MEDICAL CHANNEL

Original Article

FREQUENCY OF TRANSIENT & PERMANENT HYPOCALCAEMIA AFTER THYROID SURGERY

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ABSTRACT:

Objective of Study: To find out the frequency of transient & permanent Hypocalcaemia in patients undergoing Thyroid surgery for benign as well malignant diseases of Thyroid.
Design: Quasi- Experimental study
Place & Duration of Study: Public & private sector Hospitals of Jamshoro & Hyderabad from Jan 2009 to Sept 2012.
Patients & Methods: All patients of Thyroid pathology who fulfilled the inclusion criteria admitted in were rule in for Hypocalcaemia after Thyroid Surgery. All these patients were evaluated preoperatively for Hypocalcaemia. Affect of serum Albumin was excluded by measuring serum Albumin preoperatively. Postoperatively serum calcium levels were measured on 1st, 2nd, 3rd & 7th postoperative day, if needed repeated at one month. All relevant information was recorded on a proforma.
Results: During this period 112 patients of Thyroid pathology who undergoing total, near total, subtotal or completion Thyroidectomy or total lobectomy alone or on one side & subtotal lobectomy or Enucleation of nodules on other side were evaluated. It includes 87 female & 25 male patients with mean age of 35.2 ± 13.3 years. Hypocalcaemia occurred in 24 patients with transient hypocalcaemia in 16 patients while permanent hypocalcaemia in 08 patients.
Conclusion: Transient Hypocalcaemia was noted in 16 patients while permanent hypocalcaemia in 08 patients.

Key words: Thyroid pathology, thyroid surgery, Hypocalcaemia.

INTRODUCTION

The role of total, subtotal & near total thyroidectomy as standard procedure for thyroid pathology is well accepted. Many surgeons, however debate its routine use, mainly because of high risk of complications especially postoperative hypocalcaemia & recurrent laryngeal nerve injury[1, 2].

Hypocalcaemia after these procedures may be transient or it may be permanent. Several studies demonstrate transient & moderate decrease in serum calcium levels as a common finding which is found in 1.6 – 53.6% patients after total thyroidectomy[3]. Permanent hypoparathyroidism with result of hypocalcaemia after total thyroidectomy is found in 0.3 – 13.8% patients as shown in various studies. It is due to inadvertent resection of parathyroid glands or damage to their blood supply [3, 4]. The number of parathyroid glands preserved in situ did not help predict the duration of post-surgical calcium treatment, nor the final outcome of hypocalcaemia[5, 6].

Hypocalcaemia after total & near total thyroidectomy may be due to many causes. It includes transient hypocalcaemia due to hyperventilation which leads to respiratory alkalosis. It may also be due to multiple blood transfusions of stored blood[2, 3].

Calcium deficiency has profound effects on body. Important among them are[5,7]

- Disturbances in the conduction of electrical current through nerves leading to

paresthesia, numbness & in extreme cases it can cause respiratory suffocation.
- Disturbances in the motility of gut
- Disturbances in the conductive system of heart which can lead to serious cardiac arrhythmias.

This study is an attempt to determine frequency of transient & permanent Hypocalcaemia after different types of thyroid surgeries for different thyroid diseases.

PATIENTS & METHODS

This Quasi - Experimental study was conducted at public & private sector Hospitals of Jamshoro & Hyderabad from Jan 2009 to Sept 2012. It includes all patients of either sex above the age of 13 years having thyroid pathology undergoing total, near total, subtotal or completion Thyroidectomy or total lobectomy on one side & subtotal lobectomy on other side. Patients of both sex with age less than 13 years, patients with clinical or subclinical symptoms & signs of Hypocalcaemia or low levels of serum calcium preoperatively or altered serum Albumin levels were excluded. Patients having serious co morbid illness like Ischemic Heart Disease (ASA-3), Severe Chronic Obstructive Airway Disease requiring ventilator support, and complicated chronic liver disease were excluded. Also patients who lost to follow-up up or did not consented for study were excluded.

