

Complications Following Thyroid Procedures at King Hussein Medical Center, Jordan

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ABSTRACT

Background: In the eighteenth century, the frequency of mortality from various operative thyroid procedures was approximately 40% due to postoperative complications such as bleeding and infection. Currently, the major postoperative complications of operative thyroid procedures include infection, airway obstruction due to hematoma or bleeding, hypocalcaemia, and recurrent or superior laryngeal nerve insults.

Objectives: To evaluate the incidence of complications after different operative thyroid procedures performed for benign and malignant disorders.

Methods: Our retrospective investigation included 197 patients of both sexes who were scheduled for operative thyroid procedures for different thyroid disorders (benign and malignant) at King Hussein Hospital, King Hussein Medical Centre in Amman, Jordan, between 2012 and 2015. The operative thyroid procedures included total thyroidectomy, near-total thyroidectomy, subtotal thyroidectomy, hemithyroidectomy and isthmusectomy. Recognising recurrent laryngeal nerves and parathyroid glands was mandatory. The incidence of complications following different operative thyroid procedures was evaluated. The postoperative complications and their frequencies were evaluated using Fisher's exact test. P-values less than 0.05 were considered statistically significant.

Results: Hemithyroidectomy, isthmusectomy, and subtotal, near-total and total thyroidectomies were performed in 85 (43.1%), 16 (8.1%), 22 (11.2%), 26 (13.2%) and 48 (24.4%) patients, respectively. The overall incidence of complications after surgery was 18.3% (n = 36). Hypocalcaemia (n = 16, 8.1%) and recurrent laryngeal nerve insults (n = 14, 7.1%) were the most frequent complications after surgery.

Conclusion: Hypocalcaemia and recurrent laryngeal nerve insult after surgery were the most frequent complications after different operative thyroid procedures.

Keywords: Hypocalcaemia; Recurrent laryngeal nerve insult; Thyroidectomy.

JRMS April 2020; 27(1): 10.12816/0055468

Introduction

Thyroid gland diseases are the second most frequent endocrine pathology after diabetes mellitus.¹ Thyroid gland pathologies requiring operative procedures may be benign or malignant. Operative interventions are indicated when the swelling of the thyroid gland, such as in nodular or colloid goitre, causes problems in breathing, voice or swallowing,¹ when the enlarged thyroid gland causes toxic clinical features, or when there is suspicion of malignancy. The type of thyroidectomy depends on whether the pathology is benign or malignant, its size, and associated deficiency.

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In the eighteenth century, the incidence of mortality from operative thyroid procedures was approximately 40% due to postoperative complications such as bleeding and infection.¹ Recent advances in antisepsis, modern anaesthesia and enhanced operative haemostatic procedures have led to a marked reduction in morbidity following thyroid surgery. The major complications after operative thyroid procedures include infection, airway obstruction due to haematoma or bleeding, hypocalcaemia, and recurrent or superior laryngeal nerve insults.² Familiarity with the anatomy and operative procedures is crucial for excellent results and to maintain an acceptable complication incidence. Complications associated with operative thyroid procedures are directly proportional to the extent of thyroidectomy and inversely proportional to the surgeon's expertise.³

The objective of our investigation was to evaluate the frequency of complications following different operative thyroid procedures performed for benign and malignant thyroid disease.

Methods

Our retrospective investigation included 197 patients of both sexes with a median age of 42.7 years. All patients were scheduled for different operative thyroid procedures for benign and malignant thyroid disorders at King Hussein Hospital, King Hussein Medical Centre in Amman, Jordan, between 2012 and 2015. Written informed consent was obtained from all patients, and the study was approved by the local ethical and research board review committee of the Royal Medical Services.

The incidence of complications following different operative thyroid procedures was evaluated. Preoperative indirect laryngeal examination, thyroid profile, neck ultrasound and needle aspiration cytology were performed for all patients. Computed tomography or magnetic resonance imaging was performed if a large thyroid mass was present.

Recognising recurrent and superior laryngeal nerves and parathyroid glands was mandatory. The operative thyroid procedures included total thyroidectomy, near-total thyroidectomy, subtotal thyroidectomy, hemithyroidectomy and isthmusectomy. Laryngeal endoscopy was performed in patients with hoarseness after surgery. Vocal cord impairment persisting for 6 months postoperatively was recorded as a permanent paralysis. Serum calcium levels were recorded on the day after surgery in all patients except those who underwent isthmusectomy. Temporary hypocalcaemia was recorded when the serum calcium level was lower than 8.5 mg/L, together with muscle spasms, peri oral numbness and a tingling sensation which responded to calcium. Permanent hypocalcaemia was recorded when hypocalcaemia continued for longer than 6 months treatment with calcium and vitamin D.⁴

Statistical analysis

The postoperative complications and their frequencies were evaluated using Fisher's exact test. P-values less than 0.05 were considered statistically significant.

