

INCIDENCE OF HYPOCALCAEMIA AFTER SUTURELESS TOTAL THYROIDECTOMY AND CONVENTIONAL TOTAL THYROIDECTOMY- A COMPARATIVE STUDY

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ABSTRACT

BACKGROUND

Symptomatic and asymptomatic hypocalcaemia can occur in a significant proportion of patients who undergo thyroidectomy surgery. This study aims to determine the incidence of postoperative hypocalcaemia after sutureless thyroidectomy and conventional thyroidectomy.

MATERIALS AND METHODS

During a period of 3 years from 2015 to 2018, we included 120 patients who underwent total thyroidectomy in the department of general surgery into the study. Patients were divided into group 1 that included sutureless surgery using harmonic scalpel or bipolar diathermy and group 2 which included conventional suture ligation only. Post operatively, the serum calcium level was tested at 24 hours, 72 hrs and 1 week after thyroidectomy. The incidence of hypocalcaemia was studied in both the groups. Apart from this, the incidence of perioperative complications was also studied.

RESULTS

Among the 120 patients, 62 patients underwent sutureless thyroidectomy and 58 patients underwent conventional surgery. Transient hypocalcaemia occurred relatively more in patients who underwent sutureless thyroidectomy. Only one patient who underwent sutureless surgery developed persistent mild hypocalcaemia after 1 month of surgery who became normocalcaemic at 3 months. There were no cases of permanent hypocalcaemia in both the groups.

CONCLUSION

Incidence of transient hypocalcaemia was more with sutureless thyroidectomy. With regard to occurrence of permanent hypocalcaemia, there was no statistically significant difference between the two groups as none of the patients developed permanent hypocalcaemia.

KEYWORDS

Sutureless, Hypocalcaemia, Transient, Hypoparathyroidism.

HOW TO CITE THIS ARTICLE: Gopal A, Vijayakumar N. Incidence of hypocalcaemia after sutureless total thyroidectomy and conventional total thyroidectomy – a comparative study. J. Evid. Based Med. Healthc. 2018; 5(51), 3453-3456. DOI: 10.18410/jebmh/2018/703

BACKGROUND

Goitre is defined as an enlargement of the thyroid, have been recognized since 2700 b. c.

The normal thyroid gland weighs 20-25 gms. The functional unit is the lobule supplied by a single arteriole and consists of 24-40 follicles lined with cuboidal epithelium. The follicle contains colloid in which thyroglobulin is stored. The metabolic effects of the thyroid hormones are due to unbound free T4 and T3. Most adults have four parathyroid glands, but supernumerary glands occur, and nests of parathyroid tissue are commonly found in the thymus. The superior parathyroid is more consistent in position than the

inferior. The superior gland is commonly found in fat above the inferior thyroid artery and close to the cricothyroid articulation. The inferior parathyroid gland is usually found under the capsule of the upper horn of the thymus or on the inferior pole of the thyroid lobe.

The parathyroid glands secrete the 84-amino acid peptide parathyroid hormone (PTH), which controls the level of serum calcium in extracellular fluid. Circulating ionized calcium acts directly on parathyroid glands in a negative feedback fashion to regulate the secretion of PTH.¹

PTH is released in response to a low serum calcium or high serum magnesium level. PTH acts directly on bone to increase bone resorption and mobilize calcium. PTH also increases calcium reabsorption from distal tubules and renal activation of vitamin D with subsequent increased gut absorption of calcium. Renal excretion of phosphate is also increased.

Thyroidectomy as a first line treatment for Graves' disease is again gaining popularity in the United States, at least in some centers.² Total thyroidectomy is increasingly being employed for multinodular goitre and for the surgical management of thyrotoxicosis that has relapsed on medical

Financial or Other, Competing Interest: None.
Submission 22-11-2018, Peer Review 25-11-2018,
Acceptance 08-12-2018, Published 11-12-2018.
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DOI: 10.18410/jebmh/2018/703



treatment. This is the standard operation for thyroid cancer. It is also undertaken prophylactically in patients who are genetically at high risk of familial medullary thyroid cancer.

The indication for excision of the whole thyroid in papillary and medullary cancer is the commonly multifocal pattern of the disease. In follicular cancer the rationale is complete eradication of thyroid tissue so that any metastases can be identified and treated by uptake of radioactive iodine.

Post-operative hypocalcaemia or parathyroid insufficiency is due to removal of the parathyroid glands or infarction through damage to the parathyroid end artery; often, both factors occur together. Vascular injury is probably far more important than inadvertent removal. The incidence of permanent hypoparathyroidism should be less than 1 per cent and most cases present dramatically 2–5 days after operation but, very rarely, the onset is delayed for 2–3 weeks or if a patient with marked hypocalcaemia is asymptomatic. Rates of post procedure hypocalcaemia are approximately 5%, and it resolves in 80% of cases in approximately 12 months.

