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Influence of Various Operative Thyroid Techniques on Postoperative Hypoparathyroidism at King Hussein Medical City

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Abstract: ***Background: The main severe risk of thyroid operative techniques is hypoparathyroidism. The frequency percentage of hypoparathyroidism after surgery is 1.6%-50%. In the majority of subjects, this is temporary and only 0.5%-6.6% of subjects might remain with permanent hypoparathyroidism. The operative-induced risk of hypoparathyroidism could be correlated with the size of thyroidectomy influencing hypoparathyroidism after thyroid operative techniques. Aim: To determine the relation between operative thyroid techniques and the risk of postoperative hypoparathyroidism in subjects with thyroid diseases. Methods: Our retrospective investigation included 471 subjects with thyroid surgery for thyroid diseases, of both sexes(women:388 [82.4%], men:83 [17.6%])and aged 35-55yrs.at King Hussein hospital, King Hussein medical city, Amman, JORDAN, during the period 2018-2019. The factors that might affect the risk of hypoparathyroidism such as age and sex were enrolled in the investigation.One-way ANOVA test was used to assess each parameter in groups of operative thyroid techniques. Cox regression was measured to estimate the hazard ratio (HR). Results: Bilateral subtotal (33.3%) was the main frequently used operative technique for thyroid diseases. Nontoxic uni /multinodular goiter is the main frequent disease which needs thyroidectomy (overall = 254/471; 53.9%). 20 subjects (4.2%) with hypoparathyroidism were found. Frequency of hypoparathyroidism was recorded the most in subjects with bilateral total thyroidectomy (4/35; 11.4%) and recorded the least in subjects with unilateral subtotal thyroidectomy (2/82; 2.4%). In subjects with unilateral subtotal, the risk was the most in bilateral total (HR: 10.62), and was the least in bilateral subtotal (HR:1.12). Temporary hypothyroidism was recorded in 15 subjects (75%) and permanent one in 5(25%) subjects. Conclusion: Size of thyroid resection affected the risk of postoperative hypoparathyroidism. Frequency of hypoparathyroidism was recorded the most with bilateral total thyroidectomy and recorded the least with unilateral subtotal thyroidectomy.***

Keywords: hypoparathyroidism, operative thyroid technique, thyroid diseases, thyroidectomy

1. Introduction

Thyroidectomy is the operative selected technique in managing thyroid diseases. The main severe risk of thyroid operative techniques is hypoparathyroidism induced by the insult to parathyroid gland with disarrangement of calcium and phosphate control [(1)]. The frequency percentage of hypoparathyroidism after surgery is 1.6%-50%[(2)].In the majority of subjects, this is temporary and recovery could occur during weeks to months postoperatively. Only 0.5%-6.6% of subjects might remain with permanent hypoparathyroidism [(3)].

Post –operative thyroid techniques are the main frequent factor of hypoparathyroidism[(4)] and the control of this frequency might be performed by ascertaining the risk of various operative thyroid techniques. Post-operative thyroid techniques, there is an association between the operative thyroid techniques and the risk of hypoparathyroidism. The operative thyroid risk could be correlated with the size of thyroidectomy which affects hypoparathyroidism post thyroid operative techniques.

The goal of our investigation was to ascertain the correlation between the operative thyroid techniques and risk of hypoparathyroidism after thyroid surgery in subjects with thyroid diseases.

2. Methods

Our retrospective investigation included 471 subjects with thyroid surgery for thyroid diseases, of both sexes (women 82.4% [388], men 17.6% [83]) and aged 35-55yrs.at King Hussein hospital, King Hussein medical city, Amman, JORDAN, during the period 2018-2019, after obtaining approval from our local ethical and research board review committee of the Royal Jordanian medical services and written informed consent from all participants. All participants were followed up till the confirmation of hypoparathyroidism. Participants with hypoparathyroidism pre-any operative thyroid techniques were ruled out.

The factors that might affect the risk of hypoparathyroidism such as age and sex were enrolled in the investigation.

Statistics

One-way ANOVA test was used to assess each parameter in groups of operative thyroid techniques. A P value of less than 0.05 was considered significant. Cox regression was used to measure hazard ratio (HR).

