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The impact of different surgical procedures on hypoparathyroidism after thyroidectomy

A population-based study

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Abstract

The main objective of this study is to investigate the outcome between surgical procedures and the risk of development of hypoparathyroidism followed by surgical procedure in patients with thyroid disorders.

We analyzed the data acquired from Taiwan's Bureau of National Health Insurance (BNHI) research database from 1998 to 2011 and found 9316 patients with thyroid surgery. Cox regression model was used to calculate the hazard ratio (HR).

A count of 314 cases (3.4%) of hypoparathyroidism was identified. The 9 years cumulated incidence of hypoparathyroidism was the highest in patient undergone bilateral total thyroidectomy (13.5%) and the lowest in the patient with unilateral subtotal thyroidectomy (1.2%). However, in the patients who had undergone unilateral subtotal, the risk was the highest in bilateral total (HR: 11.86), followed by radical thyroidectomy with unilateral neck lymph node dissection (HR: 8.56), unilateral total (HR, 4.39), and one side total and another side subtotal (HR: 2.80).

The extent of thyroid resection determined the risk of development of hypoparathyroidism. It is suggested that the association of these factors is investigated in future studies.

Abbreviations: BS = bilateral subtotal, BT = bilateral total, CCI = Charlson Comorbidities Index; SES= socioeconomic status, RT&LND = radical thyroidectomy with unilateral neck lymph node dissection, US = unilateral subtotal, UT = unilateral total, UT&US = one-side total and another-side subtotal.

Keywords: hypoparathyroidism, multinodular goiter, surgical procedure, thyroid diseases, thyroidectomy

1. Introduction

Thyroidectomy has been a well-recognized surgical procedure for treating thyroid disorders. However, the most serious risk of thyroid surgery is the development of hypoparathyroidism that is caused by the damage to parathyroid gland resulting in the disturbance of calcium and phosphate regulation in the body.[1] The incidence rate of postoperative hypoparathyroidism had been reported to be 1.6% to 50%.[2,3] Most of the patients are transient, and might recover within weeks to months after surgical procedure.[4] Only a small proportion was found to be inflicted with permanent hypoparathyroidism, ranging from 0.5% to 6.6%.[5] The clinical symptoms of hypoparathyroidism include tetany with muscle cramping, cardiovascular conducting disorder, cataracts, and soft tissue ossification. These symptoms could lead to reduced quality of life, poor general well-being, and debilitating morbidity especially for those diagnosed with severe hypoparathyroidism. As postsurgical procedures are considered to be the most common cause of hypoparathyroidism,[6] the management of this incidence can be accomplished by determining the risk of different surgical procedures and arranging the

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treatment accordingly. However, there is scarcity of information about patients after surgical procedure to establish the relationship between the role of the surgical procedures and the risk for development of hypoparathyroidism. The surgery-related risk might be associated with the extent of thyroidectomy and may have an impact on postoperative hypoparathyroidism after thyroid surgery.[7]

This study aims to contribute to this growing area of research by exploring the association between the surgical procedures and risk of hypoparathyroidism that occurs postoperatively in patients with thyroid disorders.

2. Methods

2.1. Data source

In this study, we used reimbursement data from the Bureau of National Health Insurance (BNHI) system in Taiwan which was implemented on March, 1995, and it has registered all medical claims since 1996.[8] More than 99% of the citizens of Taiwan are enrolled in the BNHI, which offers mandatory and comprehensive medical care coverage to all Taiwan residents.[8] For the sake of research and administrative use, the National Research Institute established a randomly selected claim database which represents the whole population, and provides with all the information of medical services received by each individual from 1996 to 2011.[9] We obtained the data about randomly selected 2 million sample population of NHI beneficiaries from 1998 to 2011.