Every effort was made to evaluate the parathyroid tissue intra operatively. For glands that appear to be devascularised, the use of immediate parathyroid auto transplantation of 1-mm fragments of saline chilled tissue into pockets made in the sternocleidomastoid muscle or the brachioradialis muscle is extremely effective in avoiding permanent hypocalcaemia.

When the extracellular fluid concentration of calcium ions falls below normal, the nervous system becomes progressively more excitable because this causes increased neuronal membrane permeability to sodium ions, allowing easy initiation of action potentials.

At plasma calcium ion concentrations above 50 percent below normal, the peripheral nerve fibers become so excitable that they begin to discharge spontaneously, initiating trains of nerve impulses that pass to the peripheral skeletal muscles to elicit tetanic muscle contraction. Consequently, hypocalcaemia causes tetany.³ It also occasionally causes seizures because of its action of increasing excitability in the brain.

Tetany ordinarily occurs when the blood concentration of calcium falls from its normal level of 9.4 mg/dl to about 6 mg/dl, which is only 35 percent below the normal calcium concentration, and it is usually lethal at about 4 mg/dl.

Hypocalcaemia may be asymptomatic if the calcium levels are more than 7 gm/dl. This is usually treated by oral administration of calcium.

MATERIALS AND METHODS

The aim of this study is to compare the incidence of hypocalcaemia after conventional thyroidectomy and sutureless thyroidectomy. This study was conducted in a tertiary care hospital and medical college in Kozhikode district of Kerala state. Informed written consent and necessary institutional research ethical clearance was obtained. Patients who underwent total thyroidectomy for

various thyroid diseases between June 2015 and January 2018 were selected for the study.

Preoperatively serum calcium was measured in all patients. Only patients with normal pre-operative serum calcium levels were included. All surgeries were performed in the second surgical unit by surgeons with more than 5 years' experience in thyroid surgeries. Patients were randomly selected for sutureless thyroidectomies and conventional thyroidectomies. All surgeries were performed under general anaesthesia with all standard protocols followed. Biochemical euthyroid status was obtained in all cases preoperatively.

During surgery, in all patients, a Kocher's collar incisions ranging from 5 cms to 7 cms were used. Both the recurrent laryngeal nerves were identified and protected in all cases. External laryngeal nerves were identified and safeguarded in about 80 percent of cases. Branches of inferior thyroid arteries were separately ligated with Vicryl 4-0 close to the thyroid gland and the blood supply to at least two of the parathyroids were preserved. In sutureless surgery, superior pedicles, middle thyroid veins & branches of the inferior thyroid arteries and veins were coagulated with Covidien bipolar diathermy. Cases with previous history of thyroid surgeries and recurrent goitres were not included in this study.

Post operatively the patients were admitted in post-operative ICU for 18 to 24 hours. Patients were clinically monitored for symptoms and features of hypocalcaemia like circumoral numbness, carpopedal spasm, trousseau sign, Chvostek's sign etc. Serum calcium was estimated at 24 hours, 72 hours and after 1 week. Patients with serum calcium levels less than 8 mg/dl at 1 week were subjected to repeat assessment at 3 weeks.

Inclusion Criteria

1. Patients of either sex who underwent total thyroidectomy in our surgical unit between June 2015 and January 2018.
2. Age group between 22 and 64.

Exclusion Criteria

1. Patients with recurrent thyroid swellings and past history of irradiation to neck.
2. Patients whose preoperative serum calcium levels less than 8 gm/dl

RESULTS

The study included 120 patients of which 110 are females and the remaining 10 males. The average duration of surgery was 70 minutes in sutureless surgery and 80 minutes in conventional sutured thyroidectomy. No major complications occurred. Out of the 62 cases of sutureless surgeries, 20 patients had temporary hypocalcaemia. Among the 58 conventional surgery candidates only 10 had temporary hypocalcaemia.

In both groups, the serum calcium level was between 6.8 to 7.9 gm/dl during 3rd to 7th post-operative days. All cases were adequately treated with parenteral and oral

calcium supplementation. There were no cases of permanent hypocalcaemia. 6 patients developed small seromas. All cases resolved spontaneously in 2-3 weeks'

time. No cases presented with apparent hoarseness of voice post operatively. Slight change in quality of voice occurred in about 12 cases.