3. Results

Demographics are featured in Table I. Bilateral subtotal (157/471; 33.3%) was the main frequently used operative technique for thyroid diseases and the least t technique was the radical thyroidectomy with unilateral neck lymph node dissection 12/471(2.6%).

The association between thyroid diseases and the operative thyroid techniques are shown in Table II. Nontoxic uni/multinodular goiter is the main frequent disease which needs thyroidectomy (overall = 254/471; 53.9%). Unilateral subtotal thyroidectomy was the most operative technique used for nontoxic (51/82; 62.2%), bilateral subtotal for nontoxic (82/157; 52.2%), unilateral total for nontoxic goiter (74/125; 59.2%), one side total and the other side subtotal for nontoxic (33/60; 55%), bilateral total for malignant neoplasm (17/35; 48.6%) and radical thyroidectomy with unilateral neck lymph node dissection for malignant neoplasm (11/12; 91.7%).

Unilateral total (24/66; 36.4%) was the most operative thyroid technique used for malignant neoplasm. Bilateral subtotal was (82/254; 32.3%) for nontoxic goiter. For the toxic goiter, operative technique of bilateral subtotal was (61/98; 62.2%).

The risk of hypoparathyroidism was remarkably increased for subjects in bilateral total group (4/35; 11.4%) and the risk was remarkably reduced for subjects in unilateral subtotal group (2/82; 2.4%). Bilateral total group was correlated with a remarkably more risk of hypoparathyroidism in comparison to unilateral subtotal group (HR: 10.62: 5.25–18.54). Table III.Bilateral subtotal was the main frequently operative technique and had the least rate (HR, 1.12: 1.0 to 2.01) in comparison to the unilateral subtotal group. The frequency percentage of hypoparathyroidism after surgery was 4.2% (20/471) for overall thyroid patients. Twelve subjects/20 (60%) had hypoparathyroidism at the end of 3 months postoperatively, 8/20 subjects (40%) during 2 weeks and 11/20 subjects (55%) during 6 weeks postoperatively. 15/20 (75%) subjects had hypoparathyroidism at the end of 6 months and 17/20(85%) subjects at the end of 12 months.

Table I: Subjects demographics

	Uni-subtotal	Bi-subtotal	Uni-total	Uni-total, Uni-subtotal	Bi-total	Radical	P
Group	I	II	III	IV	V	VI	
No.	82	157	125	60	35	12	
Sex (no., %) F **M**	67(81.7) 15(18.3)	135(85.98) 22(14.02)	100(80) 25(20)	48(80) 12(20)	29(82.9) 6(17.1)	9(75) 3(25)	<0.005
Age(yrs.)average	43.84	39.94	44.99	44.07	48.03	45.39	<0.005

Table II: Operative thyroid techniques for various thyroid diseases

	No.	Uni-subtotal (No, %)	Bi-subtotal (No, %)	Uni-total (No, %)	Uni-total, Uni-subtotal (No, %)	Bi-total (No, %)	Radical (No, %)
Thyroid neoplasm	93/471(19.7%)						
Malignantneoplasm	66/471(14.01%)	5/82(6.1%)	6 (3.8)	24/125(19.2%)	2 (3.3)	17/35(48.6%)	11 (91.7)
Benign neoplasm	27/471(5.7%)	10/82(12.2%)	3 (1.9)	14/125(11.2%)	2 (3.3)	1 (2.9)	0
Unspecified goiter	26/471(5.5%)	6/82(7.3%)	5 (3.2)	7/125(5.6%)	3 (5)	1 (2.9)	0
Nontoxic uni-and multinodular goiter	254/471(53.9%)	51/82(62.2%)	82/157(52.2%)	74/125(59.2%)	33/60(55%)	14 (40)	1(8.3)
Toxic diffuseanduni-ormultinodular Goiter	98/471(20.8%)	10/82(12.2%)	61/157(38.9%)	6/125(4.8%)	20 (33.3)	2 (5.7)	0
Overall	471	82	157	125	60	35	12