2.2. Study population

We identified all the individuals who were admitted in hospitals with surgery for thyroid disorders from January 1, 1998 to December 31, 2010 from Taiwan National Health Insurance (NHI). Following surgical procedure codes—82001C, 82002C, 82004B, 82008B, 82015B, and 82016B—were used for the identification, and the date of surgery has been used as the index date (Table S1 in Appendix, http://links.lww.com/MD/B898). All the eligible subjects were followed up until the diagnosis of hypoparathyroidism using International Classification of Disease, Clinical Modification, Ninth Revision [ICD-9-CM] code 252.1 or until the subjects were censored for loss to follow-up or termination of insurance, or till the end of December 31, 2011. Moreover, the subjects who were diagnosed with hypoparathyroidism before performing any surgical procedure were excluded from this study.

2.3. Covariate assessment

The potential confounders were included in the study. The confounding factors that could influence the risk of hypoparathyroidism such as age; gender; location, that is, branch; and socioeconomic status (SES), that is, based on the total amounts of insurance payment (INS) to NHI that consisted of low income (patients who have INS <20,000 New Taiwan dollar [NTD] per year), middle income (patients who have INS in between 20,000 and 40,000 NTD per year), and high income (patients who have INS over 40,000 NTD per year) were included in the analysis. We also identified comorbidities that might be associated with mortality based on diagnostic codes from outpatients' dataset prior to the outcome of interest. All diseases were included in the Charlson Comorbidity Index (CCI) and analyzed, except human immunodeficiency virus (HIV).[10]

2.4. Data analysis

One way ANOVA and independent sample t test were used to compare each variable among various groups of patients who had undergone surgical procedure. A P value of $<.05$ was considered to be significant. Cumulative incidence curves were estimated by means of the method developed by Kanda[11] and were compared with the use of log-rank test. Cox regression models with the time (in days) as the time scale were used to calculate hazard ratio (HR). Multivariable Cox model were adjusted for the confounders enlisted in the Table 1. We have used SPSS 20 software to perform data analysis and the result calculations were expressed as estimated numbers together with 95% confidence intervals (CIs).

2.5. Ethical approval

This type of study did not require the Institutional Review Board review in accordance with the policy of National Health Research Institutes which provides the large computerized de-identified data (http://nhird.nhri.org.tw/en/).

3. Results

3.1. Demographic characteristics of patients in this study

We identified 9348 cases of potentially eligible thyroid disorder patients admitted for the surgical procedures in NHI claim database. We excluded 32 patients from our analysis as they had been diagnosed with hypoparathyroidism before January 1, 1999. Therefore, 9316 patients were included in the study for further analysis. Demographic characteristics, confounding comorbidities, and other factors of the identified subjects have been presented in Table 1. The number of patients among 6 different kind of surgeries for thyroid disorders consisted of 1536 patients for unilateral subtotal thyroidectomy (US), 3218 patients for bilateral subtotal thyroidectomy (BS), 2410 patients for unilateral total thyroidectomy (UT), 1252 patients for one-side total and another-side subtotal thyroidectomy (UT&US), 588 patients for bilateral total thyroidectomy (BT), and 312 patients for radical thyroidectomy with unilateral neck lymph node dissection (RT&LND). BS (35%) was the most commonly used surgical procedure for the thyroid disorders. Females accounted for 81% of the total cases. Age group of 40 to 50 years, and patients living in Taipei area (29%) were found to be the prominent characteristics. There is statistically significant difference between various surgical procedures in most of comorbid disease ($P<.001$), region ($P<.001$), and SES ($P<.001$).

3.2. Thyroid disorder and various surgery groups

The relation between thyroid disorders listed by ICD-9-CM code and the surgical procedures which surgeons chose to perform are presented in Table 2. The results revealed that nontoxic unilateral/multinodular goiter (code 241.) are the most common disorders which require thyroidectomy (total = 4901; 52.6%), followed by toxic diffuse and unilateral/multinodular goiter (code 242; total=1963; 21.1%), thyroid neoplasm including malignancy (code 193; total=1197; 12.8%) and benign (code 226; total 452; 4.85%), and unspecified goiter (code 241; total= 333; 3.57%).

