nerve in the preauricular area resulting in facial contractions. The Trousseau sign is carpal spasm that may be elicited by inflation of a blood pressure cuff on the upper arm above 180mmHg [(9)].

An effective method of evaluation of parathyroid function is to follow ionized calcium (or total calcium and albumin) levels in the perioperative period. If iatrogenic hypoparathyroidism is a concern, close follow-up care is warranted until calcium levels demonstrate that parathyroid function is intact [(10)].

Alternatively, a normal postoperative PTH level can accurately predict normocalcemia after thyroid surgery. Identification of at-risk patients with low PTH levels will facilitate prompt calcium replacement therapy and safe early discharge from hospital. The key to parathyroid preservation is identifying the parathyroids and preserving their blood supply by ligating all vessels distal to them. Ligate the vessels as close to the thyroid gland as possible. Recognition of the parathyroid glands, which appear in various shapes and which have a caramel-like color, is critical. When they lose their blood supply, they often darken in appearance [(11)].

Patients who have asymptomatic hypocalcemia in the early postoperative period should not be treated with supplemental calcium. The hypocalcemia state may stimulate the stunned parathyroid glands to produce PTH [(7)].

In 1-2 months, an attempt to wean the patient off oral calcium may be made to reveal if the hypoparathyroidism is temporary. Dependence on calcium supplementation for longer than 6 months usually indicates permanent hypoparathyroidism [(12)].

The aim of this study was designed to evaluate the problem of hypoparathyroidism following thyroid surgery and to assess the use of PTH level to predict patients with risk of post-operative hypocalcemia. Through this study, it was sought that we could reach a recommendation to rely on the routine technique of total thyroidectomy and utilization of PTH assay to allow for a safe and timely discharge of patients with normocalcemia and for the early identification of patients requiring treatment of post thyroidectomy hypocalcemia.

## PATIENTS AND METHODS

This randomized prospective study included a total of 50 patients undergoing thyroidectomy to determine the incidence and treatment of postthyroidectomy hypocalcemia. They were attended at EL-Hussain University Hospital and Misr University for Science and Technology Teaching Hospital. **Approval of the ethical committee and a written informed consent from all the subjects were obtained.** This study was conducted between January 2017 to September 2018.

After hospital approval was obtained, we reviewed the medical records of those patients.

***Inclusion criteria***

- Both males and females with age group range from 18 to 60 years old
- Goiters duo to benign thyroid lesions
- Either denovo and recurrent goiters
- Patients with normal serum calcium, PTH and vitamin D

***Exclusion criterions***

1. Completion thyroidectomy following hemithyroidectomy,
2. Suspecting malignant thyroid disease,
3. Patients who received calcium supplementation,
4. Pre-existing hypocalcemia,
5. Patients who underwent parathyroid auto-transplantation.
6. Patients with hyperparathyroidism.
7. Patients undergoing parathyroidectomy at the time of thyroidectomy.

All patients had no history of prior parathyroid or neck dissection surgery. All patients had normal renal function at the time of surgery. None of the patients had signs or symptoms indicating metabolic bone disease or on medications, such as oral calcium/vitamin D supplementation, antiresorptive agents, hormone replacement therapy for postmenopausal women, anabolic agents, thiazide type diuretics, or antiepileptic agents, known to affect serum calcium metabolism.

Additional information collected included extent of surgery, final pathology, duration of vitamin D and calcium supplementation, if required

***All patients were subjected to:***

***A) Preoperative assessment:***

1. **Thorough history taking:** including any history of manifest tetany (carpopedal spasm, stridor).
2. **Complete physical examination:**

○ **General:** Including the built, weight, pulse and blood pressure.

○ **Local:** Inspection, palpation, percussion and auscultation aiming to determine the size of the gland and its consistency, mobility or fixation to the surrounding structures, presence of palpable thrill or heard murmur.

3. **Laboratory investigations:** blood samples were obtained for thyroid functions, calcium, PTH, complete blood count, liver and kidney function tests, coagulation profile and fasting blood sugar.

4. **Radiological investigations:**

*i)* ***Neck Ultrasonography:*** This was the preliminary investigation for all patients. Examination by an experienced sonographist was a matter of concern to ensure extraction of reliable information about the thyroid disease.

