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ORIGINAL ARTICLE

Inadvertent parathyroidectomy during thyroid surgery

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Abstract
Introduction Inadvertent parathyroidectomy is a recognised complication of thyroid surgery. We aimed to investigate the incidence of and risk factors for inadvertent parathyroidectomy during thyroid surgery, in our patient cohort.
Methods A retrospective review of the records of all patients undergoing thyroid surgery in our institution between January 2012 and December 2014 was performed. Medical records, laboratory investigations and histopathology reports were evaluated. Patient demographics, indication for surgery, surgery performed, final pathology, incidental parathyroidectomy and post-operative hypocalcaemia were recorded. Univariate analysis using the Fisher's exact test was performed.
Results Two hundred and thirty procedures were included: 147 hemi-thyroidectomies and 83 total thyroidectomies. Central neck dissection was also performed in 13 cases. The most common indication for surgery was indeterminate cytology (81 cases). Post-operatively, malignant disease was reported in 52 cases (22.6%). Inadvertent parathyroidectomy occurred in 40 cases (17.3%). There was a statistically significant increased risk of inadvertent parathyroidectomy with malignant disease ($p = 0.001$) and after central neck dissection ($p = 0.013$) but no difference was seen between hemi- and total thyroidectomies ($p = 0.47$), gender ($p = 1.00$) or with increasing age ($p = 1.00$). Hypocalcaemia occurred in four cases and was transient in three.
Conclusion Inadvertent parathyroidectomy is a potential risk during thyroid surgery but post-operative hypocalcaemia as a result is rare. Malignancy and more extensive surgery appear to carry an increased risk for this complication.

Keywords Thyroid · Parathyroid

Introduction

Total and hemi-thyroidectomy are commonly performed operations with large numbers performed annually worldwide [1]. Given their anatomical relationship, damage to or inadvertent removal of parathyroid glands and potential associated hypocalcaemia are recognised complications of these surgeries [2, 3]. The position of the parathyroid glands can be variable, especially the lower glands, and disease processes also have the potential to distort normal anatomy and make identification difficult.

Despite meticulous surgical dissection parathyroid glands may be occasionally damaged or inadvertently removed. Previous studies have reported rates of 6–22% for inadvertent parathyroidectomy (IP) [4–15]. Despite this relevantly frequent occurrence the risk of permanent post-operative hypocalcaemia appears to be much lower. Two large case series have reported a risk of persistent hypocalcaemia of between 0.5 and 4% following thyroid surgery [2, 3]. We aimed to investigate the incidence of and risk factors for IP, and any associated hypocalcaemia, in our patient cohort.

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Methods

A retrospective review of all patients undergoing thyroid surgery in our unit between January 1, 2012 and December 31, 2014 was performed. All surgery was performed by or supervised by a single surgeon. Total and hemi-thyroidectomy procedures, as well as any concomitant neck dissections were included. Patients had routine post-operative calcium measurements performed. All total and completion thyroidectomy cases also had measurements performed at 2 weeks follow-up and were routinely discharged on prophylactic calcium supplementation (calcium carbonate) until this time. All specimens were examined in one histopathology department and seven different histopathologists were involved in reporting.

The medical records, laboratory investigations and histopathology reports of all included patients were evaluated. A number of variables were recorded including: patient demographics, indication for surgery, surgery performed, final pathology, the presence of inadvertent parathyroidectomy and post-operative hypocalcaemia. Statistical analysis was performed using GraphPad QuickCalc (Graphpad Inc., CA, USA) and Microsoft Excel (Microsoft Inc., Redmond, USA) software. The Fisher's exact test was used for univariate analysis with p values of 0.05 or less considered statistically significant.

Results

During the study period a total of 230 procedures were performed. This included 147 hemi-thyroidectomies and 83 total thyroidectomies. The group also included 13 central neck dissections. The average age of patients was 51.67 years (range 17–86 years). 81% of patients were female and 19% male (Table 1).

The most common indication for surgery was benign disease followed by indeterminate cytology (Table 2). Post-operative histology reported benign disease in 178 cases and malignant disease in 52 cases. The most common diagnoses are listed in Table 3.