US was found to be the main surgical procedure used for nontoxic goiter (61.6%) and toxic goiter (10.7%), BS for nontoxic goiter (51.7%) and toxic goiter (39.5%), UT for

Table 1

Demographic characteristics of patients with distinct surgical procedures for thyroid disorders.

	US	BS	UT	UT&US	BT	RT&LND	*P* value
N	1536	3218	2410	1252	588	312	
Gender, N, %							<.001
Female	1246 (81.12)	2735 (84.99)	1936 (80.33)	1012 (80.83)	484 (82.31)	245 (78.53)	
Male	290 (18.88)	483 (15.01)	474 (19.67)	240 (19.17)	104 (17.69)	67 (21.47)	
Age							<.001
Mean (SD)	45.18 (13.87)	41.28 (14.16)	46.33 (14.04)	45.41 (14.45)	49.37 (13.6)	46.73 (14.28)	
Comorbid conditions, N, %							
Myocardial infarction	11 (0.72)	19 (0.59)	24 (1)	6 (0.48)	4 (0.68)	3 (0.96)	.465
Congestive heart failure	140 (9.11)	214 (6.65)	232 (9.63)	108 (8.63)	55 (9.35)	33 (10.58)	.001
Peripheral vascular disease	60 (3.91)	104 (3.23)	109 (4.52)	67 (5.35)	38 (6.46)	15 (4.81)	.001
Cerebrovascular disease	127 (8.27)	198 (6.15)	230 (9.54)	133 (10.62)	79 (13.44)	32 (10.26)	<.001
Dementia	9 (0.59)	16 (0.5)	17 (0.71)	14 (1.12)	7 (1.19)	4 (1.28)	.125
COPD	496 (32.29)	1007 (31.29)	836 (34.69)	496 (39.62)	241 (40.99)	123 (39.42)	<.001
Rheumatic disease	60 (3.91)	126 (3.92)	189 (7.84)	106 (8.47)	60 (10.2)	30 (9.62)	<.001
Peptic ulcer disease	515 (33.53)	1101 (34.21)	931 (38.63)	561 (44.81)	278 (47.28)	136 (43.59)	<.001
Mild liver disease	401 (26.11)	931 (28.93)	707 (29.34)	442 (35.3)	234 (39.8)	116 (37.18)	<.001
Diabetes	182 (11.85)	343 (10.66)	372 (15.44)	214 (17.09)	133 (22.62)	57 (18.27)	<.001
Hemiplegia or paraplegia	22 (1.43)	55 (1.71)	49 (2.03)	34 (2.72)	22 (3.74)	5 (1.6)	.006
Renal disease	146 (9.51)	235 (7.3)	247 (10.25)	118 (9.42)	78 (13.27)	31 (9.94)	<.001
Cancer	170 (11.07)	199 (6.18)	631 (26.18)	140 (11.18)	308 (52.38)	284 (91.03)	<.001
Moderate or severe liver disease	2 (0.13)	5 (0.16)	3 (0.12)	0 (0.0)	1 (0.17)	0 (0.0)	.029
CCI							<.001
Mean (SD)	3.10 (2.94)	2.62 (2.63)	3.79 (3.22)	3.62 (3.22)	5.27 (3.44)	5.58 (3.34)	
Region, N, %							<.001
Taipei	452 (29.43)	829 (25.76)	772 (32.03)	328 (26.2)	198 (33.67)	117 (37.5)	
Northern	141 (9.18)	350 (10.88)	334 (13.86)	124 (9.9)	57 (9.69)	24 (7.69)	
Central	243 (15.82)	1051 (32.66)	574 (23.82)	285 (22.76)	135 (22.96)	45 (14.42)	
Southern	267 (17.38)	506 (15.72)	319 (13.24)	181 (14.46)	66 (11.22)	60 (19.23)	
Pingtung	393 (25.59)	425 (13.21)	356 (14.77)	302 (24.12)	124 (21.09)	53 (16.99)	
Eastern	40 (2.6)	57 (1.77)	55 (2.28)	32 (2.56)	8 (1.36)	13 (4.17)	
SES, N, %							<.001
Low income	713 (46.42)	1593 (49.5)	1084 (44.98)	581 (46.41)	244 (41.5)	132 (42.31)	
Middle income	641 (41.73)	1304 (40.52)	927 (38.46)	506 (40.42)	240 (40.82)	132 (42.31)	
High income	182 (11.85)	321 (9.98)	399 (16.56)	165 (13.18)	104 (17.69)	48 (15.38)	

