



## ORIGINAL ARTICLE

# POST-THYROIDECTOMY HYPOCALCAEMIA: CLINICAL AND HISTOPATHOLOGICAL STUDY

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### Abstract

**Aim:** To study the relation between post- thyroidectomy clinical hypocalcaemia and histopathological finding of parathyroid tissue.

**Methods:** From Jan 2006 to June 2009; 50 cases of thyroidectomy was carried out. All surgical specimens were examined histopathologically. The cases that showed parathyroid tissue were recorded. Blood samples were collected for corrected serum (ionised) calcium on first postoperative day. Calcium (and vitamin D) treatment started from day one to all cases with low calcium levels (however clinical manifestatios of hypocalcimeamanifested or not). After two weeks, corrected calcium was measured. Patients with hypocalcaemia were followed up till 6 months postoperatively

**Results:** The mean age of the patients was 34.7 years and 60% were female. Thirty cases were simple nodular goiter while 20 cases were Graves' disease. Histopathological examination showed the presence of parathyroid tissue in 12 cases. Postoperative (ionised) calcium was within normal range in 45 patients while 5 patients had low (ionised) calcium level. Clinically, two patients presented with manifestations of hypocalcaemia. After two weeks of calcium treatment, corrected calcium level was back to normal except in one case that required long term calcium (and vitamin D) treatment. That case proved to have permanent hypocalcaemia as calcium level was still below normal after 6 months of surgery.

**Conclusions:** The accidental removal of parathyroid tissue does not necessarily mean (temporary) or permanent hypocalcaemia. The incidence of (hypoparathyroidism in this study was lower than expected in relation to histopathologically proven removed parathyroid gland)(early calcium and vitamin D treatment decreases the morbidity of temporary and permanent hypoparathyroidism).

**Keywords:** Parathyroid, calcium, thyroid surgery.

### INTRODUCTION

In spite of significant changes that occurred in the past few decades in relation to the evolution of techniques

for safe and effective surgery for thyroid disease, this is still associated with a higher rate of postoperative hypocalcaemia.<sup>(1)</sup>

In the surgeon's view, the most likely cause of postoperative hypocalcaemia (PH) certainly is hypoparathyroidism secondary to devascularization or inadvertent excision of one or more parathyroid glands during surgery.<sup>(2)</sup> In situ preservation of as much functional parathyroid tissue as possible is the key to minimizing permanent hypoparathyroidism.<sup>(3)</sup> However, some glands may be anatomically intact but not physiologically viable, either because of thrombosis of the delicate parathyroid artery or because of parathyroid capsule edema despite meticulous dissection.<sup>(4)</sup>

However, pathophysiological pathways for the development of PH after thyroid surgery remain a point of discussion with the necessity for further research.<sup>(5,6)</sup>

The aim of this study was to find out if the rate of PH after thyroid resection is related to the incidental removal of parathyroid gland and to evaluate the role of early postoperative calcium treatment in preventing permanent hypocalcaemia.

## PATIENTS AND METHODS

From Jan 2006 to June 2009; thyroid surgery was attempted in 50 consecutive patients. The patients were evaluated by the Endocrinology, Anesthesia and Surgery units to rule out significant contraindications for surgery. Patients were evaluated by physical examination, free T3, free T4 and thyroid stimulating hormone levels, serum levels of calcium and laryngoscopy. They all gave their written consent for the operations.

All the patients in the preoperative periods were given an antibiotic prophylaxis with Ceftriaxone 1gm. Total thyroidectomy was the standard procedure for all cases of simple nodular goiter and Graves' disease.

All surgical specimens were sent for histopathological examination. On first postoperative day, blood samples were collected from all patients to measure corrected calcium level. The cases that showed hypocalcaemia were treated by intravenous calcium gluconate then oral calcium (400 mg twice daily) vitamin D in the form of one alpha). Two weeks after surgery, the corrected serum calcium level was measured.

The patients with postoperative hypocalcaemia were followed up at the end of the first month, and then every month in the first postoperative year.

After total thyroidectomy, 100 mg of levothyroxine was commenced, and thereafter, the dose of levothyroxine was adjusted according to the free T3, free T4 and thyroid stimulating hormone levels. Postoperative

serum calcium levels were checked on the first postoperative day, and then were subsequently checked daily if serum calcium level was under the normal limit or the patient had clinical signs of hypocalcaemia. Hypocalcaemia was considered permanent, if the patient required calcium supplement to maintain normal serum calcium level for longer than 6 months.

If the patient stopped the calcium supplementation within 6 months, the situation was accepted as temporary hypocalcaemia.