Table III: Hypoparathyroidism according to operative thyroid techniques

Thyroid surgical technique	*G*	*No.*	*Hypoparathyroidism(no., %)*	*HR*	*P*
Unilateral subtotal	I	82	2 (2.4)	1	
Bilateral subtotal	II	157	5 (3.2)	1.12 (1.0–2.01)	0.05
Unilateral total	III	125	7 (5.6)	3.15 (1.40–5.13)	<0.005
Unilateral total, Unilateral subtotal	IV	60	1 (1.7)	1.56 (1.01–3.27)	0.005
Bilateral total	V	35	4 (11.4)	10.62 (5.25–18.54)	<0.005
Radical	VI	12	1 (8.3)	7.32 (3.24–14.21)	<0.005
Overall		471	20(4.2%)		

Table IV: Hypothyroidism according to postoperative period

Interval	Hypothyroidism(no., %)
3 months	12/20(60)
6 months	15/20(75)
12 months	17/20(85)
2 weeks	8/20(40)
6 weeks	11/20(55)
Temporary	15(75)
Permanent	5(25)

4. Discussion

Our study showed that percentage of subject's with postoperative hypoparathyroidism is from 2.4% to 11.4% according to the operative thyroid technique. The main common operative thyroid technique cause of hypoparathyroidism was the bilateral total and the least common wasthe unilateral subtotal. The effect of the size of thyroidectomy on the risk of hypoparathyroidism is various. Bilateral total and radical groups are at more risk of temporary and permanent hypoparathyroidism. The more invasive the operation, the more the risk of hypoparathyroidism. The size of thyroidectomy is an

important risk of temporary and permanent hypoparathyroidism [5].The risk of hypoparathyroidism was remarkably more in bilateral total and radical groups. The bilateral total group was correlated with 10.62 times more risk of hypoparathyroidism compared to unilateral subtotal group, then with 7.32 times for radical group. Bilateral total and radical groups were the most operative thyroid techniques for malignant neoplasm, respectively (48.6% and 91.7%). Malignant neoplasm is not correlated with hypoparathyroidism.

Subjects with nontoxic uni-or multinodular goiter included the biggest number of subjects with thyroidectomy. The main common operative thyroid technique was bilateral subtotal for subjects with nontoxic multinodular goiter. The removal of minimum 2 parathyroid glands increased the risk of temporary and permanent hypoparathyroidism [6]. Keeping the parathyroid glands by fine dissection was indicated to reduce hypoparathyroidism after surgery. The frequent operation was unilateral total for subjects with nontoxic uninodular goiter. Multinodular goiter was less commonly correlated with thyroid cancer but unilateral nodular goiter had more frequency with thyroid cancer.

Radical surgery had the highest frequency percentage in thyroid cancer. Removing total thyroid is indicated for all thyroid cancers (papillary, follicular, medullaryor anaplastic). Fifty percent of thyroid cancer had conservative operation (uni-subtotal, Bi-subtotal and Uni-total) and the other 50% had other invasive operation (Bi-total, Uni-total with uni-subtotal and radical). The period of hypoparathyroidism for more than 6 months postoperatively is called the permanent hypoparathyroidism [2, 7]. In our investigation, temporary hypoparathyroidism was recorded in 15 (75%) subjects and permanent hypoparathyroidism was in 25%(5 subjects). 17 subjects had hypoparathyroidism at the end of 12 months postoperatively (85%).

Hypoparathyroidism after surgery is the frequent hazard after thyroidectomy and is mostly temporary in 10%[4]. Temporary hypoparathyroidism might be induced by blood loss intraoperatively within the first week after operation [1]. Endoscopic thyroidectomy with bilateral central neck dissection may increase the risk of temporary hypoparathyroidism [8].Calcium and vitamin D with subtotal thyroidectomy are useful to exclude temporary hypocalcemia after thyroidectomy [9]. Due to parathyroid auto transplantation, the risk of temporary hypocalcemia is increased [10].Tissue regeneration and blood reperfusion might regain parathyroid function and might reduce the risk of hypoparathyroidism. In our investigation, the frequency of hypoparathyroidism after surgery is 4.2%. More subjects had instant hypoparathyroidism after surgery on the first 6 weeks. Hypocalcemia after surgery is related to parathyroid dysfunction in subjects with normal parathyroid hormone concentrations postoperatively [11]. Hypoparathyroidism must be defined according to PTH levels and drugs needed for recovery.

