

Study of hypocalcemia and its risk factors in post thyroidectomy in Al-Karama Teaching Hospital

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Abstract:

Background: Hypocalcemia is a well-recognized complication of thyroid surgery. The aim of this study was to determine the incidence of hypocalcemia after thyroid surgery and find out the risk factors involved regarding the patient's age, gender, muscular build, clinical diagnosis, extent of surgery, ligation of the inferior thyroid artery, and pathology report.

Patients and Methods: This case series study was carried out on 50 patients who have undergone thyroid surgery for various thyroid diseases at the surgical department of Al-Karama Teaching Hospital for the period between January 2016 and July 2017. Serial serum calcium measurements were recorded as well as details of the operation, patient's age and gender, whether or not inferior thyroid artery was ligated, and the pathological report. Hypocalcemia was considered transient if it resolved within 6 months and permanent if it persisted after 6 months and the patient was maintained on supplementation therapy of calcium and vitamin D.

Results: The study found that the incidence of post-thyroidectomy hypocalcemia was 30% and in the majority of the cases (24%) was transient, while it was permanent in only (6%) of the cases; and had occurred mainly after total thyroidectomy and in cases with ligation of the inferior thyroid artery.

Conclusions: It was concluded that post thyroidectomy hypocalcemia is a relatively common complication but it is transient in the majority of the patients. Its incidence is related to the extent of the surgery and can be reduced by the good preparation of the patient preoperatively.

Keywords: Calcium therapy, Hypocalcemia, Thyroidectomy

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Introduction:

Hypocalcemia is defined as serum corrected calcium level below 8mg/dl. Permanent hypocalcemia is defined as persistent hypocalcemia after 6months of thyroidectomy. Theodore Kocher may be credited for refining the systems for thyroidectomy what's more diminishing that occurrence about post-operative discharge. He additionally perceived the vitality of protection for parathyroid organs.(1) Post-operative hypocalcemia is a champion among the troubles for thyroidectomy, its recurrence will be a more prominent sum as a relatable point following total thyroidectomy over after other a more noteworthy sum preservationist thyroidectomy.(2) The reported recurrence rate of transient hypocalcemia ranges from (1.6%-9.3%) following subtotal thyroidectomy likewise from (6.9%-42%) at that point a short time later out and out thyroidectomy. On differentiate, immutable hypocalcemia requires been accounted already, (0.2-3%) from guaranteeing patients after subtotal

thyroidectomy moreover secured close by (0.4-29%) about patients following total thyroidectomy.2 It regularly shows itself within the first 24hours post-operatively on the other hand inside the 2-days after surgery, and very rarely may begin after 2-3 weeks.(3) Done most by far patients it is transient that decides precipitously likewise best couple patients make enduring hypocalcemia.(4) Completed 80% for cases it decides in with respect to 12months.(5) The peril about this obfuscating depends on the extent of the medical procedure, the nature of the hidden disease and the information of the working authority. Moreover, specific careful issues require help experienced already, instances of dreary thyroid sickness, extensive goiter, anatomic varieties, retrosternal on the other hand without a doubt mediastinal zone what's more damage of the parathyroid organs. Hypocalcemia is more incessant in broad thyroidectomy when contrasted with minor resections of the thyroid organ, in the ligation of the sub-par thyroid supply route and has been identified with the specialist's understanding.(6) The body of a youthful grown-up human contains around 1100g (27.5mol) of calcium. , 99% of which is in the skeleton. The serum calcium, is usually around 10mg/dL (5meq/L-2.5mmol/L) is halfway bound to

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protein and incompletely diffusible. Serum calcium is dispersed among three structures which is protein bound (40%), attached to phosphate and to different anions (10%) and ionized (50%).(7)

