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RESEARCH ARTICLE

An analytical study about the post operative complications of thyroidectomies performed for both malignant and benign pathologies

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Abstract

Introduction: Major postoperative complications of thyroid surgeries include wound infection, hematoma/ hemorrhage causing airway compromise, hypocalcemia, recurrent or superior laryngeal nerve injury, and thyroid storm. Precise knowledge of the intricate anatomic details and meticulous surgical technique are prerequisite determinants for successful outcomes and to keep complications within acceptable limits. The aim of this study was to assess the incidence of different complications of various thyroid surgeries done for benign as well as malignant thyroid disorders in local secondary & tertiary care centres.

Methods: This was a Retrospective analytical study. Case sheets / files of 100 patients were selected which were proven cases of malignant or benign thyroid disorders which were admitted in the last 24 months within the randomly selected local secondary & tertiary care hospitals were included in the study.

Results: Preoperative diagnosis of benign and malignant pathologies was made in 89 and 11 % cases respectively. Most common pathological diagnosis observed was colloid goiter (multinodular goiter, MNG) occurring in 45% of cases, whereas papillary carcinoma accounting for 11 % was the commonest malignant lesion. The overall postoperative complication rate was 18%. Hypocalcemia (8%, both temporary and permanent) and recurrent laryngeal nerve injury (6% , both temporary and permanent) were observed as the most common postoperative complication.

Conclusion: Hypoparathyroidism and RLNI are the commonest complications observed after thyroidectomies. Attempts must be made to identify and preserve parathyroid glands to avoid HPT. It is of paramount importance for careful postoperative observation and timely intervention should the hypocalcemia develop and manifest. Recurrent and superior laryngeal nerve injury can be prevented by correctly identifying and following these nerves.

Keywords: thyroidectomy, Thyroid Nodule, Hypocalcaemia, RLNI

1 | INTRODUCTION

Thyroid surgery is one of the most commonly performed surgery for benign and malignant conditions of the thyroid gland worldwide. The thyroid gland is closely related to many vital structures and hence poses a unique challenge to the surgeon.

Disorders of the thyroid gland count as the second most common endocrine disorders trailing diabetes mellitus.[1] Thyroid disorders warranting surgical intervention can be either benign tumors or malignant ones. Another reason for thyroid surgery is the swelling or enlargement of thyroid in the form of nodular or colloid goiter, when enlarged, causing difficulties in breathing, voice production, and swallowing. Thyroidectomy is also indicated in cases where an enlarged thyroid gland exhibits toxic symptoms, or where there is a high index of suspicion of malignancy, albeit cosmesis is the most common indication.[2] The type of thyroidectomy is contingent upon the benign or malignant features of lesion, size of the lesion, and degree of impairment.[3]

Major postoperative complications of thyroid surgeries include wound infection, hematoma/ hemorrhage causing airway compromise, hypocalcemia, recurrent or superior laryngeal nerve injury, and thyroid storm.[4] Precise knowledge of the intricate anatomic details and meticulous surgical technique are prerequisite determinants for successful outcomes and to keep complications within acceptable limits. Ramirez et al[5] asserted that complications accompanying thyroid surgery are directly proportional to the extent of thyroidectomy and inversely proportional to the surgeon's experience.

The aim of this study was to assess the incidence of different complications of various thyroid surgeries done for benign as well as malignant thyroid disorders in local secondary & tertiary care centres.

2 | METHEDOLOGY

This was a Retrospective analytical study which involved Prior Consent from Hospital Authorities / Medical Superintendent of randomly selected local secondary & tertiary care hospitals to see the records of the patients & were found within ethical standards. Patients admitted in the various Randomly selected surgical units of tertiary care hospitals as diagnosed cases of malignant or benign thyroid disorders were selected for this study.

Case sheets / files of 100 patients were selected which were proven cases of malignant or benign thyroid disorders which were admitted in the last 24 months within the randomly selected local secondary & tertiary care hospitals were included in the study.

Inclusion criteria included patients from both the genders who had a thorough preoperative work-up and it included complete local & systemic examination, indirect laryngeal examination, blood tests, thyroid profile, neck ultrasound, and needle aspiration cytology. Special investigations like computed tomography, or magnetic resonance imaging, were done in those cases where there was suspicious consistency, retrosternal extension, and extra large thyroid masses causing compressive symptoms.

Exclusion Criteria was Patients with previous thyroid surgery and anaesthetic complications and in files without proper notes and follow up.

It was observed & made sure that all the case files have the Local Examination well explained & divided into four parts; inspection, palpation, percussion and auscultation. On inspection the site, size, shape, surface, extent, borders, skin over and around the goitre were noted. Movement upwards on deglution was given special importance. On palpation, the tenderness and local rise of temperature (if any) were noted. The inspector findings were confirmed. The consistency of the goitre along with nodules (if any) were noted. Thyroid fixity was checked.