Inadvertent parathyroidectomy occurred in 40 of the 230 cases, a rate of 17.3%. A single gland was removed in 86% of cases. When assessing risk factors using univariate analysis, demographics or surgery type (total versus hemi-thyroidectomy) were not associated with a significantly increased risk. The risk was also not increased in completion surgery cases but was increased in patients who had a concomitant neck dissection ($p = 0.013$). Malignant disease was also associated with a statistically significant increased risk for IP ($p = 0.001$) (Table 4).

Post-operative hypocalcaemia occurred in 4 of 40 IP patients. These episodes of hypocalcaemia were transient in all but one case. The one case of permanent hypocalcaemia was referred to the endocrinology service and was managed successfully on oral medications. Increasing number of glands inadvertently removed did not statistically increase the risk of hypocalcaemia, $p = 0.069$.

Table 1 Basic demographics (n, %)

Male	44 (19%)
Female	186 (81%)
Average age	51.67 years
Hemi-thyroidectomy	147 (64%)
Total thyroidectomy	83 (36%)
Central neck dissection	13 (6%)

Table 2 Pre-operative indication for surgery (n)

Benign disease	
Large solitary nodule	53
Nodular hyperplasia	36
Other	26
Indeterminate cytology	81
Completion lobectomy	
Papillary cancer	15
Follicular cancer	5
Malignancy	14

Table 3 Post-operative histology (n)

Benign	
Nodular hyperplasia	82
Hyperplastic nodule	44
Follicular adenoma	22
Other	30
Malignant	
Papillary	44
Follicular	7
Medullary	1

Discussion

Thyroid resection surgery encompasses a number of frequently performed procedures and inadvertent parathyroidectomy is a recognised complication of these operations. Despite careful dissection and surgical technique, histology reports are often returned highlighting the presence of a parathyroid gland in the specimen. A number of other authors have assessed this complication in studies of varying sample sizes with rates of between 6 and 22% reported [4–15]. The incidence of IP, of 17.3%, reported in this study appears in keeping with these previously reported series.

Table 4 Univariate analysis of risk factors for inadvertent parathyroidectomy (IP)

	IP	No IP	*p* value
Age			
>52 years	20	96	
<52 years	20	94	1.00
Gender			
Female	33	153	
Male	7	37	1.00
Pathology			
Benign	22	34	
Malignant	18	156	0.001*
Surgery			
Hemi	28	119	0.47
Total	12	71	
Neck dissection			
Yes	6	7	0.013*
No	34	183	
Completion surgery			
Yes	6	14	0.13
No	34	176	

* Statistical significance

When considering factors that might increase the risk of IP we found some variables that were associated with a statistically increased risk for this complication. Patient demographics and surgery type did not carry any increased risk. However, malignancy and concurrent neck dissection appear to carry a higher risk. This might be explained by more aggressive disease or the more extensive nature of the surgery involved. These risk factors have also been reported in prior studies [6, 8–10, 12] but not in others [7, 11, 15] suggesting some uncertainty on this. Completion surgery might also be expected to increase risk, with dissection postulated to be more difficult due to scarring in the surgical field. While this was reported by some authors it was not associated with an increased risk in our cohort [8, 12].

Given the relative frequency of this complication an understandable concern exists for the potential of resultant post-operative hypocalcaemia. Previous large cohort studies have reported rates of permanent hypocalcaemia of between 0.5 and 4% following thyroid surgery. Transient post-operative hypocalcaemia occurs more frequently at rates of between 5.4 and 20% [2, 3]. Our findings in cases of IP appear to be in keeping with these figures. To recognise and mitigate against potential hypocalcaemia a protocol is followed within our unit including post-operative calcium level measurement. All total and completion thyroidectomy cases are also discharged on prophylactic oral calcium supplementation with review of levels at 2 weeks. This is in keeping with current guidance and is estimated to reduced post-operative hypocalcemia rates to below 10% [16].

Our study does have some limitations in terms of sample size and potential bias given its retrospective nature. Our analysis was also limited by some unknown variables. The thyroid specimen weight was not always reported in the post-operative histology making uniform assessment of increasing gland size and risk for IP not possible. The excised parathyroid position, e.g. intra-capsular/intra-glandular was also rarely reported in histology results. This may be an important factor as previous studies have reported iatrogenically excised glands to be intra-thyroid in up to 40–50% of cases [8, 13]. This high rate of intra-thyroid glandular position obviously makes avoidance of this complication difficult and may explain the relative frequency of IP. The diligence of the reporting histopathologists is clearly a key factor but as seven different histopathologists were involved in examination and reporting of the specimens, we believe this potential bias is limited.

