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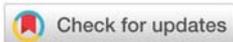
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## Research Article

# Experience of thyroid surgery at a tertiary care hospital in Karachi, Pakistan

## Abstract

**Background:** Thyroid disorders are common surgical pathology in our part of world. Most commonly encountered complication after thyroid surgery are hypocalcaemia, hoarseness of voice, wound infection, seroma formation and thoracic duct injuries secondary to modified neck dissections. The aim of this study is to share the experience of thyroid surgery at a tertiary care hospital in Karachi, Pakistan with rest of the world.

**Methodology:** The cross sectional descriptive study was conducted in Endocrine unit of Jinnah Postgraduate Medical Centre, Karachi, Pakistan from April 2009 till April 2019. About 2094 cases operated which includes multinodular goiter, malignant goiter, solitary thyroid nodules, recurrent goiter and goiter with retrosternal extension. Patients managed medically or not fit for surgery or refused to surgery are not included in this study. Descriptive statistics were used to present the data.

**Results:** Among 2094 cases 782 (37.3%) were diagnosed as MNG, 753 (35.9%) were malignant goiter, 487 (23.2%) were solitary thyroid nodules while 72 (3.43%) presented as recurrent goiter. Most common complication reported was transient hypocalcaemia which was reported in 89 (11.3%) patients who underwent thyroidectomy for MNG, 41 (5.4%) in patients with thyroidectomy for malignant goiter, 11 (2.3%) open lobectomy, 9 (12.5%) in thyroidectomy for recurrent goiter while only 1 (0.12%) reported permanent hypoparathyroidism who underwent surgery for MNG. Transient hoarseness was reported 10 (1.27%) with MNG and 14 (1.85%) in patients with malignancy proven goiter, while 2 (0.42%) in open lobectomy, 2 (13.3%) in endoscopic lobectomy and 1 (1.38%) in recurrent goiter. Permanent hoarseness was noted in only 1 (0.2%) who underwent completion thyroidectomy. Wound infection was reported in 10 (1.27%) with MNG, 18 (2.39%) with malignancy and 3 (0.63%) in open lobectomies. Seroma formation was associated with 7 (1.45%) in MNG, 13 in malignancy (1.7%), 11 (2.3%) open lobectomies, 2 (13.3%) in endoscopic lobectomies and 3 (4.1%) in recurrent goiters. Thoracic duct injury was reported in 7 (0.94%) left sided MRNDs. A total of 3 (0.14%) deaths were reported after surgery.

**Conclusion:** Thyroid surgery is the treatment of choice for benign or malignant goiters where medical therapy is ineffective and not practical. Proper preoperative preparations, better understanding of anatomy, modification of surgical techniques, use of energy devices and intraoperative nerve monitoring and careful follow-up has lead to major decline in postoperative complications and better surgical results with more detail understanding of thyroid surgery.

## Introduction

A goitre is an enlargement of thyroid gland. It may be diffuse or nodular. It can be an isolated solitary nodule with a discrete swelling in one lobe with no palpable abnormality elsewhere or it can be a dominant nodule with discrete swellings and evidence of abnormality elsewhere in the gland. Goitre can be non toxic (euthyroid), toxic (overactive) or hypothyroid (underactive). Goitre can be benign or malignant causing only cosmetic disfigurement or can be as large as to cause compression of adjacent structures and morbidity and mortality. Worldwide, the most common cause of goitre is iodine deficiency [1]. It is estimated that in a population of 800

million, goitre affect as many as 200 million people who have a diet deficient in iodine. In a study conducted in UK, about 16% of the population presented with goiter [2].

Surgery is usually reserved for large goitres with compression, malignancy and when other forms of therapy are not practical or ineffective. Establishing a euthyroid state prior to surgery is important due to multitude effects of thyroid hormones throughout the body especially cardiovascular system which may complicate the perioperative and postoperative management [3]. Several studies has been conducted on the risks and complications of thyroid surgery among which most

commonly encountered are hypocalcaemia, hoarseness of voice, wound infection, seroma formation.

Hypoparathyroidism is a dangerous complication of thyroidectomy that occur due to direct trauma to the parathyroid glands, devascularisation of glands or removal of all four glands during total thyroidectomy [4]. Hoarseness of voice can be transient or permanent due to damage to recurrent laryngeal nerve or external branch of superior laryngeal nerve [4]. When irreversible damage occur at recurrent laryngeal nerve, marked voice dysfunction occurs. Transient hoarseness of voice can occur due to temporary recurrent laryngeal nerve paralysis secondary to neural stretch [5]. There is increased risk of nerve damage in recurrent goitre surgery and malignant goitre surgery [6].