*ii)* ***Thyroid Scan:*** was done for thyrotoxic patients.

*iii)* ***Plain X- ray chest P-A view***.

*iv)* ***Neck CT with contrast:*** was done for patients with retrosternal extention.

5. **Pathological investigations:** FNAC was performed for patients with solitary thyroid nodules or patients with multinodular goiter with dominant nodules.
6. **Indirect laryngoscopy:** was done for all patients to assess the mobility of both vocal cords.

**Thyrotoxic patients were prepared before surgery using:**

- Bed rest.
- Lugol's iodine 1 ml daily for 10 days pre-operatively.
- Propranolol (Inderal): 10-40 mg t.d.s.
- Antithyroid drugs for slow preparation and occasionally in rapid preparation.

***No patient was operated upon*** unless becoming adequately prepared and well controlled and this was confirmed by: Pulse rate during rest around 70 beats /minutes, absence of symptoms of thyrotoxicosis especially palpitation.

***B) Operative Technique and postoperative Management:***

**No need to write the detailed technique. You can write the name and summary of the technique in only 5-7 lines.**

***C) Statistical Analysis***

All data were subjected to revision and validation then description and analysis on IBM-compatible PC by using SPSS (Statistical Package for the Social Science) program version 22.0.0, Microsoft Office Excel 2007, and GraphPad Prism 6. Descriptive statistics were performed for all studied parameters in the three studied groups and were presented in the form of mean, median, standard deviation (SD), minimum, maximum, range, and percentages. Analytical comparison between different groups was done by using student *t* test and analysis of variance (ANOVA) for comparing parametric data when normally distributed. For comparing non parametric data, Fisher's exact test was used instead of chi-square test as Fisher's test calculates an exact P value**,** while chi-square only calculates an approximation.

## RESULTS

**The mean age of 50 patients is 35.2±8.23, of them, 38 (76.0%) were females and 12 (24%) were males.**

**Table (1):** Demographic data of the studied cases

| | | **Total no. = 50** |
|---|---|---|
| Age (years) | Mean ± SD<br>Range | 35.32 ± 8.23<br>18 – 60 |
| Sex | Female<br>Male | 38 (76.0%)<br>12 (24.0%) |

According to data results from our study, about 41 patient are normocalcemic who are 31 (75.6%) females and 10 patients (24.4%) are males with mean age 35.61±8.58 SD in range from 18 to 60 years old. While data showed that only 9 patients from our study were hypocalcemia with 7 (77.8%) were females and 2 (22.2%) patients were males with mean age 34±6.65 SD in range from 25 to 45 years old. Both age and gender relations to hypocalcemia with no significant value.

**Table (2):** Relation between patients' demographic data and hypocalcemia

| | | **No hypocalcemia** | **Hypocalcemia** | **Test value** | **P-value** | **Sig.** |
|---|---|---|---|---|---|---|
| | | **No. = 41** | **No. = 9** | | | |
| Sex | Female<br>Male | 31 (75.6%)<br>10 (24.4%) | 7 (77.8%)<br>2 (22.2%) | 0.019* | 0.890 | NS |
| Age (years) | Mean ± SD<br>Range | 35.61 ± 8.58<br>18 – 60 | 34.00 ± 6.65<br>25 – 45 | 0.527• | 0.600 | NS |

P-value > 0.05: Non significant; P-value < 0.05: Significant; P-value < 0.01: Highly significant

*: Chi-square test; •: Independent t-test

In our study 9 patients (18%) developed hypocalcemia of them 6 patients (66.7%) had no retrosternal extension and only 3 patients (33.3%) with retrosternal goiter of plunging type, while 41 patients (82%) not developed hypocalcemia, of them 32 patients (78%) with no retrosternal extension and only 9 patients (22%) with retrosternal extension.

**Table (3):** Relation between retrosternal extention at discharge and hypocalcemia in the studied cases

| Retrosternal Extention | No hypocalcemia | Hypocalcemia | Test value* | P-value | Sig. |
|---|---|---|---|---|---|
| | No. (%) | No. (%) | | | |
| No | 32 (78.0%) | 6 (66.7%) | 0.524 | 0.469 | NS |
| Pulging type | 9 (22.0%) | 3 (33.3%) | | | |

P-value > 0.05: Non significant; P-value < 0.05: Significant; P-value < 0.01: Highly significant,*: Chi-square test

Data showed that 9 patients (18%) developed hypocalcemia of which 6 patients (66.7%) had no previous thyroidectomy 9de novo) and 3 patients (33.3%) had recurrent thyroidectomy while 41 patients (82%) had not developed postoperative hypocalcemia of which 37 patients (90.2%) de novo and 4 patients (9.8%) had recurrent thyroidectomy.