BS = bilateral subtotal, BT = bilateral total, CCI = Charlson Comorbidities Index, RT&LND = radical thyroidectomy with unilateral neck lymph node dissection, SES = socioeconomic status, US = unilateral subtotal, UT&US = one-side total and another-side subtotal, UT = unilateral total.

nontoxic goiter (57.4%) and malignant neoplasm (18.1%), UT&US for nontoxic goiter (52.6%) and toxic goiter (32.5%), BT for malignant neoplasm (46.26%) and nontoxic goiter (39.4%), and RT&LND used for malignant neoplasm (89.4%).

UT (36.3%), RT&LND (23.3%), and BT (22.7%) accumulated to a total of 82.3% were the 3 main surgical procedures performed for malignant neoplasm (code 193). BS, UT, and US accounted for 33.9%, 28.2%, and 19.3%, respectively, and accumulated to a total of 81.4% for nontoxic goiter (code: 241). However, for the toxic goiter (code: 242) surgical procedures of BS, UT, and US were 64.8%, 20.7%, and 8.41%, respectively, accumulating to a total of 93.9%.

3.3. Nine-year cumulative incidences of hypoparathyroidism and thyroidectomy

The cumulative incidence of hypoparathyroidism for 6 different surgical procedures is shown in Figure 1. For 6 different surgery procedures, the overall cumulative incidence rate shows an upward trend. The risk of hypoparathyroidism occurrence was significantly high for the patients in the group of BT (13.5%) whereas the risk was significantly low for the patients in the group of US (1.2%). The difference in 9-year cumulative incidence between overall surgeries was 12.3%. Likewise, Table 3 displays the results in terms of HR for various surgical procedures. Compared with the US group, the BT group was associated with a significantly higher risk of hypoparathyroidism occurrence (HR: 11.86; 95% CI: 6.77–20.76). The RT&LND was found to be associated with 8.56 times increased risk of hypoparathyroidism (95% CI, 4.46–16.42) compared with US, followed by 4.39 times (95% CI, 2.62–7.35) for UT, and UT&US was 2.80 times (95% CI, 1.55 to 5.06). Furthermore, BS which was found to be the most commonly used surgical procedure, had the lowest rate (HR, 1.9, 95% CI, 1.12 to 3.23) compared with the US group. Finally, the incidence rate of postsurgical hypoparathyroidism was observed to be 3.4% (314/9316) for overall thyroid patients.

3.4. Time interval of developing hypoparathyroidism after thyroidectomy

Subsequently, we have presented the number of patients who developed hypoparathyroidism by weeks, months, and years. Among 314 patients with post-thyroidectomy hypoparathyroidism, 198 patients (63%) faced hypoparathyroidism at the end of 12 weeks after surgery. It was faced by 120 patients (38.2%) within 2 weeks and in 169 patients (54%) it occurred within 6 weeks after surgery (Fig. 2A). A total of 234 patients had developed hypoparathyroidism at the end of 6 months and 260 patients at the end of 12 month, with a ratio of 74.5% and

Table 2

Surgical procedure for patients with various thyroid disorders.