Although thyroid surgery is a clean surgery and surgical site infection is quite low, it can be a result of longer hospital stays and higher readmission rates in post operative patients [7,8]. Due to close proximity to critical structures and major vessels a neck infection can not be treated with simple incision and drainage and open packing [9]. It is more common in total thyroidectomy than lobectomy and the most likely organism identified is *Staphylococcus aureus* [10]. The aim of this study is to review and share the experience of thyroid surgery in patients with goitre at the tertiary care hospital in Karachi, Pakistan.

## Materials and Methods

This cross sectional descriptive study was conducted in the General Surgery and Endocrine unit of Jinnah Postgraduate Medical Centre, Karachi, Pakistan, from April 2009 till April 2019. A total of 2094 cases who were diagnosed with goitre and undergone surgery were included in this study.

Patients with multinodular goitre, solitary thyroid nodule, malignancy proven goitre and recurrent goitre who have undergone lobectomy by both open and endoscopic approaches, total and completion thyroidectomy with or without neck dissection are included in this study. Patients managed medically or not fit for surgery or refused to treatment were excluded from study. The data was compared demographically by age at diagnosis and gender as well as on basis of post operative complications.

All patients included in this study were evaluated clinically in the outpatient department and advised ultrasound neck and thyroid profile. Solitary thyroid nodules were classified on Bethesda system by fine needle aspiration. CT scan were performed before surgery in patients with suspected malignancy or retrosternal goitre to find out the extent of the gland, its relation and compression effects on trachea, oesophagus and major vessels.

Written informed consent was taken. All surgeries were performed by consultants who had an experience of dealing with the thyroid surgeries. Preoperatively, serum calcium levels were measured one day before surgery and then postoperatively 24 hours after surgery followed by 2 weeks in OPD. Direct laryngoscopy of every patient was done to

evaluate the status of vocal cords preoperatively. Recurrent laryngeal nerve and parathyroid glands were identified in all patients. Nerve monitor systems were not used due to its lack of availability.

Statistical analysis was done using SPSS version – 23. Mean and standard deviation were calculated for quantitative variables. Frequencies and percentages were calculated for qualitative variables. Descriptive statistics were used to present the data. Data was stratified to compare different complications among different surgeries.

## Results

A total of 2094 cases over a period of 10 years were diagnosed as goitre and underwent thyroidectomy were included in this study, among which 782 (37.3%) patients were diagnosed as multinodular goitre, 753 (35.9%) patients had malignancy proven goitre, 487 (23.2%) had solitary thyroid nodule while 72 (3.43%) presented as recurrent goitre after previous thyroidectomy.

Patients with multinodular goitre were predominantly females 662 (84.6%) with ages between 14 and 55 years (mean age 34.5 years). There were 120 (15.3%) males between ages 22 and 70 years ( mean age 46 years) at presentation. Among patients with multinodular goitre 39 had retrosternal extension of goitre. Thirty five (89.74%) had retrosternal extension in anterior mediastinum whereas 4 (10.25%) patients had retrosternal extension in posterior mediastinum. Thirty six (92.30%) patients were managed through cervical incision while only 3 (7.69%) patients needed a midline sternotomy. In terms of postoperative complications, 89 (11.3%) out of 782 patients with MNG experienced transient hypocalcaemia. However, only one (0.12%) patient reported hypocalcaemic signs on and off for more than six months which resolved completely after 18 months. Our basic strategy was that a preoperative serum ionized calcium and vitamin D levels were evaluated and corrected to prevent post thyroidectomy hypocalcaemia. Preoperatively, a medial to lateral dissection is performed at upper pole in the cricothyroid space of Reeves to preserve parathyroid glands. Ten (1.27%) presented with temporary hoarseness of voice among which 8 (1.02%) had multinodular goitre with retrosternal extension. Another 10 ( 1.27%) patients reported post operative surgical site infection among which only one (0.12%) patient had experienced wound infection secondary to oesophageal injury for which a primary repair was done and gastrostomy was made and removed after 4 months.