**Table (4):** Relation between de Novo/recurrent thyroidectomy at discharge and hypocalcemia in the studied cases

| de Novo/ Recurrent thyroidectomy | ypocalcemia | ocalcemia | value* | lue | |
|---|---|---|---|---|---|
| | No. (%) | o. (%) | | | |
| | 7 (90.2%) | (66.7%) | 407 | 55 | |
| | 4 (9.8%) | (33.3%) | | | |

P-value > 0.05: Non significant; P-value < 0.05: Significant; P-value < 0.01: Highly significant,*: Chi-square test

Data showed that 9 patients (18%) of 50 patients involved in the study of which 6 patients (66.7) with simple goiter and 3 patients (33.3%) with toxic goiter, while 41 patients (82%) not developed hypocalcemia post t-test thyroidectomy of which only 5 patients (12.2%) with toxic goiter.

**Table (5):** Relation between toxic manifestation and hypocalcemia in the studied cases

| Toxic simple | No hypocalcemia | Hypocalcemia | Test value* | P-value | Sig. |
|---|---|---|---|---|---|
| | No. (%) | No. (%) | | | |
| Simple goiter | 36 (87.8%) | 6 (66.7%) | 2.454 | 0.117 | NS |
| Toxic goiter | 5 (12.2%) | 3 (33.3%) | | | |

P-value > 0.05: Non significant; P-value < 0.05: Significant; P-value < 0.01: Highly significant,*: Chi-square test

Data showed that only 9 (18%) patients developed laboratory hypocalcemia 6 patients (66.7%) needed no treatment which only 3 (33.3%) patients needed Ca and vitamin D on discharge with high significant value.

**Table (6):** Relation between hypocalcemia treatment at discharge and hypocalcemia in the studied cases

| Hypocalcemic patients needed treatment on discharge | No hypocalcemia | Hypocalcemia | Test value* | P-value | Sig. |
|---|---|---|---|---|---|
| | No. (%) | No. (%) | | | |
| No | 41 (100.0%) | 6 (66.7%) | 14.539 | 0.000 | HS |
| Ca + vitamin D | 0 (0.0%) | 3 (33.3%) | | | |

P-value > 0.05: Non significant; P-value < 0.05: Significant; P-value < 0.01: Highly significant
*: Chi-square test

Data collected showed that only 9 patients (100%) developed hypocalcemia and not needed muscle cutting intraoperative while 41 patients (82%) had no hypocalcemia of which 39 patients (95.1%) did not need muscle cutting and only 2 patients (4.9%) experienced muscle cutting during surgery.

**Table (7):** Relation between muscle cutting and hypocalcemia in the studied cases

| M Cutting | No hypocalcemia | Hypocalcemia | Test value* | P-value | Sig. |
|---|---|---|---|---|---|
| | No. (%) | No. (%) | | | |
| Not needed | 39 (95.1%) | 9 (100.0%) | 0.457 | 0.499 | NS |
| Needed | 2 (4.9%) | 0 (0.0%) | | | |

P-value > 0.05: Non significant; P-value < 0.05: Significant; P-value < 0.01: Highly significant, *: Chi-square test

**DISCUSSION**

In our study, the overall incidence of hypocalcemia was 18% which agrees with the international incidence published worldwide by **Asari *et al.***[15] . Not all those patients developed symptoms and signs of hypocalcemia even after one month of follow up. Only 6% of all patients developed clinical hypocalcemia. In our opinion, the percentage of symptomatizing patients is a more reliable parameter as this is the group of patients who would require closer follow up. This proves the theory that postoperative serum calcium alone is not quite reliable to detect thyroid surgery patients at risk of developing clinical hypocalcemia.

Incidence of hypocalcemia was significantly related to the extent of operation done. There was a high incidence of transient hypocalcemia after total thyroidectomy (16%), while incidence of permanent hypocalcemia after total thyroidectomy was 2%.