These patients were admitted in ward. Detailed history was taken especially in data related to age, sex, symptomatology, co morbid illness & family history of thyroid & parathyroid diseases. Patients were specifically asked for circumoral tingling, numbness of fingers & toes, apprehension, seizures & carpopedal spasm. Thorough examination was performed with special focus on variables like anemia, weight loss & general health of the individual. Specific clinical tests such as Trousseau's sign & Chovstek signs were performed pre & postoperatively. Patients of toxic goiter were made euthyroid clinically as well biochemically preoperatively by giving Carbimazole & Beta blocker for 3 months which were continued till night before surgery.

Investigations like complete blood count, blood sugar, blood urea and where required ECG and chest x-ray were performed to assess general fitness. In addition investigations related to pathology like thyroid profile, serum calcium & Albumin, Ultrasound neck & thyroid, Thyroid scan, FNAC dominant nodule of thyroid, C.T scan of Neck & x-ray thoracic inlet were performed to establish diagnosis. Diagnosis was made & appropriate procedure performed. These patients undergoing surgery under General Anesthesia with controlled ventilation & at no time during & after surgery patients developed hyperventilation. Capsular dissection was done in all cases. This is in the avascular plane outside the capsule, but very close to it, minimizing blood loss. The thyroid gland was approached by separating the strap muscles in the midline, digitally retracting the upper pole of the lobe downwards

Table1. Characteristics of patients & procedures performed (n=112)

Type of Thyroid Pathology	Type of Procedure performed						
	Total Thyroidectomy	Subtotal Thyroidectomy	Near Total Thyroidectomy	Total lobectomy	Total Lobectomy with sub total lobectomy of contra lateral Lobe	Total Lobectomy & Enucleation of Nodules from opposite lobe	Total
Non toxic MNG	07(6.25%)	38(33.92%)	-	-	17(15.17%)	05(4.46%)	67(59.82%)
Nodule either lobe of Thyroid or Isthmus	-	-	-	16(14.28%)	-	06(5.35%)	22(19.64%)
Malignant Thyroid	17(15.17%)	-	-	-	-	-	17(15.17%)
Controlled toxic goiter	02(1.78%)	-	01(0.89%)	-	-	-	03(2.67%)
Autoimmune Thyroiditis	02(1.78%)	-	-	-	-	-	02(1.78%)
Recurrent Goiter	01(0.89%)	-	-	-	-	-	01(0.89%)
Total	29(25.89%)	38(33.92%)	01(0.89%)	16(14.28%)	17(15.17%)	119.82%)	112

Table II. Transient Hypocalcaemia in operated cases n=16/112(14.82%)

Type of Thyroid Pathology	Type of Procedure performed						
	Total Thyroidectomy	Subtotal Thyroidectomy	Near Total Thyroidectomy	Total lobectomy	Total Lobectomy with sub total lobectomy of contra lateral Lobe	Total Lobectomy & Enucleation of Nodules from opposite lobe	Total
Non toxic MNG	02(1.78%)	08(7.14%)	-	-	01(0.89%)	00	11/67 (10.33%)
Nodule either lobe of Thyroid or Isthmus	-	-	-	00	-	00	00/22
Malignant Thyroid	03(2.67%)	-	-	-	-	-	03/17 (17.64%)
Controlled toxic goiter	01(0.89%)	-	01(0.89%)	-	-	-	02/03 (66.66%)
Autoimmune Thyroiditis	00	-	-	-	-	-	00/02
Recurrent Goiter	00	-	-	-	-	-	00/01
Total	06/29 (20.68%)	08/38 (21.05%)	01/01 (100%)	00/16	01/17 (5.88%)	00/11	16/112 (14.28%)

and ligating the superior thyroid artery flush with the thyroid. Surrounding tissues are separated from the capsule by blunt dissection, from above down, till the middle thyroid vein is encountered in the middle of the gland. This vein is smaller in length and is doubly ligated flush with the gland and cut between sutures. At this level keeping close to the thyroid capsule prevents damage to the recurrent laryngeal nerve behind the prevertebral fascia and also facilitates recognition of the parathyroid glands preventing its inadvertent removal. The branches of the inferior thyroid artery are ligated separately very close to the gland. Drains were not routinely used in any of the patients. At surgery efforts were made to identify and preserve the parathyroid glands and if parathyroid inadvertently removed or injured then autotransplantation was done in sternocleidomastoid muscle[8,9].