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The tracheal position was confirmed. The carotid pulsations were checked for their position. Cervical lymph node areas were palpated. On percussing the manubrium sternum retrosternal extension or mediastinal lymphadenopathy was noted.

Auscultation of the thyroid gland especially at the superior poles for bruit was done. The various eye signs of thyrotoxicity was checked in selected patients.

The Systemic Examination was done where the cardiovascular, nervous (including the spine), respiratory and the abdomen systems were examined in detail with special attention to any signs of metastasis. After examination the patient was subjected to relevant investigations. Routine investigations like Hb%, bleeding time, clotting time, RBS, Urea, Creatinine, Urine Routine, Chest Xray, Electrocardiogram were done. Plain X-ray of the neck in anteroposterior views and lateral views were taken to look for tracheal deviation or compression. Chest X-ray for retro-sternal extension was done. Thyroid Profile (T3, T4, TSH) were done to know about the hormonal status. FNAC was done in all cases to establish the histological diagnosis. Ultrasound neck was done in selected cases only. Indirect Laryngoscopy was done routinely in all cases to look for vocal cord status. The preoperative treatment consisted of correction of co-morbid conditions (if any) and maintenance of euthyroid status.

All surgeries were performed by general / Onco/ Head & Neck surgeons. The indication for thyroid surgery was benign in maximum cases and malignant in lesser number of cases. It was observed that Genuine efforts were exercised in each and every surgery to identify and save recurrent and superior laryngeal nerves. Measures were taken to visualize and preserve parathyroid glands. The types of surgeries done were

1.Total thyroidectomy (TT) with or without neck dissection,

2. Near-total thyroidectomy (NTT),

3.Subtotal thyroidectomy (STT),

4.Hemithyroidectomy, and

5.Isthmusectomy.

In the notes & post op Histological Specimen, following pathologies were observed

1. colloid goiter,

2. nodular goiter,

3. hyperplastic nodule,

4. papillary and

5. follicular carcinoma.

Laryngeal endoscopy was done and documented in patients who developed hoarseness postoperatively. Vocal cord dysfunction existing after 6 months was labeled as a permanent paralysis. Serum calcium levels were measured on next postoperative day in all operated cases except isthmusectomy cases. Temporary hypoparathyroidism (HPT) was considered when total serum calcium level was less than 8.5 mg/dL associated with muscle spasms, perioral numbness, and tingling sensation and which responded to exogenous calcium supplementation. Permanent HPT was considered when hypocalcemia persisted for more than 6 months despite regular calcium and vitamin D supplementation. The patients were followed up regularly in all of the cases.

The data were analyzed by IBM SPSS Statistics 20. The differences in the variables were determined by the Chi-Squared test and Fisher's exact test between classic and preperitoneal methods. Overall, $p < 0.05$ was proposed to represent statistical significance after correction.

3 | RESULTS

This study consisted of 100 patients who underwent different thyroid surgeries. There were 84 females (84%) and 16 males (16%) with female-to-male ratio of 5.25:1, and the mean age was 36.74 years. Preoperative diagnosis of benign and malignant pathologies was made in 89 and 11 % cases respectively. Most common pathological diagnosis observed was colloid goiter (multinodular goiter, MNG) occurring in 45% of cases, whereas papillary carcinoma accounting for 11 % was the commonest malignant lesion (Table 1). Majority of cases presented as obvious neck swelling. The types of thyroid operations done were as follows (Table 2). The commonest operation performed was hemithyroidectomy .

The overall postoperative complication rate was 18%. Hypocalcemia (8%, both temporary and permanent) and recurrent laryngeal nerve injury (6% , both temporary and permanent) were observed as the most common postoperative complication (Table 3). Superior laryngeal nerve injury was observed in 1% and same were hematoma , seroma and tracheal instability. (Table -3). Details of complications according to benign and malignant thyroid pathologies are shown in Table 4. In the benign group, temporary RLNI was the most common complication observed, while HPT was the most common complication observed in cases operated for malignant lesions. There was no operative mortality observed in this study. A total of eleven patients with thyroid malignancy were operated. Papillary carcinoma comprised the majority of cases.

