Original Article

Incidence of Hypocalcaemia in Patients Undergoing Total Thyroidectomy

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ABSTRACT

Objective: To determine the incidence of hypocalcaemia in patients undergoing total thyroidectomy.
Study Design: Cross-sectional study.
Place and Duration of Study: This study was conducted at the Department of General Surgery, Central Park Teaching Hospital, and Lahore from 1st March 2016 to 31st March 2019.
Materials and Methods: Two hundred and seventy eight patients who underwent total thyroidectomy for benign multinodular goiter and thyroid carcinoma after ethical committee approval. Euthyroid patients between the ages of 20 to 60 years without any gender bias having ASA class I, II and III were included in the study. Patients having concurrent parathyroid pathologies, redo surgery, coagulation disorders, renal failure and vitamin D deficiency were excluded. Post-operative hypocalcaemia was measure in immediate follow-up period and after 6 months.
Results: The mean age of patients was 42.22±9.25 years. The frequency of transient hypocalcaemia was found to be 11.15% and permanent hypocalcaemia was 1.8%. Transient hypocalcaemia varied by statistically significant frequency amongst different age groups (p=0.000) while permanent hypocalcaemia did not vary significantly amongst different age groups (p=0.116). There was no association of development of transient or permanent hypocalcaemia with gender and diagnosis of the patients (p>0.05).
Conclusion: The frequency of transient hypocalcaemia and permanent hypocalcaemia following total thyroidectomy was found to be 11.15% and 1.8% respectively.
Key Words: Hypocalcaemia, Multinodular goiter, Thyroid carcinoma total thyroidectomy.

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INTRODUCTION

Total thyroidectomy has gradually cemented it place as the standard procedure of choice nowadays for the management of most patients presenting with multinodular goitre and thyroid carcinoma because of the increased recurrence rates with more conservative surgical options.[1]

The parathyroid glands lie in close proximity to the thyroid gland and thus they can be inadvertently damaged during surgery of thyroid gland leading to hyperparathyroidism which principally manifests as Postoperative hypocalcaemia which is the commonest complication of total thyroidectomy these days.[2,3]

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The incidence of transient hypocalcaemia has been reported to range from 1.6% to 71% while the incidence of permanent hypocalcaemia has been reported between 0.2% to 17%.[4-7] Hypocalcaemia results from damage to parathyroid glands which may result from parathyroid gland devascularisation, direct damage to the parathyroid glands during dissection, thermal damage, venous congestion, incidental Para thyroidectomy, local edema and non-visualization of parathyroid glands during surgery.[8,9]

Hypocalcaemia can manifest clinically as carp pedal spasm, circumoral numbness, parenthesis, muscle cramps, stridor, lethargy, Trousseau sign, Chvostek sign, convulsions and cardiac arrhythmias.[10] Serum calcium levels and intact parathyroid hormone (iPTH) are the most common tests used for assessment of postoperative hypocalcaemia and hyperparathyroidism but due to the increased cost and decreased availability, measurement of iPTH has not been employed as a standard test. Moreover, serum calcium levels are a reliable predictor of determining hypocalcaemia and hyperparathyroidism after total thyroidectomy.[11].

MATERIALS AND METHODS

We conducted this cross-sectional study on a total of 278 patients who were admitted to the Department of General Surgery, Central Park Teaching Hospital Lahore from 1st March 2016 to 31st March 2019 and

underwent total thyroidectomy operation. The inclusion criteria consisted of patients of either sex between the ages of 20 to 60 years; ASA Grade I to III; and diagnosed cases of carcinoma thyroid andmultinodular goitre having normal thyroid functions test undergoing Total Thyroidectomy. Patients having concurrent parathyroid abnormalities; chronic renal failure; vitamin D deficiency; hypertension; ASA Grade IV and V; deranged thyroid function tests and previous history of neck surgery including thyroid and parathyroid surgery were excluded from the study. Patients were operated on the elective operation list. The workup started with history, detailed clinical assessment and relevant laboratory investigations including thyroid profile and radiological investigations like ultrasound of neck. Fine needle aspiration cytology (FNAC) was requested from histopathology department of the hospital. The baseline serum calcium level was also recorded and only patients with normal calcium levels were included in the study. All the patients underwent total thyroidectomy by the conventional knot tie. The surgery was led by a professor or an associate professor who were assisted by a senior registrar or post graduate trainees.