Thyroid disorders (ICD-9 code)	No.	US N, %	BS N, %	UT N, %	UT&US N, %	BT N, %	RT&LND N, %
Thyroid neoplasm (193 & 226)	1649 (18.1%)						
Malignant neoplasm (193)	1197 (12.8%)	73 (4.75)	80 (2.49)	435 (18.05)	58 (4.63)	272 (46.26)	279 (89.42)
Benign neoplasm (226)	452 (4.85%)	135 (8.79)	52 (1.62)	225 (9.34)	31 (2.48)	6 (1.02)	3 (0.96)
Unspecified goiter (240.)	333 (3.57%)	80 (5.21)	90 (2.80)	100 (4.15)	54 (4.31)	8 (1.36)	1 (0.32)
Simple and unspecified goiter (240)	1	1 (0.07)	—	—	—	—	—
Goiter, specified as simple (240.0)	12	4 (0.26)	4 (0.12)	4 (0.17)	—	—	—
Goiter, unspecified (240.9)	320	75 (4.88)	86 (2.67)	96 (3.98)	54 (4.31)	8 (1.36)	1 (0.32)
Nontoxic uninodular and multinodular goiter (241.)	4901 (52.6%)	947 (61.6)	1663 (51.7)	1383 (57.4)	659 (52.6)	232 (39.4)	17 (5.4)
Nontoxic nodular goiter (241)	7	4 (0.26)	3 (0.09)	—	—	—	—
Nontoxic uninodular goiter (241.0)	461	141 (9.18)	45 (1.4)	229 (9.5)	31 (2.48)	4 (0.68)	11 (3.53)
Nontoxic multinodular goiter (241.1)	2009	137 (8.92)	1090 (33.87)	268 (11.12)	345 (27.56)	167 (28.4)	2 (0.64)
Unspecified nontoxic nodular goiter (241.9)	2424	665 (43.29)	525 (16.31)	886 (36.76)	283 (22.6)	61 (10.37)	4 (1.28)
Toxic diffuse and uninodular or multinodular Goiter (242.)	1963 (21.1%)	165 (10.7)	1272 (39.5)	72 (3.0)	407 (32.5)	46 (7.8)	1 (0.3)
Thyrotoxicosis with or without goiter (242)	5	—	5 (0.16)	—	—	—	—
Toxic diffuse goiter (242.0)	1512	142 (9.24)	961 (29.86)	50 (2.07)	333 (26.60)	26 (4.42)	1 (0.32)
Toxic uninodular goiter (242.1)	27	6 (0.39)	18 (0.56)	2 (0.08)	1 (0.08)	—	—
Toxic multinodular goiter (242.2)	92	5 (0.33)	49 (1.52)	8 (0.33)	19 (1.52)	11 (1.87)	—
Toxic nodular goiter unspecified type (242.3)	67	7 (0.46)	41 (1.27)	5 (0.21)	12 (0.96)	2 (0.34)	—
Thyrotoxicosis of other specified origin (242.8)	1	—	—	1 (0.04)	—	—	—
Thyrotoxicosis without mention of goiter or other cause (242.9)	258	5 (0.33)	198 (6.15)	6 (0.25)	42 (3.35)	7 (1.19)	—
Other diseases not related to thyroid disorders	470 (5.04%)	136 (8.85)	61 (1.9)	195 (8.09)	43 (3.43)	24 (4.08)	11 (3.53)
Total	9316	1536	3218	2410	1252	588	312

BS = bilateral subtotal, BT = bilateral total, RT&LND = radical thyroidectomy with unilateral neck lymph node dissection, US = unilateral subtotal, UT&US = one-side total and another-side subtotal, UT = unilateral total.

82.8%, respectively (Fig. 2B). The number of patients developing hypothyroidism had been decreasing stepwise since 1 year after surgery (Fig. 2C).

4. Discussion

The inclusion of a large cohort of contemporary patients treated with 6 different surgical procedures for thyroid disorders allowed us to understand the incidence of postsurgical hypoparathyroidism among various types of thyroidectomy. To our knowledge, this study is first of its kind to represent the risk for hypoparathyroidism across multiple surgical specialties. The findings of our investigation indicate that the proportion of patients who develop hypoparathyroidism after surgery is substantial, varying from 1.11% to 10.37%, depending on the type of surgical procedure used. The most frequent cause of hypoparathyroidism inflicted after surgical procedure was in the group which had undergone BT while the least frequent in the group which undergone US. Consequently, the impact of the extent of thyroidectomy on the risk for hypoparathyroidism is different according to the type of surgical procedure used. Patients are at greater risk of development of transient and permanent hypoparathyroidism if they undergo surgery of BT and RT&LND type. The results reflect that the more intensive and aggressive the surgery, the higher the risk of hypoparathyroidism development. Our findings conform to the previous studies[12] that the extent of thyroidectomy is a major risk factor for the development and incidence of both transient and permanent hypoparathyroidism.