Results

There were 160 females (81.2%) and 37 males (18.8%) in the study, with a female: male ratio of 4.3:1. The median age was 42.7 years. Preoperative diagnosis of benign and malignant disorders and indication for operative thyroid procedures occurred in 87.3% (n = 172) and 12.7% (n = 25) of patients, respectively. The pathologies included colloid goitre, nodular goitre, hyperplastic nodule, and papillary and follicular

carcinoma. The most frequent pathology was colloid goitre, observed in 47.2% (n = 93) of patients (P<0.05), but papillary carcinoma was the most frequent malignancy, observed in 9.1% (n = 18) of patients (Table I). The most frequent operative thyroid procedure was hemithyroidectomy (n = 85, 43.1%; P<0.04; Table II). The total complication incidence after surgery was 18.3% (n = 36; Table III). Recurrent laryngeal nerve insults were recorded in 7.1% (n = 14) of all surgical patients, which made up 38.9% (n = 14) of all complications. All insults, temporary or permanent, were unilateral. Temporary and permanent recurrent laryngeal nerve insults were recorded in 5.1% (n = 10) and 2.03% (n = 4) of patients, respectively (P<0.039). Temporary hypocalcaemia was recorded in 4.1% (n = 8) of all patients. In the benign group, temporary recurrent laryngeal nerve insult was the most frequent complication, while permanent hypocalcaemia was the most frequent complication in the malignant group (Table IV). The distribution of complications according to different operative thyroid procedures is presented in Table V.

Table I. Thyroid pathology.

Pathology	N(%)	P value
Colloid goitre	93(47.2%)	<0.048
Nodular/multinodular goitre	64(32.4%)	<0.042
Cyst	5(2.6%)	>0.063
Hyperplastic nodule	10(5.1%)	
Papillary carcinoma	18(9.1%)	
Follicular carcinoma	7(3.6%)	

Table II. Types of operative thyroid procedures.

Surgery	N(%)	P value
Hemithyroidectomy	85(43.1%)	<0.04
Subtotal thyroidectomy(STT)	22(11.2%)	>0.071
Near-total thyroidectomy(NTT)	26(13.2)	
Total thyroidectomy(TT)	48(24.4%)	
Isthmusectomy	16(8.1%)	

Table III. Complications following operative thyroid procedures.

Complications	N(%) of all patients	N(%) of complications	P value
Temporary hypocalcaemia	8(4.1%)	8(22.2%)	>0.066
Permanent hypocalcaemia	8(4.1%)	8(22.2%)	
Temporary RLNI	10(5.1%)	10(27.8%)	<0.039
Permanent RLNI	4(2.03%)	4(11.1%)	
Others	6(3.04%)	6(16.7%)	>0.074

RLNI, recurrent laryngeal nerve injury.

Table IV. Postoperative complications according to malignant or benign lesions.

Complications	Malignant lesions	Benign lesions	P value
Permanent RLNI	0	4	<0.044
Temporary RLNI	2	8	
Permanent hypocalcaemia	8	0	>0.069
Temporary hypocalcaemia	8	0	
Others*	0	6	<0.046

RLNI, recurrent laryngeal nerve injury.

*bleeding, hematoma, serroma, infection.

Table V. Complications according to the operative thyroid procedure.

Complications	TT	NTT	STT	Hemithyroidectomy	Isthmusectomy	P value
Permanent RLNI	2	0	0	2	0	>0.080
Temporary RLNI	6	2	0	2	0	<0.049
Permanent hypocalcaemia	8	0	0	0	0	<0.035
Temporary hypocalcaemia	8	0	0	0	0	<0.041
Others*	2	1	1	2	0	>0.078

Near-total thyroidectomy, NTT; subtotal thyroidectomy, STT; total thyroidectomy, TT; RLNI, recurrent laryngeal nerve injury.

*bleeding, hematoma, serroma, infection.

Discussion

Advances in operative thyroid procedures since the 1800s have improved the safety of this surgery, primarily due to modern anaesthesia, antiseptic protocols and proper haemostasis.⁵ Kocher, “the father of modern thyroid surgery”, initially described the ligation of inferior thyroid arteries, resulting in a marked reduction in blood loss.⁶

