

Inadvertent parathyroidectomy during thyroid surgery: the incidence of a complication of thyroidectomy

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Abstract

Background and aims Incidental parathyroidectomy is a complication of thyroid surgery. The aim of this report is to explore the incidence, risk factors, and clinical relevance of inadvertent parathyroidectomy during thyroidectomy.

Materials and methods Patients who underwent thyroidectomy between January 1998 and June 2005 were evaluated. Pathology reports were reviewed for the presence of parathyroid tissue in the thyroidectomy specimens. Information regarding diagnosis, operative details, and postoperative hypocalcemia were collected.

Results Three hundred and fifteen thyroid procedures were performed: 163 total thyroidectomies, 124 near-total thyroidectomies, and 28 lobectomies. The findings were benign in 240 and malignant in 75 cases. Incidental parathyroidectomy was found in 68 (21.6%) cases: 58 were benign and 10 were malignant. One and two parathyroids were accidentally removed in 46 and 22 patients, respectively. Parathyroid tissue was found in intrathyroidal (33%) and extracapsular (27%) sites. Total/near-total thyroidectomy was not associated with increased risk of incidental

parathyroidectomy ($P=0.646$), and there was no association of inadvertent parathyroidectomy with postoperative hypocalcemia ($P=0.859$). Thyroid malignancy was associated with decreased incidence of incidental parathyroidectomy ($P=0.047$).

Conclusion Inadvertent parathyroidectomy, although not uncommon, is not associated with postoperative hypocalcemia. The type of surgical procedure does not increase the risk of incidental parathyroidectomy, while thyroid malignancy may reduce the incidence of inadvertent parathyroidectomy.

Keywords Thyroidectomy · Lobectomy · Parathyroidectomy · Hypocalcemia

Introduction

Thyroidectomy is a common, safe surgical procedure and is typically associated with low morbidity if identification and preservation of the parathyroid glands and laryngeal nerves are performed.

The complications of thyroidectomy are well known. Some of these can be fatal; others are quite disturbing particularly in their permanent form. To minimize morbidity, it has been suggested that these anatomic structures should be recognized during surgery. Even in case of careful thyroidectomy, at least temporary parathyroid dysfunction may be observed. The reported incidence of postthyroidectomy hypoparathyroidism ranges from less than 1 to 15% [1, 2]. This may be due to a variety of factors, such as injury, devascularization of the parathyroid glands, and accidental resection of one or more parathyroid glands. Incidental parathyroidectomy during thyroidectomy

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is a potential complication of this procedure. This incidence varies widely among centers and among surgeons, depending on the thyroid surgery experience.

The aim of present work is to evaluate the incidence, risk factors, and clinical relevance of inadvertent parathyroidectomy during total, near-total thyroidectomy, and lobectomy of thyroid gland, over the course of 7.5 years, in a group of consecutive patients in whom thyroid surgery was carried out by experienced surgeons. Our goals are to investigate whether there is an association between inadvertent parathyroidectomy and the type of thyroid procedure, between incidental parathyroidectomy and postoperative hypocalcemia, and between thyroid malignancy and inadvertent parathyroidectomy.

Materials and methods

A total of 315 thyroid operations were performed between January 1998 and June 2005 at the First Surgical Department of “Evangelismos” General Hospital of Athens. These included 62 males (19.7%) and 253 females (80.3%). The patients’ age ranged from 19 to 76 years (median age, 53 years).

Patients with repeated operations for recurrent or persistent thyroid disease and patients in whom intentional parathyroidectomy was performed were excluded from the study. Extensive thyroid procedures undertaken for locally advanced thyroid cancer were not included in the study group. Indications for thyroidectomy are shown in Table 1. Thyroid malignancy was documented preoperatively by fine-needle aspiration.

Data were gathered regarding postoperative biochemical and clinical hypocalcemia. Serum calcium levels were measured preoperatively, before, on the day of surgery, and on postoperative days 1, 2, and 3.

Pathology reports were reviewed for the presence of parathyroid tissue. Cases where parathyroid tissue was submitted separately for histologic evaluation were not included in this study. For all the specimens in which incidental parathyroid tissue was found, the slides were reviewed to identify their location, the number, size, and histologic features of the parathyroid tissue.

