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Study of changes in thyroid profile and serum calcium after subtotal thyroidectomy

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ABSTRACT

Thyroidectomy is a common procedure being performed worldwide as a treatment of choice for thyroid enlargement. Subtotal thyroidectomy (STT) is considered as a preferred method over total thyroidectomy as in the previous procedure the surgeon leaves a small thyroid remnant *in situ* to preserve thyroid function, thereby preventing lifelong thyroid hormone supplementation therapy. The aim of this retrospective case study was to assess thyroid functions before and after STT. A retrospective case note review of patient of goiter admitted in the ENT department of our hospital was done. The parameters included in the study were thyroid function tests and their half-lives, serum calcium and serum albumin. After surgery, the slow decrease in levels of T₃ and T₄ were because of their half-lives. This case study concluded that the patient under study developed hypothyroidism, temporary hypocalcaemia and temporary hypoalbuminemia after STT.

KEY WORDS: Half-life, subtotal thyroidectomy, thyroid function tests

INTRODUCTION

Goiter is an enlargement of thyroid gland. It usually presents as a non-tender anterior neck mass. The patients generally presented with wheezing, change in quality of voice, difficulty in respiration and dysphagia [1]. Approximately, 45% patients have sub-sternal extension of the gland [2]. Two types of treatment modalities are available. The first mode is the medical treatment, which reduces the size of the gland or may avoid the progression of the disease; it is commonly used in asymptomatic patients. Second mode of treatment is the surgical procedure which is one of the most frequently performed, since ancient times. These procedures are frequently done in patients presented with symptoms of thyroid disease. The outcome and complication rates are chiefly dependent on skill and experience of the surgeon. Two different surgical techniques are used for the treatment of hyperthyroidism: Total thyroidectomy and subtotal thyroidectomy (STT). STT was considered better because of the lower incidence of post-operative complications, including recurrent laryngeal nerve paralysis and hypo-parathyroidism, and an anticipated post-operative euthyroid state by leaving a small remnant of thyroid tissue *in situ* to maintain adequate hormone production. There is, however, the risk that the disease will persist or recur in the remnant [3]. The aim of this retrospective case study was to evaluate the thyroid functions before and after STT for hyperthyroidism. In this case report, we also mention the importance of half-lives of T₃ and T₄, the levels of serum

calcium and serum albumin to determine the frequency of post-operative complications after revision STT.

CASE REPORT

The case we present here is about a 46-year-old male patient presented with neck swelling to the Department of ENT at Shri Guru Ram Rai Institute of Health and Medical Sciences, Dehradun. The swelling was slowly progressing since 5-6 years. Physical examination revealed that the swelling was soft, mobile, non-tender, and non-pulsatile on palpation and measure about 6 cm × 7 cm. No previous history of Tuberculosis, diabetes mellitus and hypertension. Personal history showed that he was a smoker (2-3 packs/day) and alcoholic since 8-10 years. Family history was irrelevant. He had undergone STT 2 years back, but due to financial problem he stopped taking treatment and after 9 months of operation, the swelling developed again. Later, he presented to our institute. Computed tomography was done, which showed a diffusely enlarged thyroid gland with a heterogeneous contrast enhancement. The left lobe of the gland extended medially to the left of the midline behind the oropharynx.

Various investigation like thyroid function tests (TFTs), Fasting blood glucose, serum albumin and serum calcium (uncorrected) were performed. TFTs include thyroid-stimulating hormone (TSH) (reference values 0.465-4.68 mIU/L), total thyroxine (T₄) (reference values 59-153 nmol/L) and total triiodothyronine (T₃)

(reference values 0.56-1.88 ngm/ml). TFTs were estimated using commercial kits on chemiluminescence. Serum calcium and serum albumin were measured by commercially available enzymatic reagents on auto-analyzer (Vitros dry chemistry). Pre-operative TFTs showed the patient was hyperthyroid, i.e., levels of T_3 and T_4 were very high, while the levels of TSH were very low than their normal ranges. Revision STT was done. The pathological examination revealed multinodular colloid goiter with features of hyperplasia. TFTs, serum calcium were measured routinely every 4 h after surgery and at least once a day during the hospital stay.

Patient was classified as hypothyroid post-operatively, in the case of T_3 and T_4 levels below the reference range and/or elevated TSH levels on at least two consecutive measurements. Temporary hypocalcemia was observed (when serum calcium level was <7 mg/dl requiring calcium and/or vitamin D supplements, and it was resolved within 6 months) [Table 1]. The levels of T_3 and T_4 were continuously evaluated in the biochemistry laboratory. We observed that the levels were not decreased immediately after surgery. Serum T_3 were decreased after 3-4 days of surgery, while the levels of T_4 became low after 8-10 days of surgery. The levels became reduced slowly on day 4th, 8th and 16th. The serum levels of calcium and albumin were found to be lower than normal range. Approval from institutional ethical committee was not required for this case report.

DISCUSSION

The goal of treatment for goiter surgery is to control the hyperthyroidism and restore euthyroidism. No surgical operation can be done without the risk of complication under any kind of anesthesia. Sub-total thyroidectomy is the first line of treatment for multi-nodular goiter, with low acceptable morbidity and mortality rates.

Post-operative hypocalcaemia is a common temporary complication. It delays the post-operative discharge and requires considerable care in immediate post-operative period. We observed the levels of serum calcium and serum albumin were lower than normal ranges immediately after surgery and on 4th, 8th and 16th day after surgery. Calcium supplementation and good high-protein rich diet were prescribed to the patient. The levels of serum calcium and serum albumin were normal at the time of 6 months follow-up. This observation was in consistence with other international studies [4,5] which demonstrated that the development of post-thyroidectomy hypocalcemia is multifactorial. The contributory factors include hemodilution secondary to intravenous fluid administration during the perioperative phase, increased urinary calcium excretion secondary to surgical stress, calcitonin release after thyroid gland manipulation, and hungry bone syndrome in patients with metabolic bone disease. However, hypo-parathyroidism through direct injury, removal or devascularization of parathyroid glands is the most likely cause of post-operative hypocalcemia [6].

We observed that, the levels of T_3 became reduced after 3 days the STT than levels of T_4 . This difference was because of the

Table 1: Comparison of Thyroid function tests, serum calcium and serum albumin on 1st hr, 4th, 8th and 16th day after STT

Parameters	1 h	4 th day	8 th day	16 th day
T_3 (ngml/L)	18.64	1.08	0.03	0.18
T_4 (nmol/L)	906	967	534	38
TSH (mIU/L)	0.00	12.0	28.8	26.7
Serum calcium (mg/dl)	5.6	5.5	5.0	5.2
Serum albumin (mg/dl)	1.7	1.5	0.9	1.0

TSH: Thyroid-stimulating hormone

difference in half-lives of T_3 (2.5 days) and T_4 (7-8 days). These findings were in consistence with other reports.

In various studies the reported post-operative thyroid function outcomes vary, with hypothyroid rates ranging from 21.1% to 83.3% [7]. This case study demonstrated the thyroid hormone deficiency in a patient after surgery. A possible explanation for the variation in post-operative thyroid status rates depends upon the variation in the amount of thyroid tissue left behind. It may also depend upon the variation in the study populations, for example, in terms of sex, age, and disease severity. The incidence of hypothyroidism in the present study is same as observed in various other studies [7,8]. Hypothyroidism was treated by giving thyroid hormone replacement therapy to the patient.

We have summarized that the patient developed hypothyroidism, hypocalcaemia and hypoalbuminemia following STT. These findings highlight the importance of continuing systematic evaluation of treatment results to optimize patient counseling.

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