	MNG Non-Toxic	MNG Toxic	Graves' Disease	Follicular Neoplasm	Ca Thyroid
Incidence	85	12	6	10	7
Sutureless thyroidectomy	44	6	2	6	4
Conventional thyroidectomy	41	6	4	4	3

Table 1. Indications for Surgery and Distribution of Cases

Age	Males	Females	Total
20-40	3	46	49
40-60	5	52	57
>60	2	12	14

Table 2. Age and Sex Distribution

Thyroidectomy	No. of Cases	Hypocalcaemia	
		Temporary	Permanent
Sutureless	62	20 (32%)	0 (nil)
Sutured	58	10 (17%)	0 (nil)

Table 3. Incidence of Hypocalcaemia

Complications	Group 1	Group 2
Post-operative bleeding	1	1
Vocal cord palsy	0	0
Haematoma	3	2
Transient hoarseness of voice	4	4
Seroma	2	4
Hypertrophic scarring	2	2

Table 4. Perioperative Complications

DISCUSSION

Endocrine neck surgery is associated with general non-surgical morbidity in less than 1.5% of patients, corresponding to respiratory (1.5%), urologic (0.9%) gastrointestinal (0.8%), and cardiac (0.5%) complications. In addition, allergy, drug, or other abnormal reactions are reported in 0.4% of patients.⁴

The complications of thyroidectomy include hypocalcaemia, damage to the external laryngeal and recurrent laryngeal nerves, haematomas, vascular injuries, seromas, wound cellulitis. Transient hypocalcaemia (from surgical injury or inadvertent removal of parathyroid tissue) has been reported in up to 50% of cases, but permanent hypoparathyroidism occurs <2% of the time. Although the reported incidence of non-recurrent laryngeal nerve is less than 1%, the surgeon has to be aware of the existence of this rare anatomic condition.^{5,6} Postoperative hypocalcaemia is more likely in patients who undergo concomitant thyroidectomy and central and lateral neck dissection and in patients with Graves' disease. The reported rate of hypocalcaemia after thyroid surgery varies from 1% to over 50%.^{7,8,9}

Although the pathogenesis of post thyroidectomy hypocalcaemia is multifactorial, damage to the parathyroid glands in the form of direct injury, unrecognized inadvertent

removal, or indirectly by devascularization of the gland are the most common causes. Knowledge of the specific anatomic details and meticulous surgical technique are prerequisite conditions for successful restriction of the risk of hypocalcaemia. Controversy exists regarding the how many parathyroid glands should be preserved during thyroid surgery for normal calcium homeostasis. While some argue that preservation of a singular intact parathyroid gland is sufficient for normal homeostasis, others recommend the identification and in situ preservation of at least three glands.

If the viability of a parathyroid gland is doubtful, it has to be cut into small fragments and auto transplanted into the sternomastoid muscle (orthotopic autotransplantation). Several studies reported a decrease of the risk of permanent hypoparathyroidism to less than 1% when this approach is practiced.^{2,10} Recently it was shown that intraoperative parathyroid hormone (PTH) determination allows prediction of postoperative hypocalcaemia (PTH <10 pg/ml) and the necessity of early vitamin D supplementation in order to reduce the risk of postoperative symptomatic hypocalcaemia.¹¹

Patients exhibiting clinical signs of hypocalcaemia, such as circumoral or acral paraesthesia, muscle cramps, or numbness of the hands and feet, may be orally treated with calcium carbonate or calcium lactate in divided doses to a total of 2-8 gms per day. Additionally, calciferol or dihydrotachysterol may be required in order to enhance calcium absorption. After normalization of serum calcium levels, oral calcium therapy is continued until stabilization of calcium homeostasis is achieved. Severe symptoms require immediate intravenous therapy with 10 ml 10% calcium gluconate over 3-5 minutes and subsequent continuous infusion of 0.9% saline containing 30-40 ml 10% calcium gluconate per 24 hours.

Permanent hypocalcaemia (more than 6 months postoperatively) is a major concern causing impairment of life quality, chronic gastrointestinal discomfort, changes in bone metabolism, and development of cataracts. Single reports on heterologous transplantation of parathyroid tissue after microencapsulation with amitogenic alginate exist, however, reliable clinical systems are not yet widely available.¹²

CONCLUSION

The incidence of temporary hypocalcaemia was comparatively more after sutureless total thyroidectomy, 32% compared to conventional thyroidectomy, 17%. None

of the patients developed permanent hypocalcaemia. Hypocalcaemia was found to be maximum between 24 to 72 hours after surgery. Response to intravenous calcium gluconate was adequate during corrective treatment.

Other postoperative complications are comparable in both study groups. Sutureless thyroidectomy is a safe viable alternative to conventional surgery with no statistically significant difference in permanent hypocalcaemia and other complications.

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