Daily calcium intake is 1-3gm, most of which is discharged by means of the inside with urinary discharge moderately low. Body calcium adjustment is under complex hormonal control; yet aggravations in digestion are moderately long haul and less imperative in the intense careful setting. In any case, regard for the basic part of ionized calcium in neuromuscular capacity frequently is required.(8) The system and pathogenesis of hypocalcemia after thyroid medical procedure isn't totally seen, in any case, it is ascribed to careful harm perpetrated on the parathyroid organs amid thyroidectomy or illustration, coordinate damage, devascularization, or accidental evacuation, vascular damage is likely more essential than unintentional expulsion.(6)

Patients and methods:

This observational study was conducted on 50 patients operated on for thyroid diseases in the surgical department of Al-Karama Teaching Hospital from January 2016 to July 2017. Patients, who had undergone total, near total or subtotal thyroidectomy by bilateral exploration were included in the study. Patients with concurrent lymph node dissection and pre-existing hypocalcemia were excluded. Preliminary workup included a complete clinical examination and biochemical assay of hormone profile. Ultrasound imaging of the thyroid gland and the neck in general was done routinely. Aspiration cytology was performed from all solitary nodules and nodules showing suspicious features on clinical examination or ultrasound imaging. Plain helical computerized tomography was done when clinical evidence of mediastinal extension was noted. Hyperthyroidism was controlled before the operation. Vocal cords were assessed by indirect laryngoscopy prior to the operation. The operation was performed by members of surgical team under general anesthesia, good muscle relaxation and endotracheal intubation. On the operating table, patients should be supine, and must be tilted up by 15o at the end of head to lower venous engorgement. A gel pad is put transversely under the shoulder, to extend the neck, make the gland clearer and to provide tension to the skin. A gently curved skin incision is done midway between the thyroid cartilage notch and the suprasternal notch. Flaps of skin, subcutaneous tissue and platysma are raised to the superior thyroid notch and downwards to the suprasternal notch. The sternothyroid muscle is mobilized off the thyroid lobes with care taken to be near the muscle and outside capsule. Lateral mobilization is done by the capsular dissection technique to identify the

parathyroid glands and recurrent laryngeal nerves. Total, near total, or subtotal resection of each lobe is performed, absolute haemostasis can be maintained by vessels ligation and by thyroid remnants suture to the tracheal fascia. The cervical fascia and pre-tracheal muscles are sutured and the wound is closed. Vocal cords are reassessed after extubation by direct laryngoscopy. Hypocalcemia is diagnosed when serum calcium level drops below 8 mg/dL. Patients with transient hypocalcemia received oral calcium supplementation (1g three or four times/day). Patients who developed neuromuscular symptoms received intravenous infusion of calcium gluconate, 10ml of 10% calcium gluconate (equivalent to 8.4mg or 2.3mmol calcium) was administered (1mg elemental calcium/kilogram body weight/h). Serum calcium was estimated to screen for the parathyroid insufficiency at the first review (4-6weeks following surgery). Three Patients who developed complications were reviewed monthly for 12 months or more.

Results:

A total of 50 patients between 20 and 70 years of age underwent thyroidectomy during the study period at the surgical department of Al-Karama Teaching Hospital, of whom 46 were females and 4 were males. Most of patients 35 patients(70%) had a simple multinodular goiter, 6(12%) of patients had Grave's disease, 4 patients (8%) had toxic nodular goiter, 3 patients(6%) had thyroiditis, and only two patients (4%) had cancer. as shown in Table (1) .

Table (1): Distribution of the occurrence of hypocalcaemia by the type of thyroid disease

Thyroid disease	Hypocalcaemia		Total
	Yes	No	
MNG	7	28	35
Ca	2	0	2
Thyroiditis	2	1	3
Grave's	2	4	6
TNG	2	2	4
Total	15	35	50

X² value = 9.0476, df = 4, P > 0.05 (Not significant)

Total thyroidectomy was performed for (10%) of the patients, near total thyroidectomy for (22%) of patients and subtotal thyroidectomy for (68%) of patients. Among the five patients with Total Thyroidectomy, 2 were diagnosed as cancer, 2 as Graves' disease and 1 as toxic nodular goiter. Among those with Near-total Thyroidectomy 5 were with MNG, 1 with thyroiditis, 3 with Graves' disease and 2 with toxic nodular goiter. Finally, for patients who underwent Subtotal Thyroidectomy, 30 had MNG, 2 had thyrpoiditis, 1 had grave's disease and another 1 had toxic nodular goiter, as shown in Table (2)

Table (2): Distribution of cases according to the type of the surgical procedure and thyroid disease.