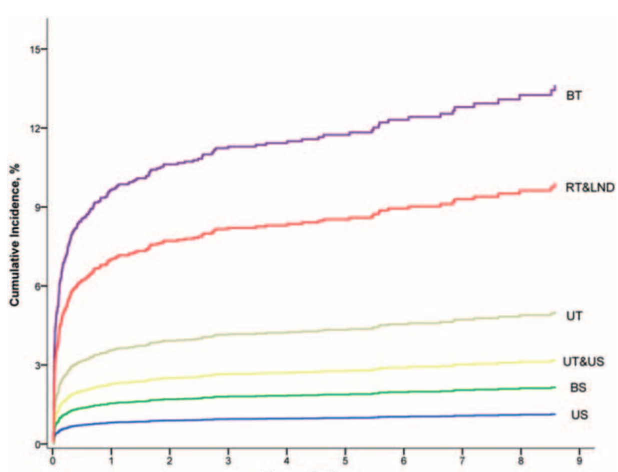

Figure 1. Cumulative incidences of hypoparathyroidism by different surgical procedures.

Table 3

Risk of hypoparathyroidism after adjusting for surgical procedures.

Operation procedures	No.	Hypoparathyroidism no., %	HR (95% CI)	*P* value
US	1536	17 (1.11)	1 [Reference]	
BT	588	61 (10.37)	11.86 (6.77–20.76)	<.001
RT&LND	312	27 (8.65)	8.56 (4.46–16.42)	<.001
UT	2410	107 (4.44)	4.39 (2.62–7.35)	<.001
UT&US	1252	32 (2.56)	2.80 (1.55–5.06)	.001
BS	3218	70 (2.18)	1.90 (1.12–3.23)	.018

BS = bilateral subtotal, BT = bilateral total, RT&LND = radical thyroidectomy with unilateral neck lymph node dissection, US = unilateral subtotal, UT&US = one-side total and another-side subtotal, UT = unilateral total.

Adjusted hazard ratios were adjusted for the confounders as comorbid conditions, CCI, regions, and SES in Table 1.

