

Incidental parathyroidectomy during thyroid surgery: risk factors, incidence, and outcomes

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Received: 16.11.2012 • Accepted: 07.03.2013 • Published Online: 02.01.2014 • Printed: 24.01.2014

Aim: Incidental removal of the parathyroid glands is common in some cases. In this trial, we investigated the risk factors, incidence, and outcomes associated with incidental excision of the parathyroid glands during thyroid surgery.

Materials and methods: The records of patients who had undergone thyroid surgery in our department between January 2006 and December 2011 were retrospectively evaluated.

Results: A total of 801 patients were enrolled in the trial. The number of incidental parathyroidectomies was determined as 19 (2.3%). Statistical evaluation revealed that sex ($P > 0.05$) and type of surgical operation ($P > 0.05$) were not associated with a significant impact on incidental parathyroidectomies. However, the rate of incidental parathyroidectomies was determined to be statistically significantly high among patients with malignant conditions ($P < 0.05$). Hypocalcemia was observed to be statistically significant in patients with an incidental parathyroidectomy ($P < 0.05$).

Conclusion: Incidental parathyroidectomy is a rare condition in centers specializing in endocrine surgery. Furthermore, the parathyroid glands should always be explored during dissection in patients with malignancies. The clinical manifestation of hypocalcemia is a common condition observed after incidental parathyroidectomy.

Key words: Incidental parathyroidectomy, thyroid surgery

1. Introduction

In the current century, thyroidectomy is regarded as a safe operation based on minimal morbidity rates and favorable postoperative outcomes (1). The 2 most common complications are recurrent laryngeal nerve injury and hypocalcemia (2). In thyroid surgery, the overall rate of complications is less than 5%, including the above-mentioned issues in addition to hematoma, infections, and keloids (2,3). However, the rate of hypocalcemia after thyroidectomy is quite high. While this rate is 1.6%–50% for transient hypocalcemia, the corresponding rate of permanent hypocalcemia is 1.5%–4% (4).

The parathyroid gland is accidentally observed in pathology reports following thyroid surgery. In several trials, the rates of incidental parathyroidectomy were reported as 6.4% and 31% (5). The parathyroid glands embryologically develop from the 3rd and 4th pharyngeal pouches and are frequently located in the subcapsular region (6). In a trial conducted on this subject, 77% of superior parathyroids were determined to be located in

the posterior cricoid junction and 22% in the upper edge of the thyroid, while 42% of inferior parathyroids were found in the lower edge of the thyroid and 42% were found accompanying the thymus, the number of glands varying between 2 and 6 (7). The parathyroid glands are supplied by the superior and inferior thyroid arteries. Careful evaluation of these localizations during surgery is of utmost importance in terms of development of postoperative hypocalcemia (6).

The objective of this trial was to determine the risk factors and the incidence of incidental parathyroidectomy during thyroidectomy and to evaluate the impact on the development of postoperative hypocalcemia.

2. Materials and methods

The records of patients having undergone thyroid surgery in our department between January 2006 and December 2011 were evaluated retrospectively. The patients were assessed in terms of age, sex, type of operation, surgical team, and postoperative histopathological diagnosis. The

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pathology reports were closely assessed to determine the presence of parathyroid tissue (if any). In patients with incidentally determined parathyroid tissue, the postoperative blood calcium values were evaluated. Patients with blood calcium (Ca) levels of lower than 8.0 mg/dL and clinical symptoms of hypocalcemia were recorded as postoperative hypocalcemia cases. Routine laboratory investigation for patients who will undergo thyroid surgery involves preoperative blood Ca levels and albumin levels in our clinic. This makes it possible for us to determine Ca and thereby asymptomatic parathyroid abnormalities preoperatively. We also were able to retrospectively evaluate the blood Ca levels in patients who had incidental parathyroidectomies.

The data were supplied as figures and percentages. SPSS 20 was utilized in the data analysis. The categorical data were analyzed using the chi-square test. The level of statistical significance was determined as $P < 0.05$. No statistically significant correlation was found between incidental parathyroidectomy and the sex of the patients ($P > 0.05$) or the type of operation ($P > 0.05$). However, a statistically significant correlation was observed between incidental parathyroidectomy and patients with malignancy ($P < 0.05$). The rate of hypocalcemia in patients with incidental parathyroidectomy was determined to be statistically significant ($P < 0.05$).