Table 1 Indications for thyroidectomy

Thyroid disease	Number of patients
Multinodular goiter	190 (60.3)
Solitary thyroid nodule	43 (13.7)
Hyperthyroidism	28 (8.9)
Thyroid malignancy	54 (17.1)

Values in parentheses are percentages.

The following items were recorded: sex, age, details of surgical procedures (total or near-total thyroidectomy, lobectomy), histological findings, parathyroid autotransplantation, number of parathyroid glands identified, and postoperative hypocalcemia (Table 2).

All thyroid procedures were performed by surgeons with experience in thyroid surgery using the same technique. Once extended, the neck was explored through a transverse cervical incision made approximately 3 cm cephalad to the sternoclavicular joints. Strap muscles were not routinely cut. Extracapsular dissection of the thyroid lobes, including the pyramidal lobe if present was systematically employed. Systematic was also the search of the parathyroid glands with their blood supply. Attempt to identify the recurrent laryngeal nerve was routine policy. Suction drainage was used routinely. After resection, the thyroid gland surface was carefully examined for the presence of parathyroid tissue. Removed parathyroid glands were autotransplanted.

Statistical analysis

Comparisons were made for incidental parathyroidectomy and operative procedure, postoperative hypocalcemia, and malignancy. Univariate analysis was performed using a *t* test, and categorical values were determined using the χ^2 test. $P < 0.05$ was considered statistically significant.

Table 2 Patients’ demographics, preoperative diagnosis, operative procedures, histological findings, and postoperative hypocalcemia

Variable	Number of patients (<i>n</i> =315)
Sex	
Male	62 (19.7)
Female	253 (80.3)
Age (years)	
Mean	53
Range	19–76
Preoperative diagnosis	
Benign	54 (17.1)
Malignant	261 (82.9)
Procedure	
Total thyroidectomy	163 (51.7)
Near-total thyroidectomy	124 (39.4)
Thyroid lobectomy	28 (8.9)
Parathyroid autotransplantation	4 (1.3)
Final thyroid pathology	
Benign	240 (76.2)
Malignant	75 (23.8)
Incidental parathyroidectomy	68 (21.6)
Benign thyroid disease	58 (85.3)
Malignant thyroid disease	10 (14.7)
Hypocalcemia	
Temporary	72 (22.9)
Permanent	0

Values in parentheses are percentages.

Results

Total and near-total (leaving no more than 3 g of residual thyroid parenchyma) were the procedures of choice. Total thyroidectomy was performed in 163 (51.7%) cases, near-total thyroidectomy in 124 (39.4%) cases, and thyroid lobectomy in 28 (8.9%) cases. Thyroid lobectomy was employed in patients with solitary or multiple nodular lesions confined within one lobe. The indications for surgery in patients with solitary nodules included FNA suggesting malignancy and failure of medical treatment. Surgery was performed in patients with hyperthyroidism due to poor tolerance or compliance to medical treatment.

Histopathologic examination of the resected thyroid revealed the presence of benign thyroid disease in 240 (76.2%) cases and thyroid malignancy in 75 (23.8%) cases (Table 2). Histopathological analysis also identified 68 (21.6%) patients with incidental parathyroid tissue. Of these, 58 (85.3%) were benign and 10 (14.7%) were malignant. One and two parathyroid glands were accidentally removed in 46 (67.6%) and 22 (32.4%) patients, respectively. Total or near-total thyroidectomy was performed in 61 (89.7%) patients, compared with thyroid lobectomy in seven (10.3%) patients. In four patients, parathyroid autotransplantation with forearm autograft in the brachioradial was performed. After resection of the thyroid gland and after examining the surgical specimen in the operating room, accidentally removed parathyroid was recognized and confirmed by frozen section.

The results of univariate analysis of patient variables and incidental parathyroidectomy are summarized in Table 3. Univariate analysis did not identify total/near-total thyroidectomy as a risk factor for inadvertent parathyroidectomy ($P=0.646$). An overall of 287 total/near-total thyroidecto-

mies were performed, and 61 (21.3%) of these were associated with incidental parathyroidectomy. The incidence of inadvertent parathyroidectomy was inversely correlated with thyroid malignancy ($P=0.047$).