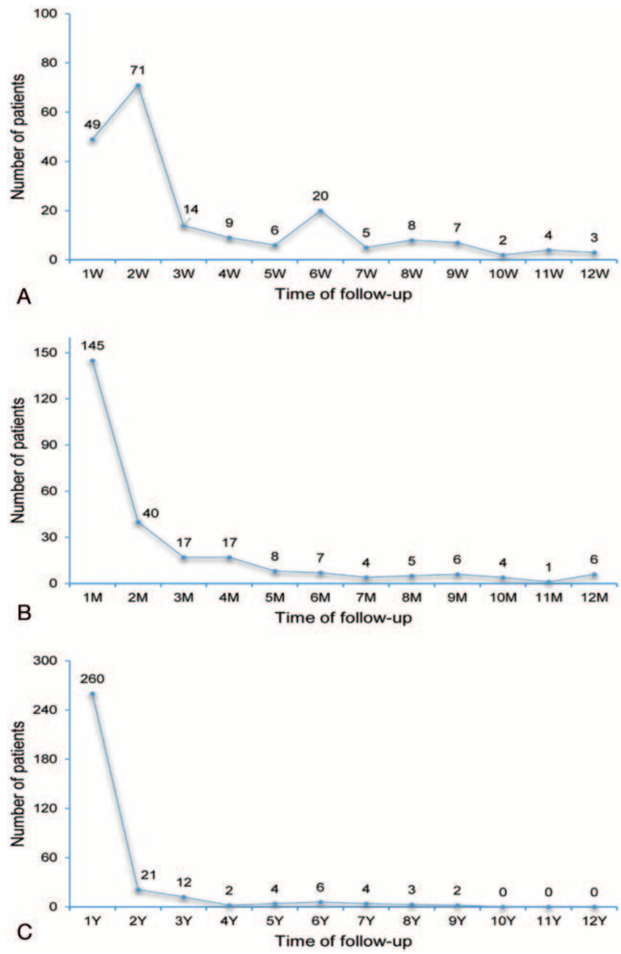

Figure 2. Hypoparathyroidism developed after thyroidectomy with a distinct ime interval (weeks, months and years).

However, the risk of hypoparathyroidism occurrence was significantly high for the patients in the group of BT and RT&LND. In terms of HR for various surgical procedures, the BT group was found to be associated with 11.86 times increased risk of hypoparathyroidism (95% CI, 6.77–20.76) compared with US group, followed by the 8.56 times (95% CI, 4.46–16.42) for RT&LND group. However, BT and RT&LND were found to be the main surgical procedure used for malignant neoplasm, respectively (46.26% and 89.4%). Although these conclusions indicate that these procedures are usually used for malignant neoplasm, they do not directly imply the malignant neoplasm itself to be associated with hypoparathyroidism. It is the procedure that patients have greater risk of developing hypoparathyroidism.

Patients with nontoxic unilateral or multinodular goiter (code 241) accounted for the largest number of patient undergone thyroidectomy (53%). In addition, the most frequent surgical procedure used was BS for 33.87% patients with nontoxic multinodular goiter (code 241.1). The resection of at least 2 parathyroid glands increased the risk of transient and permanent hypoparathyroidism.[13] Hence, preservation of the parathyroid glands in situ by meticulous dissection and preservation of their blood supply[14] was the recommended surgical strategy in thyroid disorder to decrease the rate of postoperative hypoparathyroidism. The common surgery was UT for 9.5% patients with nontoxic uninodular goiter (code 241.0). Multinodular goiter was less frequently associated to the development of a thyroid cancer but unilateral nodular goiter had a relatively higher incidence of thyroid cancer development as compared with multinodular. That is why those patients more frequently received unilateral surgery.

Among 6 surgical procedures, RT&LND had the highest incidence rate, that is, 89% patients with thyroid cancer whereas BT had 46%. Removing entire thyroid can be used for all types of thyroid cancer (papillary, follicular, medullary, or anaplastic). If some of the thyroid tissue cannot be removed, it can be destroyed subsequently by radioactive iodine therapy. Half of the patients with thyroid cancer (code 193) received conservative surgery (US, BS, and UT) and other half received more aggressive surgery (BT, UT&US, and RT&LND). The procedure of surgery may be chosen on the basis of type of cancer call. It also depends on the size of the nodule, age, and whether the cancer has spread. Unfortunately, we are not able to provide further information about the cell type and staging in our study because of the nature of limited NHI database. Therefore, our findings should be interpreted with regards to this limitation.

The duration of hypoparathyroidism for more than 6 months after surgery was defined as permanent hypoparathyroidism according to the previous studies.[3,15] In this study, transient hypoparathyroidism was observed in 243 (74.52%) patients, whereas the incidence of permanent hypoparathyroidism was 25.48%. Furthermore, a total of 260 patients had developed hypoparathyroidism at the end of 1 year after surgery, with a ratio of 82.8% (17% recovered in between 6 and 12 months). This demonstrates that there is a large number of patients with hypoparathyroidism after surgery in the short run; meanwhile, the number of patients developing hypothyroidism largely decreased after 1 year postoperative. Though we attempted to address the patient variation among different procedures, it still obtains similar results among 6 surgical procedures.