Conclusion

Inadvertent parathyroidectomy is a recognised risk of thyroid surgery. Despite its relative frequency resultant permanent post-operative hypocalcaemia appears to be rarer. Malignancy and extensive surgery may carry a higher risk for this complication.

Compliance with ethical standards

Funding This study received no funding.

Conflict of interest David M. McGoldrick declares that he has no conflict of interest. Mudassar Majeed declares that he has no conflict of interest. Akbar Amin Achakzai declares he has no conflict of interest. H. Paul Redmond declares that he has no conflict of interest.

Ethical approval This article does not contain any studies with human participants or animals performed by any of the authors.

Informed consent Not required.

References

1. Loyo M, Tufano RP, Gourin CG (2013) National trends in thyroid surgery and the effect of volume on short-term outcomes. Laryngoscope 123:2056–2063
2. Bergamaschi R, Becouarn G, Ronceray J, Arnaud JP (1998) Morbidity of thyroid surgery. Am J Surg 176:71–75
3. Pattou F, Combemale F, Fabre S, Carnaille B, Decouix M, Wemeau JL, Racadot A, Proye C (1998) Hypocalcaemia following thyroid surgery: incidence and prediction of outcome. World J Surg 22:718–724

4. Sakorafas GH, Stafyla V, Bramis C, Kotsifopoulos N, Kolettis T, Kassaras G (2005) Incidental parathyroidectomy during thyroid surgery: an underappreciated complication of thyroidectomy. World J Surg 29(12):1539–1543
5. Khairy GA, Al-Saif A (2011) Incidental parathyroidectomy during thyroid resection: incidence, risk factors and outcome. Ann Saudi Med 31(3):274–278
6. Qasaimeh GR, Al Nemre S, Al Omari AK (2011) Incidental extirpation of the parathyroid glands at thyroid surgery: risk factors and post-operative hypocalcaemia. Eur Arch Otorhinolaryngol 268(7):1047–1051
7. Gourgiotis S, Moustafellos P, Dimopoulos N, Papaxoinis G, Baratsis S, Hadjiyannakis E (2006) Inadvertent parathyroidectomy during thyroid surgery: the incidence of a complication of thyroidectomy. Langenbecks Arch Surg 391(6):557–560
8. 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(3):304–308
9. Youssef T, Gaballah G, Abd-Elaal E, El-Dosoky E (2010) Assessment of risk factors of incidental parathyroidectomy during thyroid surgery: a prospective study. Int J Surg 8(3):207–211
10. Sippel RS, Ozgul O, Hartig GK, Mack EA, Chen H (2007) Risks and consequences of incidental parathyroidectomy during thyroid resection. ANZ J Surg 77(1–2):33–36
11. Abboud B, Sleilaty G, Braidy C, Zeineddine S, Ghorra C, Abadjian G, Tabchy B (2007) Careful examination of thyroid specimen intraoperatively to reduce incidence of inadvertent parathyroidecotmy during thyroid surgery. Arch Otolaryngol Head Neck Surg 133(11):1105–1110
12. Lin DT, Patel SG, Shaha AR, Singh B, Shah JP (2002) Incidence of inadvertent parathyroid removal during thyroidectomy. Laryngoscope 112(4):608–611
13. Lee NJ, Blakey JD, Bhuta S, Calcaterra TC (1999) Unintentional parathyroidectomy during thyroidectomy. Laryngoscope 109(8):1238–1240
14. Rix TE, Sinha P (2006) Inadvertent parathyroidectomy excision during thyroid surgery. Surgeon 4(6):339–342
15. Manouras A, Markogiannakis H, Lagoudiankis E, Antonakis P, Genetzakis M, Papadima A, Konstantoulaki E, Papanikolaou D, Kekis P (1998) Unintentional parathyroidectomy during total thyroidectomy. Head Neck 30(4):497–502
16. Stack BC Jr, Bimston DN, Bodenner DL, Brett EM, Dralle H, Orloff LA, Pallota J, Snyder SK, Wong RJ, Randolph GW (2015) American Association of Clinical Endocrinologists and American College of Endocrinology Disease State Clinical Review: postoperative hypoparathyroidism- definitions and management. Endocr Pract 21(6):674–685