**Statistical analysis:** Data were expressed as mean  $\pm$  SD for age. Statistical analysis was made by SPSS 11.5.

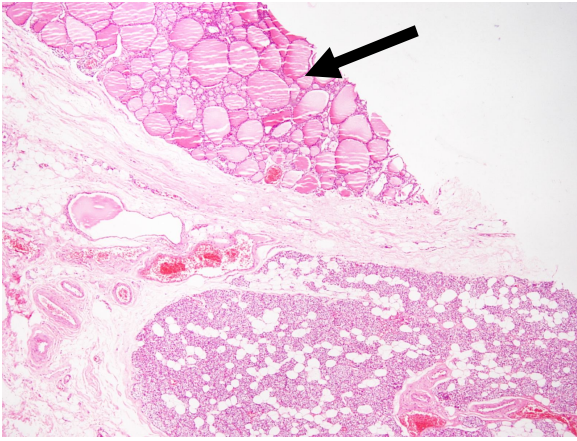
## RESULTS

Table 1 shows the criteria of patients included in the study. The age ranged from 21 to 47 with an average of  $34.7 \pm 8.36$  years while 60% of the patients were females and 40% were males. The preoperative diagnosis varied between nodular goiter and toxic goiter and postoperative histopathological examination of the surgical specimens confirmed the preoperative diagnoses as 30 cases of simple nodular goiter and 20 cases of toxic goiter and parathyroid tissue was accidentally found in some slides. The total number of cases that had parathyroid tissue removed during surgery was 12 (Fig.1). Eight cases were associated with toxic goiter and 4 cases were found in cases of simple nodular goiter. Only 5 cases showed low corrected calcium level on day one postoperatively. Out of those 5 patients, only 2 patients presented with symptoms of hypocalcaemia e.g. numbness and body cramps.

Two weeks later, corrected calcium was repeated where the number of hypocalcaemic patient was reduced under calcium treatment to one patient that persisted for more than six months denoting permanent hypoparathyroidism Table 2.

**Table 1. Criteria of the patients included in the study.**

34.7 $\pm$ 8.36 years (range 21-47)	Age
Male 40% (20 cases)	Gender
Female 60% (30 cases)	
Simple nodular goiter (30 cases)	Diagnosis
Graves' disease (20 cases)	



**Fig 1. Post-thyroidectomy histopathology slide stained with H&E shows thyroid tissue and a group of parathyroid cells (marked by black arrow).**

**Table 2. Postoperative relation between calcium level and histopathology findings.**

50 cases	Total number of cases
12 cases	Parathyroid tissue found
(8 Graves' disease & 4 simple nodular goiter)	
5 cases	Hypocalcemia cases
	(Laboratory finding)
2 cases	Clinically evident hypocalcemia
1 case	Permanent hypocalcemia
	(> 6 months)

## DISCUSSION

Although risk factors for morbidity of thyroid surgery are well defined, their actual contribution to morbidity rates is still debated.<sup>(7,8)</sup> Postoperative morbidity was found to be increased with the increasing extent of thyroid resection.<sup>(9,10)</sup>

In addition, underlying thyroid disease, intraoperative technique, surgeon's experience were the risk factors for

postoperative thyroid morbidity.<sup>(11)</sup> The surgical technique is one of those factors debated to affect the outcome of thyroid surgery.<sup>(12-14)</sup>

Despite of the era of modern and extended thyroid surgery, which has been advocated by Deldridge at the end of the 20th century, postoperative hypothyroidism is still a major concern following thyroid surgery.<sup>(3,15)</sup> It often extends the duration of hospital stay and the need for biochemical tests, and it significantly increases the overall costs of thyroidectomy. When severe, it can lead to serious complications and require intravenous therapy to alleviate the clinical symptoms.<sup>(16,17)</sup>

Even in the hands of surgeons experienced in endocrine surgery, hyperthyroidism was reported as an independent risk factor for developing RLN (recurrent laryngeal nerve) injury and hypoparathyroidism after total thyroidectomy.<sup>(18,19)</sup>

Hypoparathyroidism can be assessed by identification of subnormal parathyroid hormone levels; however, in many studies, hypoparathyroidism was accepted as the cause of hypocalcaemia, even when parathyroid hormone levels were not assessed.

Hypoparathyroidism constituted the majority of the complications after total thyroidectomy in most series.<sup>(20)</sup> The incidence of hypoparathyroidism varied in different series with the dominance of temporary nature.

Although there were reports of hypoparathyroidism with high incidences as 30.4% and 35% after total thyroidectomy, the incidence of permanent hypoparathyroidism was not high (0.4% and 3%, respectively) in these studies.<sup>(21,22)</sup>

Systematic dissection of RLN was reported to increase hypoparathyroidism, mainly by devascularization of parathyroid glands. However, in the experienced hands routinely identifying RLN, percentages of total and permanent hypoparathyroidism after total thyroidectomy were not high (9.6% and 0.7%, respectively). The reason for significantly high incidence of temporary hypocalcaemia when RLN was identified was thought to be the result of the comprehensive dissection which might have caused temporary trouble to vascular supply of parathyroid glands.<sup>(23,24)</sup>

It was known that routine parathyroid autotransplantation increased postoperative temporary hypocalcaemia and decreased permanent hypocalcaemia. Parathyroid gland autotransplantation was not routine in our study. The increased incidence of parathyroid gland autotransplantation in some studies showed that parathyroid gland autotransplantation was influenced by the identification of RLN, but did not reduce the incidence of hypocalcaemia. Increased number of ischemic glands might have been recognized as a result of comprehensive dissection.

Autotransplantation was thought to be unsuccessful owing to the implantation of only the ischemic gland.<sup>(25-27)</sup>

The accidental removal of parathyroid tissue does not necessarily mean evident or permanent hypocalcaemia. The incidence of parathyroid removal was higher in toxic goiter than in simple nodular goiter.

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