Type of Surgery	MNG	CA	Thyroiditis	Grave's	Toxic Nodular Goiter	Total
Total Thyroidectomy	0	2 (4%)	0	2 (4%)	1 (2%)	5 (10%)
Near total Thyroidectomy	5 (10%)	0	1 (2%)	3 (6%)	2 (4%)	11 (22%)
Subtotal Thyroidectomy	30 (60%)	0	2 (4%)	1 (2%)	1 (2%)	34 (68%)
Total	35	2	3	6	4	50

Fifteen patients (30%) developed hypocalcaemia postoperatively which was transient in 12 (24%) and permanent in 3 (6%). One each of the three patients who developed permanent hypocalcaemia had undergone total thyroidectomy, near total thyroidectomy and subtotal thyroidectomy, as shown in Table (3).

Table (3): Distribution of cases according to the type of the surgical procedure and the occurrence of hypocalcaemia

Type of surgery	Hypocalcaemia		No Hypo-calcaemia	Number & % of patients
	Transient	Permanent		
Total thyroidectomy	3 (6%)	1 (2%)	1 (2%)	5 (10%)
Near total thyroidectomy	4 (8%)	1 (2%)	6 (12%)	11 (22%)
Subtotal thyroidectomy	5 (10%)	1 (2%)	28 (56%)	34 (68%)
Total	12 (24%)	3 (6%)	35 (70%)	50 (100%)

X² value = 9.654, df = 2, P < 0.05 (Significant)

All patients diagnosed with cancer had post thyroidectomy hypocalcaemia while (66.7%) of patients with thyroiditis had hypocalcaemia, (33.3%) of those with Grave's disease had hypocalcaemia,

(50%) of those with toxic nodular goiter had hypocalcaemia and only (20%) of those with simple multinodular goiter had hypocalcaemia, as shown in Table (4).

Table (4): Distribution of cases according to the type of the surgical procedure, histopathology and the occurrence of hypocalcaemia

Type of surgery	Number of patients	Hypocalcaemia	MNG	CA	Thyroiditis	Grave's	Toxic Nodular Goiter
Total Thyroidectomy	5	4	-	2	-	1	1
Near total Thyroidectomy	11	5	2	-	1	1	1
Subtotal Thyroidectomy	34	6	5	-	1	-	-

Eleven (91.7%) out of the 12 patients who developed transient hypocalcaemia, and two (66.7) out of the three patients who developed permanent hypocalcaemia were females, Figure (1). While one (8.3%) out of 12 patients who develop transient hypocalcaemia and one (33.3%) out of the three patients who developed permanent hypocalcaemia were males. , as shown in Table (5).

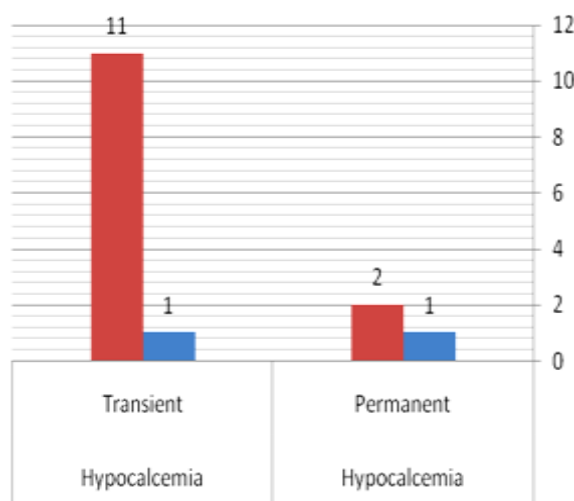


Figure (1): Distribution of the cases by the occurrence of hypocalcaemia and gender.