**Trottier *et al.*** [13] reported that most of the higher rates of hypocalcemia have been observed in patients who had total thyroidectomies. **Mehanna *et al.*** [14] reported hypocalcemia after total thyroidectomy to occur in 0.33 to 65% of cases. **Asari *et al.***[15] reported an incidence of 1.6% to 50%. **Kerimoglu *et al.*** [16] reported a lower range as he confirmed that literature has reported a high incidence of hypocalcemia between 0.1% and 32% following total thyroidectomy.

**Karamanakos *et al.*** [17] conducted a retrospective study on 2043 cases of thyroidectomy performed at a university hospital in Greece and published results almost close to our study. He stated a higher incidence of hypocalcemia in total thyroidectomy patients of 40.4% compared to 24.7% in near total thyroidectomy patients and 9.05% in subtotal thyroidectomy patients.

**Fahmy *et al.*** [18] reported that transient hypocalcemia ranges from 5.4 to 26 %, while permanent hypocalcemia ranges from 0.5 to 24 %. **Karamanakos *et al.*** [17] stated that the incidence of transient hypocalcemia in several studies varied from 6.9% to 46%, while a rate of 0.4% to 33% has been reported for permanent hypocalcemia.

Our study had an overall incidence of permanent hypocalcemia of 2%, while the incidence of transient hypocalcemia was 16%. This coincides with most of the published ranges mentioned before. Permanent hypocalcemia is defined by **Pfleiderer *et al.*** [19] as that requiring exogenous supplements at 6 months postoperatively.

**Wiseman *et al.*** [20] reported an incidence of 17 – 26% of transient hypocalcemia after total thyroidectomy. **Wu *et al.*** [21] stated that the British Association of Endocrine and Thyroid Surgeons (BAETS) third National audit reported that 30% of patients after total thyroidectomy had transient hypocalcemia and about 7% had permanent hypocalcemia requiring long-term treatment. **Asari *et al.*** [15] reported 24.1% transient hypocalcemia and 1.2% permanent hypocalcemia following total thyroidectomy.

Hypocalcemia is usually occurring within 14–72 hours after surgery [13]. Recently, there has been a great deal of interest in identifying perioperative factors that can predict the development of hypocalcemia after thyroidectomy [22]. Controversy exists concerning the most relevant measurements and the best time for their determination in predicting postoperative transient or permanent hypoparathyroidism [15].

Those patients who can be identified as being at low risk for developing postoperative hypocalcemia can conceivably be treated on an outpatient or short stay basis, which would result in considerable health care cost savings [22].

Close monitoring of serum calcium levels has always been a standard of care to identify post-thyroidectomy hypocalcemia due to parathyroid insufficiency [23]. However, the measurement of total serum calcium is inaccurate, at least in part, owing to postoperative haemo dilution [24]. Moreover, the phenomenon of calcium decline within 24 hours is not a response specific to thyroid surgery. Postoperative evolution of calcium and other electrolytes after operations of the same magnitude and duration performed outside the cervical area strictly parallels that of thyroidectomized patients. In contrast, the PTH level did not fall after such unrelated operations [23].

**Asari *et al.*** [15] found that total serum calcium levels alone; measured during the first 2 postoperative days, cannot predict transient hypoparathyroidism correctly. We have added in our study that even ionized serum calcium could not be considered alone as a reliable predictor of post thyroidectomy hypocalcemia with results showing that 18% of our patients developed biochemical hypocalcemia yet only 6% suffered symptoms and signs of hypocalcemia.

**Asari *et al.*** [15] agreed that day one postoperative PTH measurements may be considered as the most reliable predictor for determining transient or permanent hypoparathyroidism. **Kwon *et al.*** [25] reported that sensitivity of postoperative serum PTH to predict post thyroidectomy hypocalcemia was ranging from 64% to 100% and specificity ranging from 72% to 100%.