Patients were briefed about the diagnosis and procedure to be performed. Patients were informed and permission was taken. They were assured that their participation is voluntary with no harms to them in terms of getting due treatment. They were also given right to withdraw from study without putting any reasons. Patient's data was recorded on a preformed proforma. All this data was analyzed for categorical and continuous variables like age, sex, Type of thyroid pathoogy, type of thyroid surgery, Transient & permanent hypocalcemia in relation to type of thyroid pathology & type of thyroid surgery performed. Primary variables studied in this study were transient & permanent hypocalcemia & its relation to type of thyroid pathology & type of thyroid surgery; & secondary variables were age & sex of patient, type of thyroid patholgy & type of thyroid procedure performed.

STATISTICAL ANALYSIS

Specific statistical tests were applied & P- value was calculated. P-value less than 0.05 was considered significant. All analysis was done using SPSS 12.0.

RESULTS

During this period 112 patients of different Thyroid pathologies who undergoing total, near total, subtotal or completion thyroidectomy or Total Lobectomy on one side & subtotal lobectomy on other side were studied. Age ranged from 16 years to 70 years with mean age of 35.2 years ± 13.3 years. 87 patients were female while 25 were male making female to male ratio of 3.48:1.

Out of these 112 patients, 67 patients were of multinodular

Table II. Permanent Hypocalcaemia in operated cases n=08/112(7.14%)

Type of Thyroid Pathology	Type of Procedure performed						
	Total Thyroidectomy	Subtotal Thyroidectomy	Near Total Thyroidectomy	Total lobectomy	Total Lobectomy with sub total lobectomy of contra lateral Lobe	Total Lobectomy & Enucleation of Nodules from opposite lobe	Total
Non toxic MNG	01/07	01/38	-	-	00/17	00/05	02/67 (2.98%)
Nodule either lobe of Thyroid or Isthmus	-	-	-	00/16	-	00/06	00/22
Malignant Thyroid	03/17	-	-	-	-	-	03/17 (17.64%)
Controlled toxic goiter	01/02	-	00/01	-	-	-	01/03 (66.66%)
Autoimmune Thyroiditis	01/02	-	-	-	-	-	01/02 (50%)
Recurrent Goiter	01/01	-	-	-	-	-	01/01 (100%)
Total	07/29 (24.13%)	01/38 (2.63%)	00/01	00/16	00/17	00/11	08/112 (7.14%)

goiter, 22 patients of Nodule either lobe or isthmus of thyroid, 17 patients of thyroid malignancy, 3 patients of controlled toxic goiter, 2 patients of autoimmune thyroiditis & 1 patients of recurrent multinodular goiter.

Among 17 patients of thyroid malignancy 13 patients were having papillary carcinoma & 4 patients of follicular carcinoma. Total thyroidectomy was performed either as initial procedure or as staged procedure in patients with thyroid malignancy. 13 patients of papillary carcinoma & one patient of Follicular carcinoma undergoing Total Thyroidectomy as an initial procedure as clinically as well as on FNAC & on U/S Thyroid tumor were behaving as malignant tumor. While remaining 3 patients of Follicular carcinoma undergoing total thyroidectomy as staged procedure as none of the above findings were in favour of malignancy. Amongst them 2 patients of staged procedure & 12 patients of initial procedure received 1 pint of fresh blood preoperatively. Six patients of this group developed symptoms & signs of Hypocalcaemia which settled down in 3 patients within one week & While in remaining 3 patients who developed permanent hypocalcaemia which required calcium & vitamin D therapy for longer period.

Among 67 patients of non Toxic MNG, 38 patients undergoing subtotal thyroidectomy, 7 patients undergoing total thyroidectomy, 5 patients had Total Lobectomy on one side Excision of Nodules from other lobe & in 17 patient's Total lobectomy on one side & subtotal Lobectomy on other side were performed. 3 patients in this group who undergoing total thyroidectomy received 2 pints of blood per & postoperatively. 21 Patients of subtotal thyroidectomy & 1 patient of total lobectomy on one side & sub total

lobectomy on other side received 1 pint of fresh blood preoperatively. Hypocalcaemia was noted in 3 patients who undergoing total thyroidectomy that settled down in 2 patients on supplemental treatment & 1 patient developed permanent hypocalcaemia. While Hypocalcaemia was found in 9 patients who undergoing subtotal thyroidectomy recovered on supplemental therapy in 8 patients while 1 patient had permanent hypocalcaemia. 1 patient who had total lobectomy on one side & subtotal lobectomy on other side developed hypocalcaemia who recovered in 1 week period on calcium therapy.