Postsurgical hypoparathyroidism is the common complication following thyroidectomy and is generally transient which occurs in 10% of patients.[6] Transient hypoparathyroidism could be caused by blood loss during surgery and is limited to the first week of following surgery.[2] Some authors have also argued about the endoscopic thyroidectomy with bilateral central neck dissection (ETBC) being safe for patients with thyroid cancer; however, it may increase the risk of transient hypoparathyroidism in comparison with conventional surgical procedures.[16] To avoid transient hypocalcemia after thyroidectomy calcium and vitamin D supplements along with subtotal thyroidectomy are useful in light of findings of a review study by Antakia Ramez et al.[17] Some authors are of the view that as a result of parathyroid autotransplantation, the risk of transient hypocalcemia is enhanced; still it is in favor of improved patient outcomes in the long run.[18]

Tissue regeneration and blood reperfusion would restore parathyroid function again and help to decrease the risk of hypoparathyroidism. Few patients develop permanent hypoparathyroidism. In this study, estimates of the incidence of postoperative hypoparathyroidism are 3.4%. A higher number of patients experience immediate postsurgical hypoparathyroidism on the first 6 weeks after surgery, and then this number decreased as time passed.

It has also been found that postsurgical hypocalcemia is also related to parathyroid dysfunction in those patients who have normal parathyroid hormone concentrations after surgery as discussed by Marco Raffaelli et al (2016).[19] Others suggest that lower levels of postsurgical parathyroid hormone (PTH) can get back to normal quickly, however, in some cases it may take up to 1 year that is why there is need to define hypoparathyroidism on the basis of both PTH levels as well as medications required to recover.[20]

This might also have potential implications in this regards. Similar finding have also been reported by Wang X et al (2016) in China.[21] It has been found that there is an association between discolored parathyroid glands and hypoparathyroidism after total thyroidectomy.[22] There are certain technique that can help avoid postsurgical complications in total thyroidectomy as suggested by some experts that to avoid hypoparathyroidism and reduce the recovery period extracapsular surgical technique while total thyroidectomy is quite useful[23]; however, some authors opine that total thyroidectomy is significantly associated with higher incidence of permanent hypothyroidism in patients with benign thyroid disease.[24] In another study authors have found that when compared with subtotal thyroidectomy, total thyroidectomy is safer and produces less complications being safer in the long run.[25]

In this study, there are certain limitations. First, we do not analyze the concurrent procedure codes related to lymph node dissection. Evaluation of lymph node dissection is imperative because it is well known that adding lymph node dissection will greatly increase the risk of hypoparathyroidism. For thyroid cancer operation, the procedures are usually IV (unilateral total thyroidectomy + contralateral subtotal thyroidectomy) or V (bilateral total thyroidectomy [including both BT and RT&LND]). Clinically, prophylactic central lymph node dissection is mostly performed during thyroid cancer operation. However, the procedure is less harmful to parathyroid. More extensive (unilateral or bilateral) lateral compartment lymph node dissection may have impact on subsequent parathyroid function but it is limitedly performed when lymph node metastasis is diagnosed or suspicious before operation. Hence, it is hard to differentiate the additional coding IV or V in many clinical practices. However, for thyroid cancer, the role of lymph node dissection in addition to thyroidectomy is controversial.[26] Therefore, the clinical practice may vary, that is, thyroidectomy with or without lymph node dissection. As such, we mainly evaluate the impact of the extent of thyroidectomy on the risk of hypoparathyroidism. Second, this study does not discuss parathyroid autotransplantation because it is usually not done in the clinical setting of IV or V procedures. Furthermore, previous studies have assessed the influence and effectiveness of parathyroid autotransplantation in preventing persistent hypoparathyroidism.[3,27] In sum, the effects of lymph node dissection and parathyroid autotransplantation would be assessed in future studies with a larger cohort and rigorous design, which will render the effects on the risk of hypoparathyroidism more comprehensive during thyroidectomy.

5. Conclusion

In short, it can be concluded from the findings of this study that the extent of thyroid resection determines the risk of development of hypoparathyroidism. Transient hypoparathyroidism could be observed within 6 weeks after surgical procedure. The incidence of hypoparathyroidism has been increasing after time prolongation. These observations should be considered when assessing the comparative risk for development of hypoparathyroidism after thyroid surgery.

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