The overall incidence of complications in our investigation was 18.3%, which is similar to that reported in other studies (21% and 24%).^{1, 7}The occurrence of haematoma after thyroidectomy is rare (1–2%).⁸ Most of our surgeon use energy devices for haemostasis and securing vessels, metallic clip and ligature are used very rarely in thyroid surgery either because they consume time or unavailable. Complications of haemostasis occur during the first postoperative day, often involving respiratory distress, pain and dysphagia.⁹ In most patients, late haemorrhage is venous, and is apparent upon walking and coughing due to the negative pressure on the large vessels of the neck. Haemostasis must be ascertained by raising the intrapulmonary pressure.¹⁰ Injury to the superior laryngeal nerve appears as vocal exhaustion and reduced voice tone.¹⁰ Ligation of the superior thyroid vessels close to the capsule of the gland prevents insult to the superior laryngeal nerve. Recurrent laryngeal nerve insult occurs in 0–4% of patients, and is dependent on the extent of thyroid surgery, the presence of Grave’s disease, thyroid carcinoma and repeat surgery.^{1, 11}The causes of temporary recurrent laryngeal paralysis include extensive nerve exposure, neuritis, severe stretching, electro coagulation and endotracheal intubation.

The frequency of permanent vocal cord palsy in our investigation was 2.03% which is considered to be higher than the reported percentage in literature which is 1.1% and this might be related to that most of the cases are referred to our centre because of their difficulty and the extensive use of energy devices which causes nerve damage either directly or by transmitted heat rather than ligatures and metallic clip. Large excision, preoperative thyroid malignancy and recurrent goitre have been identified as risk factors for recurrent laryngeal nerve insults.¹² The presence of Grave’s disease, thyroiditis, recurrent goitre, malignancy and large thyroid excision are risk factors for transient recurrent laryngeal nerve insult, while Grave’s disease and recurrent goitre are risk factors for permanent recurrent laryngeal nerve insult.¹³ The risk of seroma is higher in bilateral surgeries and in thyroidectomy performed for large goitres.¹ Frequency of infection after thyroidectomy is reduced.^{1, 14} In neoplastic pathologies, the use of non-iodinated disinfectant is recommended as to not interfere with the thyroid scan after surgery.¹⁰

When neck node dissection is scheduled with thyroidectomy, there is a possibility of chylous leakage due to the risk of insult to the thoracic duct on the left side and to the lymphatic duct on the right side.¹⁵

Hypoparathyroidism after surgery is caused by devascularisation and accidental injury to the parathyroid glands.¹ Postoperative tetany is related to the removal of the parathyroid glands or interference with their blood supply.⁵ Hypoparathyroidism is diagnosed when calcium levels are lower than 7.5 mg/L or lower than 8.5 mg/L combined with clinical features of hypocalcaemia. If the calcium levels remain lower than 8.5 mg/L at 12 months after surgery, it is diagnosed as permanent.¹ The clinical features of Hypoparathyroidism appear 1–2 days postoperatively.

Surgical excision, Grave’s disease, recurrent goitre, female sex and a specimen weight greater than 45 g are all risk factors for transient Hypoparathyroidism, while the size of the surgical resection, Grave’s disease, recurrent goitre and malignancy are risk factors for permanent hypoparathyroidism.¹³ The frequency of permanent Hypoparathyroidism was not recorded for benign lesions, but the increased frequency of Hypoparathyroidism after thyroidectomy for malignant lesions in the current study was due to susceptibility of the parathyroid to devascularisation or accidental removal with the thyroid after no capsular dissection or central bilateral compartment lymphadenectomy, which carries the risk of damage to the blood supply of the parathyroid glands.

Hypothyroidism is not a complication, but rather an outcome of thyroid surgery.¹⁰ In total thyroidectomy, permanent thyroid failure may occur. Subtotal thyroidectomy may reduce the frequency of hypothyroidism after surgery.

The frequency of hypothyroidism after near-total thyroidectomy has been reported to range from 44–46.3%.¹ In our investigation, postoperative hypothyroidism was recorded only in patients who underwent total thyroidectomy. Tracheomalacia is the failure of the cartilaginous trachea to maintain the airway, which can occur secondary to degeneration of previously normal cartilage caused by external compression by the enlarged thyroid gland. Patient malpositioning may cause stretching paralysis of the brachial plexus and paralysis of the ulnar nerve.¹⁰ Pneumothorax or pneumomediastinum is a very rare complication of thyroid surgery which occurs due to mediastinal dissection. Rare complications induced by hyperextension of the head during surgery include vertigo, headache, nausea, and Claude-Bernard-Horner syndrome and punctiform corneal lesions with visual damage.¹⁰

Conclusion

Complications following thyroid surgery depend on the patient's comorbidities and thyroid pathology, as well as the surgeon's experience and the extent of surgery. Hypoparathyroidism and recurrent laryngeal nerve insult are the most frequent complications after thyroidectomy. It is important to preserve the parathyroid glands to prevent Hypoparathyroidism and to avoid recurrent and superior laryngeal nerve insult. The overall frequency of complications may be reduced by using adequate method of haemostasis with adequate dissection.

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