However, there is no consensus on the threshold for PTH and the optimal timing for its measurement post thyroidectomy. **Tolone *et al.*** [24] has stated that PTH measurement on the first postoperative day has been shown to be a useful method to predict post thyroidectomy hypocalcemia precising that PTH concentration; when checked 1-6 h after thyroidectomy, has a higher accuracy in predicting hypocalcemia. **Terris *et al.*** [26] narrowed the range publishing that a measurement taken in the recovery room 1–2 hours after surgery has been proven informative by several independent groups. Beforehand, **Asari *et al.*** [15] commented on intraoperative monitoring of PTH levels recommending that levels that were less below the normal range at the end of or immediately after the operation were highly correlative with postoperative hypoparathyroidism and seemed to allow for early prediction, with a sensitivity and specificity ranging from 71% to 100%.

Our study was designed to detect the usefulness of postoperative PTH as a predictor of post thyroidectomy hypocalcemia and fortunately our results agreed with most of the aforementioned publications. Out of the 9 patients who developed laboratory hypocalcemia, one patients had subnormal postoperative PTH level (<12 pg/ml) and the remaining 8 patients had a low normal PTH level (12 pg/ml). Moreover, the decline in postoperative PTH level was found to be significant (P value < 0.05) between hypo and normocalcaemic patients.

**Lombardi *et al.*** [27] found that 15 out of 16 patients who developed post thyroidectomy hypocalcemia had 4- and 6-hour postoperative PTH levels of less than 10 pg/ml with a 100% specificity, 94% sensitivity, and 98% overall accuracy. In a prospective study of 40 patients, **Lam *et al.*** [28] noted that all 12 patients who developed postoperative hypocalcemia had 1-hour postoperative PTH levels that were less than or equal to 8 pg/mL. **Pattou *et al.*** [29] reported that a postoperative PTH level of 12 pg/mL or less was very predictive of hypocalcemia; however, they did not report how many hours after surgery the PTH values were obtained.

In a meta-analysis of 27 papers, **Grodski and Serpell** [30] reiterated this recommendation, reporting that postoperative PTH at any time within the first postoperative day following total thyroidectomy can be used to accurately predict the development of hypocalcemia and anticipate the need for calcium replacement.

In this same vein, our findings support the use of intraoperative PTH to identify those patients in whom postoperative hypocalcemia may be anticipated. A level of less than 12 pg/ml had a 100% specificity, 77.8% sensitivity and 98% overall accuracy.

Whilst the use of serum PTH levels as a reliable indicator of post thyroidectomy hypocalcemia became now well established, **Tolone *et al.*** [24] declared the fact that it appears to lack the desirable 100% accuracy rate. **Lo *et al.*** [23] concluded that it is a sensitive tool to confirm postoperative normocalcaemia and to identify patients at risk of developing postoperative hypoparathyroidism however he described that other factors may determine the occurrence of postoperative hypocalcemia. This was also meeting with our study results as not all the patients who developed symptomatic hypocalcemia expressed a low intraoperative PTH level.

This made **Terris *et al.*** [26] still recommend that routine calcium monitoring may be helpful in the setting of outpatient thyroidectomy; even if postoperative PTH levels are measured, as a fail-safe mechanism should the PTH level be spuriously normal. A lot of the major worldwide health boards have adopted an outpatient thyroidectomy protocol such as The American Thyroid Association [26] and The Australian Endocrine Surgeons Society [31]**.** A Canadian review of outpatient thyroid surgery demonstrated that a short period of observation (4–10 h) is safe and that thyroid surgery can be performed as an outpatient procedure with an acceptable complication rate provided that careful patient selection and preoperative assessment are vitalized [26].

There is no statistically significant difference in complications among the TT, NT, and ST groups. Further, partial thyroidectomies provided no decisive advantage over total thyroidectomies in terms of subsequent requirement of supplemental hormone therapy. Reoperation in cases of recurrent pathology and incidental carcinoma was reported at high rates. Thus, in the total versus subtotal discussion we sided with the authors who recommend TT as the most appropriate approach for MNG [32]**.** So the continuity to perform total thyroidectomy became more safer recently with low incidence of hypocalcemia according to our study results and parallel to other international studies.

## CONCLUSION

Serum calcium concentrations have been the basis of identification of post-operative hypocalcemia however this has been replaced by PTH levels being more sensitive and specific to the early prediction of transient as well as permanent hypocalcemia. Postoperative PTH; also known as quick PTH assay, level of < 12 pg/ml was found to have an overall accuracy of 98% in early prediction of permanent hypocalcemia in our study, the continuity to do total thyroidectomy is recommended to avoid risk of complications and redo.

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