TABLE 1: Pathologies observed in the study

Pathology	Number / percentage (n=100)
Colloid goiter	45
Nodular/MNG	37
Cyst	5
Hyperplastic nodule	2
Carcinoma	Papillary carcinoma-9
	Follicular carcinoma-2

TABLE 2: Type of thyroid operation performed

Type of operation	Number of cases / percentage (n=100)
Hemithyroidectomy	46
Subtotal thyroidectomy	11
Near-total thyroidectomy	13
Total thyroidectomy (with or without neck dissection)	24
Isthmusectomy	06

TABLE 3: Complications of thyroid surgery

Complications	Number / percentage (n=18)
Temporary hypocalcemia	4
Permanent hypocalcemia	4
Temporary RLNI	5
Permanent RLNI	1
SLN injury	1
Hematoma formation	1
Seroma	1
Tracheal instability	1

RLNI: recurrent laryngeal nerve injury; SLN: superior laryngeal nerve

TABLE 4: Complications seen in surgery done for malignant and benign lesions

	Surgery for malignant lesions	Surgery for benign lesions
Permanent RLNI		1
Temporary RLNI		5
Hematoma		1
SLN injury		1
Permanent HPT	4	
Temporary HPT	4	
Seroma		1
Tracheal instability		1

RLNI: recurrent laryngeal nerve injury;SLN: superior laryngeal nerve, HPT : Hypoparathyroidism

4 | DISCUSSION

In 1646, Wilhelm Fabricus recounted the first thyroid surgery done taking advantage of scalpels. Pierre Joseph Desault in 1791, in Paris, did a successful partial thyroidectomy, while Guillaume Dupuytren, in 1808, performed the first TT. In 1821 Johann Hedenus, a German surgeon from Dresden, considered the most successful thyroid surgeon of that time, cited his experiences of six large obstructing goiters removed successfully. The notable ad-

vances in surgical practice that occurred in the 1800s assisted in changing the then perspective of thyroid surgery from a bloody and fearsome procedure to a modern and safe surgery. Paramount among those adjuncts were anesthesia, antisepsis, and adequate hemostatic control.[6]

The major breakthrough in surgery came with the crucial introduction of anesthesia, as it was termed by Oliver Wendell Holmes. The introduction of antiseptic techniques by Joseph Lister in 1867 was the second stride in this march of surgical evolution. The decisive step in this surgical evolution was marked by the ability of achieving hemostasis with the help of new surgical instrument introduced by Spencer Wells, who devised a simple, self-retaining arterial forceps in 1872.[6] It was Kocher, widely accepted as "the father of modern thyroid surgery," whose pioneering work heralded the development of modern thyroid surgery. Kocher performed more than 5,000 thyroid surgeries spanning his vast career and he described initial ligation of inferior thyroid arteries, considerably minimizing the amount of blood loss.[6]

The total rate of complications in our series was 18%, which is in concordance with other studies, that is, 21[7] and 24%.[8] Hematoma formation following thyroidectomy is a rare event occurring in < 1 to 2% of all such surgeries.[9] Majority of this feared and life- threatening complications occur within 24 hours after surgery. These cases present with respiratory distress, pain and pressure, dysphagia, and drainage.[10] In present study, only one patient developed hematoma , which was immediately explored and evacuated. In the majority of the cases, delayed bleeding is of venous origin; and due to negative pressure on the large vessels of the neck, it appears on waking or during a bout of cough. To prevent it, it is imperative to check hemostasis circumspectly at the termination of surgery. To be certain whether bloodless bed has been achieved or not, it is advisable to elevate the intrapulmonary pressure to 40 cm H_2O by performing Valsalva maneuver, which ensures recognition of bleeding vessels.[11]

Injury to SLN, transient or permanent, often goes unnoticed and hence underreported. It was in 1935, after world famous opera singer Amelita Galli-Curci underwent thyroid surgery, with postoperative loss of her upper vocal registry, that the importance of SLN came into existential fact.[6] Injury to SLN will manifest as vocal fatigue, lowered voice tone, and difficulty in singing note intonation.[11] Generally, ligation of superior thyroid vessels near the capsule of the gland avoids injury to the SLN.

Recurrent laryngeal nerve injury (Table 5) remains one of the most debilitating complications in thyroid surgery. Wolfler, while acting as Billroth's first assistant, described the importance of protection of RLN during thyroid surgery. He was the first to bring forth a thorough discussion of RLN anatomy and its potential for operative injury.[6] The incidence of RLNI occurs in 0 to 4% cases, and it depends on the extent of thyroid surgery, presence of Grave's disease, thyroid carcinoma, and need for reoperation.[12,13] The incidence of permanent vocal cord palsy observed in present study was in concordance with published data. Extensive surgical excision, preoperative diagnosis of thyroid malignancy, and recurrent goiter are said to be independent risk factors for RLNI as found in a study.[14] In a study, Grave's disease, thyroiditis, recurrent goiter, malignant pathology, and extended thyroid resection were considered independent risk factors on multivariate analysis for temporary RLNI, whereas Grave's disease and recurrent goiter were found to be independent risk factors for permanent RLNI.[15]

TABLE 5: Causes of transient recurrent laryngeal paralysis[11]