3. Results

A total of 801 patients that had undergone thyroid surgery in our department between January 2006 and December 2011 were enrolled in the trial. The age, sex, histopathological diagnosis, and type of surgical operation of the patients are presented in Table 1.

The number of female patients undergoing thyroid surgery was 3 times the number of male patients; total thyroidectomy was performed in 88.8% of the cases. Evaluation of the histopathological diagnosis revealed goiter as the most common condition among benign cases, while the most common diagnosis in malignant cases was papillary carcinoma.

Among the 801 enrolled patients, the number of incidental parathyroidectomies was determined as 19 (2.3%). As per sex, incidental parathyroidectomy was observed in 3 of the male patients (1.4%) and in 16 of the female patients (2.6%). Histopathological evaluation revealed incidental parathyroidectomy in 2 of the benign cases (0.3%) and in 17 of the malignant cases (12.3%). All the patients with malignancies were histologically diagnosed as papillary carcinoma. The localizations of parathyroid glands were extracapsular in 11 patients (57.9%), subcapsular in 7 patients (36.9%), and intrathyroidal in 1 patient (5.2%). One parathyroid gland had been incidentally excised in 18 patients (94.7%), while

Table 1. The demographic data of the patients.

			n (%)	Incidental parathyroidectomy	
Age (years)			48.62 (range: 17–88)		
Sex	Male		202 (25.2)	3	(1.4)
	Female		599 (74.8)	16	(2.6)
Thyroidectomy	Total		711 (88.8)	19	(2.6)
	Lobectomy		80 (10)	0	(0)
	Totalization		10 (1.2)	0	(0)
Diagnosis	Benign	Nodular goiter	507 (63.3)	2	(0.3)
		Hashimoto	81 (10)	0	(0)
		Follicular adenoma	30 (3.8)	0	(0)
		Hurthle cell adenoma	26 (3.2)	0	(0)
		Basedow-Graves'	6 (0.8)	0	(0)
		Riedel thyroiditis	1 (0.1)	0	(0)
	Malign	Papillary carcinoma	138 (17.2)	17	(12.3)
		Follicular carcinoma	6 (0.8)	0	(0)
		Medullary carcinoma	3 (0.4)	0	(0)
		Hurthle cell carcinoma	3 (0.4)	0	(0)

2 parathyroid glands had been excised in 1 patient (5.3%). On histopathological assessment of the excised parathyroid glands, the results were reported as parathyroid adenoma in 5 cases (26.3%) and as normal in 14 samples (73.7%). In 12 of the patients with incidental parathyroidectomy (63.1%), the calcium values were under 8.0 mg/dL (mean: 6.9 mg/dL), with clinical symptoms of hypocalcemia. Preoperative blood Ca levels and corrected Ca levels were determined at the postoperative period retrospectively to exclude asymptomatic hypercalcemia and hyperparathyroidism. Calcium replacement therapy had been initiated in these patients during the postoperative period. In cases of severe clinical symptoms of hypocalcemia, intravenous calcium was administered in the early stages, followed by oral calcium as maintenance therapy.

4. Discussion

Thyroidectomy is the most frequently applied endocrine surgery (8). One of the most significant complications of thyroidectomy, which is a relatively safe surgical operation, is transient and/or persistent hypocalcemia. Injury of the parathyroid glands is a common cause of hypocalcemia (6). In order to prevent injury of the parathyroid glands, Halsted and Evans recommend a very thorough and careful surgical technique during thyroidectomy (9).

Due to the variable number of parathyroid glands and the anatomical variations in each patient, injury and/or incidental resection of the parathyroids is possible (10). Compliance with anatomical principles and surgical guidelines during the operation will decrease the number of these surgical complications (11,12). During the operation, attempting to visualize each parathyroid gland is dangerous and will cause more injuries due to the anatomical variations and the variable number of parathyroid glands (6). The majority of parathyroid glands are located in the extracapsular regions. Parathyroids located in the thyroid gland are difficult to resect and can hardly be visualized during surgery (5,6). Therefore, surgeons specialized in thyroid surgery with thorough information and experience on variable localizations and arterial supply of parathyroid glands will minimize the rate of surgical complications (13). In the current trial, 11 incidentally excised parathyroid glands exhibited extracapsular localization (57.9%), while 7 showed subcapsular (36.9%) and 1 showed intrathyroidal localization (5.2%).