In the majority of patients, the parathyroid tissue was histologically normal ($n=54$, 79.4%); however in five (7.4%) patients, the excised gland was adenomatous, while in nine (13.2%) patients, the excised glands were hypercellular without atypia. The mean diameter of the inadvertently excised parathyroids was 4.8 mm.

Further histopathological inspection revealed that the parathyroid tissue in the resected specimen was found to be intrathyroidal in 29 (42.6%) cases (i.e., parathyroid tissue completely contained within the thyroid capsule or completely surrounded by thyroid tissue). In 18 (26.5%) patients, the parathyroid tissue was found to be firmly adherent to the thyroid capsule.

In the entire series, biochemical temporary postoperative hypocalcemia occurred in 15 (22%) patients with incidental parathyroidectomy and in 57 (23.1%) patients with no incidental parathyroidectomy. No patients with permanent hypocalcemia were observed. There was no statistically significant difference regarding the occurrence of postoperative hypocalcemia between the patients with incidental parathyroidectomy and the patients with no incidental parathyroidectomy ($P=0.859$). In all these patients, the symptoms resolved within 2 months after thyroid surgery, and the calcium supplementation therapy was stopped.

Discussion

Iatrogenic hypoparathyroidism is a common complication after thyroidectomy. In the literature, the incidence of incidental parathyroidectomy during thyroid surgery ranges from 8 to 19% [3–6]. In this study, we observed inadvertent parathyroidectomy in 21.6% of our patients. In most cases, only one parathyroid gland was resected with the thyroid; while in our series, one parathyroid gland was accidentally removed in 46 (67.6%) cases.

Although experienced thyroid surgeons have emphasized the importance of parathyroid identification and preservation during thyroidectomy [2, 7], taking the greatest possible care to localize, dissect, and preserve the parathyroid glands, parathyroidectomy may ensue. The variable location of the parathyroid glands (particularly the intracapsular site of some) contributes to the risk of inadvertent parathyroidectomy. Incidentally excised parathyroid glands have been reported to be intrathyroid in up to 40 to 50% of cases [4, 5]. In our study, 42.6% of the parathyroids removed unintentionally were intrathyroidal. In these cases, improvements in surgical technique cannot eliminate the risk of inadvertent parathyroidectomy; inad-

Table 3 Univariate analysis

Variable	Incidental parathyroidectomy ($n=68$)	No incidental parathyroidectomy ($n=247$)	P^a
Procedure			
Total thyroidectomy/near-total thyroidectomy	61 (89.7)	226 (91.5)	$P=0.646$
Lobectomy	7 (10.3)	21 (8.5)	
Final thyroid pathology			
Benign	58 (85.3)	182 (73.7)	$P=0.047$
Malignant	10 (14.7)	65 (26.3)	
Hypocalcemia			
Temporary	15 (22)	57 (23.1)	$P=0.859$
Permanent	0	0	

Values in parentheses are percentages.

^a χ^2 test

vertent parathyroidectomy may occur even in the hands of experienced thyroid surgeons. It is doubtful if improvement in surgical technique could completely eliminate the risk of incidental parathyroidectomy.

The average size of a normal parathyroid gland is approximately 6 mm [2]. The average size of excised parathyroid tissue in our patients was 4.8 mm. This discrepancy in the size may be explained by the histopathological sampling and processing of the specimen.

It has been postulated by some authors [5] that the risk of inadvertent parathyroidectomy is increased in some cases, such as in patients who undergo surgery for malignant thyroid disease. It is interesting to note that in this study, there was marginally significant difference in the rate of inadvertent parathyroidectomy between procedures conducted for a malignant or benign thyroid disease. Univariate analysis identified a final diagnosis of malignant thyroid disease ($P=0.047$) as being associated with decreased incidental parathyroidectomy. It may be explained by the fact that there was no patient with advanced thyroid malignancy and there was no case with extensive thyroid procedure. Finally, the surgical techniques may be more meticulous in cases with suspected malignancy.