Table (5): Distribution of the cases by the occurrence of hypocalcaemia and gender

Gender	Hypocalcaemia		Total
	Yes	No	
Females	13	33	46
Males	2	2	4
Total	15	35	50

X² value = 0.8283, df = 1, P > 0.05 (Not significant)

All of the 16 patients who had undergone total or near total thyroidectomy have had bilateral ligation of the inferior thyroid artery. Ten of those patients (66.6%) had hypocalcaemia. Out of the 34 patients who had undergone subtotal thyroidectomy 15 have had a unilateral ligation of the inferior thyroid artery, and five (33.4%) had hypocalcaemia postoperatively. All four patients who developed hypocalcaemia following total thyroidectomy were of normal or below normal muscular built, while only one patient out of the 5 who have had hypocalcaemia following near total thyroidectomy was obese and of a short neck and one patients out of the six who have had hypocalcaemia following subtotal thyroidectomy were obese and of a short neck; Figure (2).

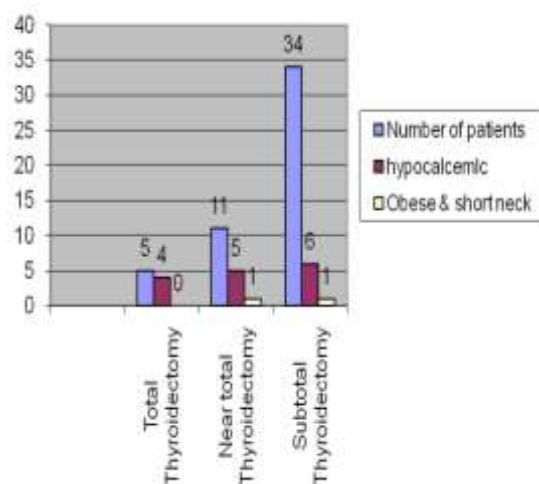


Figure (2): Distribution of the cases by the occurrence of hypocalcaemia and muscular built

Discussion:

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. The result of this study showed that the incidence of post-thyroidectomy hypocalcaemia is 30% and that it was transient in the majority of the cases. One third of the patients who had transient hypocalcemia (33.3%) and two thirds of the patients who had permanent hypocalcemia (66.6%) belong to the 31-40 years age group, which is nearly similar to the results of Chaudhary et al. Most of the patients who had transient hypocalcemia (91.7%) and most of the patients who had permanent hypocalcemia (66.7%) were females, which is similar to the results of Thomusch. Regarding the type and extent of the surgical procedure, we found that the incidence of transient hypocalcaemia was 60% after total thyroidectomy, 36.3% after near-total thyroidectomy and only 14.7% after subtotal thyroidectomy. The incidence of permanent hypocalcemia was 20% after total thyroidectomy, 9% after near-total thyroidectomy and only 2.9% after subtotal thyroidectomy. These figures are consistent with those reported in other studies (Chaudhary et al, Nair al, and Wingert et al), which showed that the extent of resection and surgical technique has a greater impact on the rate of post-thyroidectomy hypocalcaemia. Regarding the ligation of the inferior thyroid artery, the current study found that (66.6%) of the patients who underwent bilateral ligation of that artery had post-thyroidectomy hypocalcaemia while (33.4%) of the patients who underwent a unilateral ligation of that artery had hypocalcaemia, indicating that the procedure is an important risk factor. This result was due to the inadvertent excision of parathyroid gland in total thyroidectomy and belong to the 31-40 years age group the interference with the blood supply of the parathyroid gland in case of truncal inferior thyroid artery ligation.