Serum calcium levels were assessed in all patients daily till discharge from the hospital. Most patients were discharged on the third post-operative day. Serum calcium level less than 8 mg/dL at any instance was taken as hypocalcaemia. Patients will be given calcium and vitamin D3 supplement (calcium carbonate 1250mg; cholecalciferol 125IU, Qalsan D) one tablet twice daily. Patients were then followed for serum calcium levels at 3 and 6 months of surgery. The calcium levels were checked on follow up visits such that calcium supplements were not taken for 24 hours. Patients having serum calcium levels below 8 mg/dL after 6 months of surgery were labeled as cases of permanent hypocalcaemia while those in which hypocalcaemia settled were labeled as cases of transient hypocalcaemia. Follow up was ensured by taking contact numbers of all patients. The data was analyzed through SPSS-25**.**

RESULTS

The mean age of patients included in the study was 42.22±9.25 years.

Table No. 1: Stratification of transient and Permanent hypocalcaemia amongst different age groups

Variable	Age groups (years)		Total	P value
	20-40	41-60		
Transient hypocalcaemia				
	2	29	31	0.000
	150	97	247	
Permanent hypocalcaemia				
	1	4	5	0.116
	151	122	273	

There was a female predominance with 212 out of 278 patients (76.26%) while 68 patients (23.74%) were male giving the female to male ratio of 3.2:1. Out of 278 total patients, 152 patients (54.68%) were between the ages of 20-40 years while 126 patients (45.32%) had ages between 41-60 years. Ninety one patients (32.73%) were classified as ASA Grade I, 142 patients (51.08%) were ASA Grade II, while the remaining 45 patients (16.19%) were classified as ASA Grade III respectively.

Table No. 2: Stratification of transient and permanent hypocalcaemia according to gender

Variable	Gender		Total	P value
	Male	Female		
Transient hypocalcaemia				
	8	23	31	0.774
	58	189	247	
Permanent hypocalcaemia				
	2	3	5	0.389
	64	209	273	

Table No. 3: Stratification of transient and permanent hypocalcaemia according to diagnosis

Variable	Diagnosis		Total	P value
	MNG	Carcinoma		
Transient hypocalcaemia				
	25	6	31	0.774
	205	42	247	
Permanent hypocalcaemia				
	3	2	5	0.175
	227	46	273	

As regards the diagnosis, 230 patients (82.73%) were cases of benign multinodular goiter while 48 patients (17.27%) cases undergoing total thyroidectomy were cases of thyroid carcinoma. The mean preoperative serum calcium level of all the patients included in the study was 9.25±0.54 mg/dL. The mean serum calcium level on the third post-operative day (day of discharge) was 8.67±0.67 mg/dL. The frequency of transient hypocalcaemia was calculated to be 11.15% (31 out of 278 patients), while the frequency of permanent hypocalcaemia came out to be 1.8% (5 out of 278 patients) respectively (Table Figs. 1-2). There is statistically significant difference in frequency of transient hypocalcaemia (p=0.000), however the frequency of permanent hypocalcaemia between different age groups was statistically non-significant (p=0.116) [Table 1]. There was no statistically significant difference in the frequency of transient hypocalcaemia (p=0.774) as well as permanent hypocalcaemia (p=0.389) [Table 2]. There was no statistically significant difference in the frequency of transient hypocalcaemia (p=0.744) as well as permanent hypocalcaemia (p=0.175) [Table 3]**.**

DISCUSSION

Total thyroidectomy has become the surgical procedure of choice for both multinodular goiter and most cases of thyroid carcinoma and hypocalcaemia are one of the most common complications.[12] Studies have reported a disparate results regarding the frequency of hypocalcaemia after total thyroidectomy.

In this study, the mean age of patients was found to be 42.22±9.25 years. A study from Karachi by Baloch et al[13] reported a comparable mean age of 42.1 years. Edafo et al[14] reported a mean age of 46.7 years, while a higher mean age of 50.7±15.9 was reported in a study by Baldassarre et al.[15] Our study comprised of 76.26% female patients. Baloch et al[13] reported a comparable frequency of female patients equal to 78.45%, while studies by Edafo et al[14], Baldassarre et al[15] and Basim et al[16] reported the frequency of female gender to be 77.3%, 81.1% and 83.5% respectively.