In the previous 2 centuries, a decrease was observed in the postoperative complications parallel to an increase in experience with thyroid surgery; however, incidental parathyroidectomy is also encountered in thyroidectomy operations that are performed by experienced surgeons (14). Different authors have reported the rate of incidental parathyroidectomy as 6.4% to 19.7% (Table 2) (5,6). This

Table 2. Incidental parathyroidectomy incidence.

Authors	Patients	n/%
Sasson et al. (16)	141	21/15
Sakorafas et al. (6)	158	28/17.7
Sippel et al. (20)	513	33/6.4
Manouras et al. (25)	508	100/19.7
Erbil et al. (5)	440	48/10.9

rate was determined as 2.3% in our department. In a trial conducted by Campos et al. (15), the corresponding rate was determined as 2.93%. This low rate was associated with a highly experienced surgical team with experience of 4–12 years. We support this comment proposed by Campos and his team. All of our patients were operated on by a surgical team experienced in endocrine surgery. We suggest that the lower rates in the current trial compared to previous trials are largely due to this fact.

Compared to benign thyroid diseases, papillary thyroid carcinoma is a significant risk factor for incidental parathyroidectomy. While incidental parathyroidectomy is seen in 10.11% of papillary thyroid carcinoma cases, the corresponding rate in benign diseases is 1.4%. Attempts to maintain relatively large oncological surgical margins in malignant cases, along with the extra dimensions of the thyroid, are designated as possible causes. Furthermore, another risk factor is the modified radical cervical lymph node dissection performed in thyroid malignancies (16–18). In a trial performed by Khairy and Al-Saif (19), neither the central nor the modified radical cervical dissections were reported to pose a risk in terms of incidental parathyroidectomy. Maximum efforts provided in order to comply with oncological procedures in central cervical dissections have been indicated to minimize these complications. In addition, the rate of incidental parathyroidectomy has been reported as 15.4% in malignant cases and as 17.1% in benign cases (16). In malignant thyroid diseases in particular, extra dimensions of the thyroid and adhesions to peripheral tissues are other risk factors for incidental excision of the parathyroid gland (19). In our series, the rate of incidental parathyroidectomy was observed as 0.3% in benign cases and as 12.3% in malignant cases. Our rates were determined to be somewhat lower than those in the literature, both in benign and in malignant cases. This finding was suggested to be due to the experience of our surgical team in endocrine surgery and to the performance of total thyroidectomy and lymph node dissection in malignant cases in 2 different sessions.

In several trials (6,20), male sex and young age have been indicated as risk factors; however, Khairy and Al-Saif

(19) reported that neither of these 2 factors was designated as a risk factor. In the current trial, sex was not indicated as a risk factor ($P > 0.05$).

Total thyroidectomy and reoperations are significant risk factors for incidental parathyroidectomy. Another risk factor may be stated as thyroiditis. This is suggested to be due to adhesions caused by fibrosis (21). In our trial, the type of the operation was not determined as a risk factor ($P > 0.05$).

Injury of the parathyroid glands during thyroidectomy and associated autotransplantation, as well as incidental excision of the parathyroids, are independent risk factors for hypocalcemia. Furthermore, the symptoms of hypocalcemia develop earlier and last longer in parallel to the increase in the number of injured parathyroid glands (22,23). Postsurgical inspection and autotransplantation of the resected parathyroid glands will be beneficial in

prevention of transient or persistent hypocalcemia and this inspection should be routinely performed on all patients (24). Sasson et al. (16) reported that there was no correlation between hypocalcemia and incidental parathyroidectomy; however, in the current trial, development of hypocalcemia was found to be significant in these patients ($P > 0.05$). Although the symptoms of hypocalcemia are transient, persistent hypocalcemia has been reported in several series at a rate of 2.1% (17). No persistent hypocalcemia was observed in our series.

In conclusion, although incidental parathyroidectomy is a complication of thyroid surgery, it is a rare condition in centers specializing in endocrine surgery. Moreover, the parathyroid glands should be observed during dissection in malignant cases and dissection should be pursued in this manner. Clinical hypocalcemia following incidental parathyroidectomy is a common condition.

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