1. Excessive nerve skeletalization
2. Neuritis (due to scarring, myelinic lesion)
3. Axonal damage due to excessive stretching
4. "A frigore" or "a calore" paralysis
5. Injury due to electrocoagulation
6. Viral neuritis
7. After difficult intubation

Seroma formation, albeit not a serious complication of thyroidectomy, was noted in one patient. Clinically evident seromas respond well to percutaneous aspiration and so did occur in our case, too. The risk of seroma formation increases in direct relation to extent of surgery (bilateral) or thyroidectomy for large goiters.[16]

Wound infection was not observed in any patient in present study. The use of antibiotics is suggested only when patients have history of severe diabetes, valvular heart diseases, or immunodeficiency. For disinfection and cleaning of the skin, particularly in cases having neoplastic pathology, the use of noniodated disinfectant is advisable so as not to interfere an eventual postsurgical thyroid scan.[11]

Postoperative HPT is a serious issue leading to prolonged hospital stay and increased expenditure.[15–18] The causation of postoperative HPT comprises various factors, with the surgical technique, the devascularization, and unintentional violation of the parathyroid glands being the most significant factors.[19] Wolfler, as Billroth's first assistant, first reported postoperative tetany in 1879. It was Eugene Gley, in 1891, who related it to removal of the parathyroid glands, or to interference with their blood supply.[6] Hypoparathyroidism is considered when the calcium readings are below 7.5 mg/dL or less than 8.5 mg/dL if there are symptoms due to hypocalcemia; if the calcium level remained below 8.5 mg/dL at 1 year, it is considered permanent.[19] The symptoms usually manifest 24 to 48 hours after surgery and occur as paresthesia and numbness over fingertips and perioral area and muscle cramps. In a study, multivariate analysis for temporary HPT, the magnitude of surgical resection, Grave's disease, recurrent goiter, female gender, and specimen weight above 45 gm were observed as independent risk factors, while the extent of surgical resection, Grave's disease, recurrent goiter, and malignant pathology came out as risk factors for permanent HPT.[15] Incidence of permanent HPT was nil in benign disease and 33% in malignant disorders operated in our series. In another study,[20] the high incidence of HPT after thyroidectomy for malignant cases was suggested due to the following reasons:

- Incidences can be overestimated as no effort to discontinue calcium and vitamin D supplementation was made.
- Noncapsular dissection methodmakestheparathyroid susceptible to devascularization or accidental removal along with thyroid removal leading to high incidence of HPT.
- Central compartment lymphadenectomy in malignant cases exposes risk to blood supply of parathyroids, particularly if done bilaterally, endangering their vascular supply, which eventually may increase chances of postoperative HPT

In majority of cases, hypothyroidism is not regarded as a complication of thyroid surgery.[11] More suitably, it should be considered as an expected outcome. In cases of total or completion thyroidectomy, permanent thyroid insufficiency must be expected. The STT may lessen the chances of developing postoperative hypothyroidism; nevertheless, the sound oncologic principles must not be jeopardized by the fear of permanent hypothyroidism.[21] The incidence of postoperative hypothyroidism after NTT in various studies has been reported to be 44[22] to 46.3%.[23] In present study, hypothyroidism was observed only in cases who underwent TT.

Tracheomalacia occurs when the cartilaginous framework of trachea fails to maintain an adequate airway, which can be either due to congenital immaturity of tracheal rings (primary tracheomalacia) or where previously normal cartilage experiences degeneration due to extrinsic compression by enlarged thyroid gland (secondary tracheomalacia).[24] Malpositioning on the operating table may cause rare complications like severe paralysis due to stretching of brachial plexus and also paralysis of ulnar nerve.[11]

Pneumothorax or pneumomediastinum is a very uncommon complication of thyroid surgery and is usually accompanied with extensive surgical procedure that necessitates mediastinal dissection.[25] During difficult thyroidectomies, dissection often extends toward the pleura or mediastinum, so chances of developing pneumothoraces are high where air may escape into cervical fascial planes under low pressure or when pleura is unintentionally breached. However, it bears little clinical significance unless the lung or pleura is perforated. This condition can clinically present in symptomatic cases as having decreased breath sounds or desaturation; therefore if clinical suspicion of airway violation arises, a postoperative chest radiograph is advisable.[21]

5 | CONCLUSION

Conclusively, complications after thyroid surgery depend on patient's condition and presence of co-morbidities, thyroid pathology, surgeon's expertise, and extent of surgery. Hypoparathyroidism and RLNI are the commonest complications observed after thyroidectomies. Attempts must be made to identify and preserve parathyroid glands to avoid HPT. It is of paramount importance for careful post-operative observation and timely intervention should the hypocalcemia develop and manifest. Recurrent and superior laryngeal nerve injury can be prevented by correctly identifying and following these nerves.

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