In our study, 82.73% were diagnosed cases of benign multinodular goiter while the 17.27% patients had diagnosis of thyroid carcinoma. However in the study by Baloch et al[13], thyroid carcinoma was the predominant diagnosis in 87.58% cases and only 12.41% patients were cases of benign diseases.

The frequency of transient hypocalcaemia was found to be 11.15% while the frequency of permanent hypocalcaemia i-e. Hypocalcaemia persisting for more than 6 months after surgery was observed in 1.8% patients. The frequency of transient hypocalcaemia was found to be significantly associated (p=0.000) with the age of the patients at the time of surgery as shown in Table 1. The odds of development of permanent hypocalcaemia were also greater in older patients. However there was no gender predisposition of developing postoperative hypocalcaemia after total thyroidectomy. Similarly the preoperative diagnosis had no bearing on the development of hypocalcaemia.

A study by Nair et al[9] published in 2013 reported the frequency of transient hypocalcaemia following total thyroidectomy to be 23.6% which was higher than our result while the frequency of permanent hypocalcaemia was reported as 1.61% which was comparable to our study. Contrary to our results, the study reported that there was no difference in the frequency of transient hypocalcaemia (p=0.732) or permanent hypocalcaemia (p=0.332) between different age groups. Total thyroidectomy was also found to be significantly associated with the diagnosis of multinodular goiter for transient hypocalcaemia (p=0.02).

A similar study from Karachi by Baloch et al[13] reported that the frequency of transient and permanent hypocalcaemia was 7% and 0.11% respectively. Another study by Basim et al[16] from India in 2017 reported the incidence of hypocalcaemia to be 24.27%. The study also reported that the frequency of hypocalcaemia was greater in patients more than 50 years of age but the frequency didn't vary by a statistically significant proportion (p=0.35).

Baldassarre et al[15] reported the incidence of hypocalcaemia in total thyroidectomy to be 9% which was comparable to our study. However this study reported that postoperative hypocalcaemia was significantly associated with female gender (p<0.001, and malignancy (p<0.001).

Edafe et al[17] reported the frequency of post-thyroidectomy transient and permanent hypocalcaemia as 29% and 5.5% respectively.[14]Iqbal et al in 2010 reported the frequency of transient hypocalcaemia to be 21.6% with none of the patients developing permanent hypocalcaemia. Esimontas et al in 2018 from Lithuania reported a much higher frequency of post-operative hypocalcaemia in 64.2% patients.[18] While Ritter et al[19] reported the frequency of transient and permanent hypocalcaemia to be 18% and 1.9% respectively.

The above mentioned studies highlight the wide disparity in the reported incidence of postoperative hypocalcaemia. Hypocalcaemia is an important post-operative complication following total thyroidectomy that develops due to hyperparathyroidism resulting from direct or indirect damage to the parathyroid glands. It not only increases the hospital stay with studies reporting an increase in stay up to 7 days but also increases the financial burden.[20]

Various techniques have been reported by different studies for prevention of postoperative hypocalcaemia such as prophylactic postoperative calcium supplementation, identification and preservation of parathyroid glands and their vasculature, auto transplantation of parathyroid glands and use of magnification loupes for better visualization amongst others.[21-24] Moreover there is an increased tendency of overprescribing calcium and vitamin D supplements in these patients which predisposes the patients to development of complications like renal stones etc.[25]

Thus we recommended that meticulous dissection technique aimed at preserving parathyroid glands should be employed to prevent hypocalcaemia after total thyroidectomy. Prophylactic administration of calcium and vitamin D supplements can prevent postoperative hypocalcaemia, however their prolonged use should only be prescribed in the light of serum levels of calcium since the overall frequency of permanent hypocalcaemia after total thyroidectomy is very less. Owing to the increased cost of iPTH assay, it was not done in our patients. Further research is recommended to find out frequency of hypocalcaemia following total thyroidectomy with the newer dissection techniques like LigaSure small jaw, Focus harmonic scalpel and laparoscopic thyroidectomy**.**

CONCLUSION

The frequency of transient hypocalcaemia and permanent hypocalcaemia following total thyroidectomy was found to be 11.15% and 1.8% respectively. We recommend the use of calcium and vitamin D supplements in the postoperative period to prevent the development of hypocalcaemia; however prolonged use of these supplements should be based on serum calcium levels**.**

Author's Contribution:

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