There is a correlation between parathyroid glands and hypoparathyroidism following total thyroidectomy[12]. To avoid hazards after surgery in total thyroidectomy, avoid hypoparathyroidism and decrease the recovery timeextracapsular operative procedure [13]. Total thyroidectomy is remarkably correlated with increased frequency of permanent hypothyroidism in benign thyroid disease [14]. If compared with subtotal thyroidectomy, total thyroidectomy is safer [15]. Lymph node dissection will increase the risk of hypoparathyroidism. For thyroid cancer, the techniques are unilateral total thyroidectomy with contralateral subtotal thyroidectomy or bilateral total thyroidectomy and radical. Preventive central lymph node dissection is done within thyroid cancer surgery. More invasive (unilateral or bilateral) lateral lymph node dissection could have effect on parathyroid function.

5. Conclusion

The size of thyroid resection affects the risk of postoperative hypoparathyroidism. Temporary hypoparathyroidism might be recorded during6 weeks postoperatively. The frequency of hypoparathyroidism increased following time. Frequency of hypoparathyroidism was recorded the most with bilateral total thyroidectomy and recorded the least with unilateral subtotal thyroidectomy.

References

[1] Kuan CC, Usman I, Phung AN, etal.The impact of different surgical procedures on hypoparathyroidism after thyroidectomy.A population-based study.Medicine 2017; 96:43(e8245).
[2] Cui Q, Li Z, Kong D, et al. A prospective cohort study of novel functional types of parathyroid glands in thyroidectomy: in situ preservation or auto-transplantation? Medicine 2016; 95:e5810.
[3] Shoback D. Clinical practice. Hypoparathyroidism. N Engl J Med 2008; 359:391–403.
[4] Khan M, Waguespack S, Hu M. Medical management of postsurgical hypoparathyroidism. EndocrPract 2010; 17(suppl 1): 18–25.
[5] Asari R, Passler C, Kaczirek K, et al. Hypoparathyroidism after total thyroidectomy: a prospective study. Arch Surg 2008; 143:132–7.
[6] Chereau N, Trésallet C, Noullet S, et al. Prognosis of papillary thyroid carcinoma in elderly patients after thyroid resection: a retrospective cohort analysis. Medicine 2016; 95:e5450.
[7] Du W, Fang Q, Zhang X, et al. Unintentional parathyroidectomy during total thyroidectomy surgery: a single surgeon's experience. Medicine 2017; 96:e6411.
[8] Xiang D, Xie L, Li Z, et al. Endoscopic thyroidectomy along with bilateral central neck dissection (ETBC) increases the risk of transient hypoparathyroidism for patients with thyroid carcinoma. Endocrine 2016; 53:747–53.
[9] Antakia R, Edafe O, Uttley L, et al. Effectiveness of preventative and other surgical measures on hypocalcemia following bilateral thyroid surgery: a systematic review and meta-analysis. Thyroid 2015; 25: 95–106.
[10] Oran E, Yetkin G, Mihmanlı M, et al. The risk of hypocalcemia in patients with parathyroid autotransplantation during thyroidectomy. Turk J Surg [UlusalCerrahiDergisi] 2016; 32:6–10.

[11] Raffaelli M, De Crea C, D'Amato G, et al. Post-thyroidectomy hypocalcemia is related to parathyroid dysfunction even in patients with normal parathyroid hormone concentrations early after surgery. Surgery 2016; 159:78–84.
[12] Lang BH-H, Chan DT, Chow FC-L, et al. The association of discolored parathyroid glands and hypoparathyroidism following total thyroidec-tomy. World J Surg 2016; 40:1611–77.
[13] Lang BH-H, Chan DT, Chow FC-L. Visualizing fewer parathyroid glands may be associated with lower hypoparathyroidism following total thyroidectomy. Langenbecks Arch Surg 2016; 401:231–8.
[14] Hauch A, Al-Qurayshi Z, Randolph G, et al. Total thyroidectomy is associated with increased risk of complications for low-and high-volume surgeons. Ann SurgOncol 2014; 21:3844–52.
[15] Padur AA, Kumar N, Guru A, et al. Safety and effectiveness of total thyroidectomy and its comparison with subtotal thyroidectomy and other thyroid surgeries: a systematic review. J Thyroid Res 2016; 2016:7594615.