All 22 patients of Nodule either lobe of Thyroid or isthmus undergoing total lobectomy of the relevant side or isthmusectomy. However peroperative examination of contralateral lobe revealed

nodules in 6 patients which were enucleated. 2 patients in this group received 1 pint of fresh blood preoperatively. No patient in this group developed hypocalcaemia.

Among 3 patients of controlled toxic goiter 2 undergoing total thyroidectomy &1 near total thyroidectomy. All these patients received 2 pints of fresh blood per & postoperatively. Hypocalcaemia was noted in all 3 patients postoperatively on 3rd postoperative day which responded to conservative treatment in 1 patient while 2 patients developed permanent hypocalcaemia.

2 patients of Autoimmune Thyroiditis & 1 patient of recurrent goiter undergoing total thyroidectomy. Patient of recurrent goiter required 2 pints of fresh blood per & postoperatively. Permanant Hypocalcaemia was noted in 1 patient of autoimmune variety & 1 patient with recurrent goiter postoperatively.

Clinical & Biochemical Hypocalcaemia occurred in 16 patients which remain less than one week in 2 patients, less than one month in 7 patients & more than one month in 7 patients. All these patients were put on calcium supplement therapy either orally or through injectables depending upon severity of Hypocalcaemia.

Limitations:
i) Lack of frozen section facility to identify Parathyroid glands peroperatively.
ii) Non availability of Intra- operative & Postoperative PTH analysis.

DISCUSSION:

Thyroidectomy has a definite role in the management of malignant and benign thyroid disorders, with minimal complications and rare postoperative mortality. Even though thyroid surgery is quite safe, mechanical damage, revascularization or inadvertent removal of the parathyroid glands are possible leading to Hypocalcemia[10]. It occurs more frequently in certain high-risk patients. However, hypoparathyroidism does not appeared to be the main reason for hypocalcaemia after thyroidectomy, and other causes including surgical stress, "hungry bone syndrome", release of calcitonin during surgical manipulation, may be important contributory factors[10,11].

Permanent hypoparathyroidism is a distressing complication of thyroid surgery. The reported incidence varies between 0.4 and 13.8 % and is directly correlated to the extent of thyroidectomy[12]. Total thyroidectomy, extra thyroidal extension of the tumor, and thyroiditis were found to be the risk factors [13].

Nonetheless, the incidence of hypocalcaemia following thyroidectomy remains significantly high in the range of 1.6% to 50%, with permanent hypocalcaemia occurring in 1.5% to 4% of the cases[5]. Regardless of surgeon experience, an incidental parathyroid gland features occasionally in the pathology reports of thyroid specimens[10]. In this study transient hypocalcaemia was noted in 16/112(14.28%) patients & permanent hypocalcaemia in 8/112(7.14%) patients.

In study by Khairy etal [13] Postoperative hypocalcaemia occurred in 18 (38.3%) of the patients in whom the parathyroid gland was removed inadvertently and in 48 (20%) of the rest of the patients (P=.0123). In their study, the factors that did not increase the risk for inadvertent parathyroidectomy & resultant hypocalcaemia included age, sex, pathological features (whether benign or malignant), modified radical neck dissection, central compartment clearance, and completion thyroidectomy. In previous studies, female sex [14] and younger age[11] were found to be the risk factors. In another study [15] male sex was reported as a strong predictor of incidental removal. However, in series by Khairy etal[13], age and sex were not found to carry any risk for IPE while Rix and Sinha [16] showed a strong statistically significant association. In this study 03/17(17.64%) patients in whom total Thyroidectomy was done for Malignant Thyroid developed transient Hypocalcaemia & 03/17(17.64%) patients developed permanent hypocalcaemia,

In study by Pesce CE etal at Johns Hopkins University, USA [17]. They found that Graves' disease patients had significantly higher odds of greater number of calcium tablets prescribed upon discharge. Further, 6 of 68 patients with Graves' disease and no patient in the control group were readmitted with tetany. There was a trend, though not significant, toward patients with Graves' disease having a higher prevalence of hypocalcaemia the day after thyroidectomy and 1 month later. In this study 3 patients of controlled toxic goiter were operated with total thyroidectomy in 2 patients & near total thyroidectomy. All 3 patients developed hypocalcaemia with one patient who developed transient hypocalcaemia was of near total thyroidectomy.