Regarding the clinical and the pathological diagnosis, the current study found that all patients with thyroid cancer had post thyroidectomy hypocalcemia. The others developed hypocalcaemia in the following rates: 66.7% of patients with thyroiditis, (33.3%) of patients with Grave's disease, 50% of patients with toxic nodular goiter, and only 20% of patients with simple multinodular goiter. These findings are in agreement with other studies which showed that the thyroid cancer is a risk factor for inadvertent parathyroid excision. This was due to the radical removal of thyroid tissue, excessive dissection, and truncal ligation of inferior thyroid artery. All these factors might lead to unintentional removal of parathyroid gland and subsequent hypocalcaemia.

Regarding the muscular built of the patient, the current study found that only 13.3% of the patients who had post-thyroidectomy hypocalcemia were obese and with a short neck.

Conclusion:

It was concluded that post-thyroidectomy hypocalcaemia is a relatively common phenomenon, especially after extensive thyroid surgery but it is transient in the majority of the cases. Its incidence is related to the extent of the surgical procedure especially if this was associated with ligation of the inferior thyroid artery and it can be only reduced by the use of the appropriate surgical procedures.

Authors' contributions:

Dr. Mohammed Hillu surriah; Data collection , analysis , writing and discussion the results .
 Dr.Ahamed Nafa; Data collection, analysis, sharing in discussion the data.
 Dr. Amine Mohammed:Also sharing in collection ,analysis and discussion of data .

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دراسة نقص كلس الدم وعوامله الخطرة في مرحلة ما بعد استئصال الغدة الدرقية في مستشفى الكرامة التعليمي

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الدكتور أمين محمد بكور

الخلاصة:

خلفية الموضوع : نقص كلس الدم هو احد المضاعفات المعروفة جيداً لجراحة الغدة الدرقية. غالباً ما يكون هذا حدث عابر يحدث بعد استئصال الغدة الدرقية المكثف الذي قد يتطلب مكملات الكالسيوم و / أو فيتامين د لتخفيف أو منع الأعراض. كان الهدف من هذه الدراسة هو تحديد نسبة حدوث نقص كلس الدم بعد جراحة الغدة الدرقية ومعرفة عوامل الخطر المتعلقة بسن المريض ونوعه وبناء العضلات ، والتشخيص السريري ، ومدى الجراحة ، وربط الشريان الدرقي السفلي ، وتقرير علم الأمراض.

المرضى وطرق العمل : أجريت هذه الدراسة المستقبلية على 50 مريضاً خضعوا لجراحة الغدة الدرقية بسبب أمراض الغدة الدرقية المختلفة في القسم الجراحي لمستشفى الكرامة التعليمي في الفترة ما بين يناير 2016 إلى يوليو 2017.

تم تسجيل قياسات الكالسيوم في المصل المسلسل وكذلك تفاصيل العملية وسن المريض ونوع الجنس ، ربط الشريان الدرقي أو عدمه ، تقرير مرضي. تم اعتبار نقص كلس الدم عابراً إذا تم حلها في غضون 6 أشهر ودائم إذا استمرت بعد 6 أشهر. وتم ابقاء المريض على العلاج التكميلي للكالسيوم وفيتامين D.

النتائج: أن نسبة حدوث نقص كلس الدم بعد الغدة الدرقية كانت 30% وفي معظم الحالات (24%) كانت عابرة ، بينما كانت دائمة في 6% فقط من الحالات وحدثت بشكل رئيسي بعد استئصال الغدة الدرقية الكلي وفي حالات ربط الشريان الدرقي السفلي.

الاستنتاجات : خلاصنا إلى أن نقص كلس الدم بعد استئصال الغدة الدرقية هو اختلاط شائع نسبياً ، لكنه عابر في غالبية المرضى . يرتبط حدوثه بمدى الجراحة .

الكلمات المفتاحية : استئصال الغدة الدرقية ، نقص كلس الدم ، العلاج بالكالسيوم .