In our series, univariate analysis did not identify total/near-total thyroidectomy as a risk factor for inadvertent parathyroidectomy. A total of 287 total/near-total thyroidectomies were performed, and 21.3% of them were associated with an incidental parathyroidectomy. In contrast, of the 247 patients without incidental parathyroidectomy, 226 (91.5%) patients simultaneously underwent total/near-total thyroidectomy.

Several studies have been reported on hypocalcemia after thyroid surgery [8–10]. Postoperative hypocalcemia remains a fact of the present and constitutes a clinical challenge. Biochemical hypocalcemia has been reported in as many as 83% of cases, but symptomatic hypocalcemia is seen much less frequently [8, 11]. In our study, no patient with permanent hypocalcemia was observed. Also, there was no statistically significant difference regarding the occurrence of postoperative hypocalcemia between the patients with an incidental parathyroidectomy and the patients with no incidental parathyroidectomy. Biochemical temporary postoperative hypocalcemia occurred in 22% of patients with incidental parathyroidectomy and in 23.1% of patients with no incidental parathyroidectomy ($P=0.859$).

Routine parathyroid autotransplantation during thyroid surgery resulted in less than 1% incidence of permanent hypoparathyroidism [12]. In our series, parathyroid autotransplantation was performed in four (1.3%) cases. Autotransplantation should be considered when more than

two parathyroids are identified in the specimen after thyroid surgery [12].

Conclusion

Incidental parathyroidectomy is not uncommon during thyroidectomy. Almost half of the parathyroid glands were found within the thyroid gland, so some inadvertent parathyroidectomies are unavoidable. Total/near-total thyroidectomy does not increase the incidence of incidental parathyroidectomy. In contrast, patients with malignancy have decreased incidence of inadvertent parathyroidectomy. No association between inadvertent parathyroidectomy and postoperative hypocalcemia was found. Inadvertent parathyroidectomy may be considered as a minor complication of thyroidectomy.

References

- Pattou F, Combemale F, Fabre S, Carnaille B, Decoulx M, Wemeau JL, Racadot A, Proye C (1998) Hypocalcemia following thyroid surgery: incidence and prediction of outcome. *World J Surg* 22:718–724
- Shaha AR, Jaffe BM (1998) Parathyroid preservation during thyroid surgery. *Am J Otolaryngol* 19:113–117
- Lin DT, Patel SG, Shaha AR, Singh B, Shah JP (2002) Incidence of inadvertent parathyroid removal during thyroidectomy. *Laryngoscope* 112:608–611
- Sasson AR, Pingpank JF, Wetherington W, Hanlon AL, Ridge JA (2001) Incidental parathyroidectomy during thyroid surgery does not cause transient symptomatic hypocalcemia. *Arch Otolaryngol Head Neck Surg* 127:304–308
- Lee NJ, Blakey JD, Bhuta S, Calcaterra TC (1999) Unintentional parathyroidectomy during thyroidectomy. *Laryngoscope* 109:1238–1240
- Sakorafas GH, Stafyla V, Bramis K, Kotsifopoulos N, Kolettis T, Kassaras G (2005) Incidental parathyroidectomy during thyroid surgery. An underappreciated complication of thyroidectomy. *World J Surg* 29:1539–1543
- Bergamaschi R, Becouarn G, Ronceray J, Arnaud JP (1998) Morbidity of thyroid surgery. *Am J Surg* 176:71–75
- Demeester-Mirkine N, Hooghe L, Van Geertruyden J, De Maertelaer V (1992) Hypocalcemia after thyroidectomy. *Arch Surg* 127:854–858
- McHenry CR, Speroff T, Wentworth D, Murphy T (1994) Risk factors for postthyroidectomy hypocalcemia. *Surgery* 116:641–648
- Glinoe D, Andry G, Chantrain G, Samil N (2000) Clinical aspects of early and late hypocalcemia after thyroid surgery. *Eur J Surg Oncol* 26:571–577
- Wingert DJ, Friesen SR, Iliopoulos JI, Pierce GE, Thomas JH, Hemreck AS (1986) Post-thyroidectomy hypocalcemia; incidence and risk factors. *Am J Surg* 152:606–610
- Olson JA, DeBenedetti MK, Baumann DS, Wells SA (1996) Parathyroid autotransplantation during thyroidectomy: results of a long-term follow-up. *Ann Surg* 223:472–480