In another study by Chindavijak S on prediction of Hypocalcaemia in total thyroidectomy at National Cancer Institute, Thailand [18] he found Post operative hypocalcaemia in 20 of 30 patients. Those hypocalcaemia patients showed statistically significant lower intraoperative PTH at 20 minute post total thyroidectomy. Intraoperative PTH at 20 minutes after total thyroidectomy can predict impending post operative hypocalcaemia. Based on the result, this can guide which patients will be considered safe, and who can be discharged early. Furthermore, it is used to closely monitor the calcium level and provide early calcium supplementation. In study conducted in Iran by Sokouti M etal [19] on Sixty-five patients of thyroid malignancy, who were treated by total thyroidectomy with or without radical neck dissection. Transient hypocalcaemia occurred in 18 patients. None of patients progressed to permanent hypocalcaemia. However they found a significant difference in hypocalcaemia occurrence between patients, who had just total thyroidectomy and those who undergoing thyroidectomy with neck dissection (p=0.01).

In this study 29/ 112(25.89%) patients undergoing total thyroidectomy for different thyroid diseases. Amongst them 6/ 29(20.68%) patients developed transient hypocalcaemia while 7/ 29(24.13%) patients developed permanent hypocalcaemia.

In another prospective study conducted in Turkey by Unalp HR etal [20] on 143 consecutive patients who undergoing surgical therapy for non-toxic multinodular goiter. Patients were randomly assigned to surgical procedures. Patients in group 1 (n = 75) performed TT, and patients in group 2 (n = 68) performed near total thyroidectomy (NTT). The difference between serum calcium levels and percentage decrease in serum calcium levels before and after thyroidectomy were calculated. TT had a 33-fold increased risk for hypocalcaemia. Moreover, TT had a 8-fold and a 27-fold higher risk than NTT for moderate and severe percentage decreases in serum calcium level, respectively. In this study 67/112 patients were operated for Non toxic MNG. Transient & permanent hypocalcaemia developed in 02/01 of Total thyroidectomy (07), in 08/01 patients of Subtotal thyroidectomy (38), in 01/00 patients of total lobectomy on one side & subtotal lobectomy on other side (17) & in total lobectomy with Enucleation of nodules on other lobe (05) no patient developed hypocalcaemia.

In a feasibility study on endoscopic thyroidectomy, Gagner et al [21] concluded that there was no significant difference in the rate of IPE between endoscopic and traditional open thyroidectomy. In

study by Khairy etal [13], about 43% of the incidentally resected parathyroids were intrathyroidal. Intrathyroidal location of parathyroids has been described in about 2% to 5% of autopsy studies[22]. Thus, incidental parathyroidectomy may occur even in the hands of more experienced thyroid surgeons.

CONCLUSION:

Hypocalcaemia is a common finding after thyroid surgery. Total thyroidectomy, toxic goiter and thyroiditis were found to be the risk factors for Hypocalcaemia; however, to date there is no reliable way of predicting in which patients this will happen.

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Operational definitions.[8,9]

Total thyroidectomy: Total removal of thyroid gland leaving no residual thyroid gland.

Subtotal thyroidectomy: Removal of bulk of thyroid tissue from both lobes leaving behind 4 -6 gms of thyroid tissue within the vicinity of Recurrent laryngeal nerve.

Near Total Thyroidectomy: Hemithyroidectomy and a removal of a considerable part of the contralateral lobe. Only a sliver of tissue was left along the recurrent laryngeal nerve to protect the integrity of the nerve.

Total Lobectomy: removal of one lobe and the isthmus and was performed for unilateral nodular disease and a normal contralateral lobe.

Hypocalcaemia: Hypocalcaemia was defined as serum calcium level less than 8mg/dl & it was symptomatic .It was considered Permanent when despite treatment serum calcium levels remain below 8 mg/ dl at the end of one month.