Seven hundred and fifty three patients were diagnosed as malignant goitre which predominantly include 626 (83.1%) papillary carcinoma, 75 (9.9%) were medullary while 52 (6.9%) were of follicular variety. The majority of patients were females i.e. 505 (67.06%) with age of presentation as low as 12 years and as high as 70 years ( mean age 41 years). 248 (32.9%) were males with minimum age of 17 years and maximum age of 75 years (mean age 46 years). About 62 (8.2%) underwent total thyroidectomy, 33 (4.3%) underwent modified neck dissection alone with lymph node metastasis and previous

history of total thyroidectomy, 87 (11.5%) underwent total thyroidectomy and modified neck dissection simultaneously, 493 (65.4%) underwent completion thyroidectomy with previous history of thyroidectomy and incomplete removal of malignant tissue, while 78 (10.3%) underwent completion thyroidectomy combined with modified neck dissection. With regard to postoperative complications in malignant thyroid surgery most common complication reported was transient hypocalcaemia presented in 3 (0.39%) in total thyroidectomy, 6 (0.79%) in total thyroidectomy with MRND, 3 (0.39%) in MRND alone, 22 (2.92%) in completion thyroidectomy while 11 (2.33%) in completion thyroidectomy with MRND. About 10 (1.32%) reported temporary voice changes and hoarseness with no apparent intra operative nerve damage. While in 4 (0.53%) patients recurrent laryngeal nerve was excised due to tumor invasion of nerve and among them, in 3 cases the nerve was reconstructed by anastomosing it with ansa cervicalis while in remaining 1 case primary anastomosis was done. Only 1 (0.2%) reported permanent hoarseness who underwent completion thyroidectomy. Seven (0.92%) experienced thoracic duct injury secondary to left sided MRND. Out of seven 4 (0.53%) injuries were noted in completion thyroidectomy with MRND, 2 (0.26%) in total thyroidectomy with MRND while 1 (0.13%) in MRND alone. Among seven, 4 thoracic duct injuries were identified and repaired peroperatively while 3 were missed during surgery but completely managed conservatively within 4 weeks after giving total parenteral nutrition (TPN) for one week and advising a low fat diet to them.

Among 487 (23.2%) patients who underwent lobectomy for solitary thyroid nodule, 362 (74.3%) were females with minimum age of presentation at 17 years and maximum age of presentation at 51 years (mean age 34 years) while 125 (25.6%) were males with minimum age of presentation at 29 years and maximum age of 75 years (mean age 52 years). Among 472 (96.9%) patients who underwent open lobectomy, 11 (2.33%) reported transient hypocalcaemia, 2 (0.42%) reported temporary voice changes, 3 (0.63%) reported wound infection while 11 (2.3%) presented with seroma formation. However, an intraoperative accidental injury to unilateral recurrent laryngeal nerve was reported in only one (0.2%) patient with no permanent voice changes. About 15 (0.7%)

endoscopic lobectomies were performed which was associated with temporary hoarseness of voice in 2 (13.3%) patients while seroma formation was reported in 2 (13.3%) patients postoperatively.

Seventy two cases of recurrent goitre (3.38%) were operated among which 63 (87.5%) were females with minimum age of 34 years and maximum age of presentation of about 45 years (mean age 39.5 years). There were only 9 (0.12%) males with minimum age of 30 years and maximum age of 55 years (mean age of 42.5 years). Regarding postoperative complications secondary to thyroidectomy for recurrent surgery, nine (12.5%) patients experienced transient hypocalcaemia while 1 (1.38%) experienced temporary voice changes as a result of accidental recurrent laryngeal nerve injury during the surgery and 3 (4.1%) presented with seroma formation.

Three (0.14%) deaths were reported postoperatively among which one (0.04%) was secondary to anaplastic advanced stage thyroid malignancy with multiple metastasis in brain and lung, another one (0.04%) was reported secondary to anesthesia complications while one (0.04%) was secondary to unknown etiology Table 1.

## Discussion

Goitre is simply a swelling in neck due to thyroid enlargement. Worldwide the most common cause of goitre is iodine deficiency with the highest prevalence among populations living in mountainous regions of South East Asia, Latin America and Central Africa [11]. The most common thyroid disease is simple diffuse physiological goitre with its highest prevalence in females in their pre menopausal age [12]. In contrast, the incidence of thyroid nodules increases with age with its prevalence higher in females than males [12]. Thyroid nodules can be benign or malignant.

Multinodular goitre is the most common thyroid pathology seen in this study. In a study conducted in 2011, the prevalence of single thyroid nodules was higher (3%) as compared to multinodular goitres (1%) [12]. In contrast, our study shows higher prevalence of multinodular goitre (37.3%) as compared to solitary thyroid nodule (23.2%). This may be due to late

**Table 1:** Complications in Thyroid Surgery (N = 2094).

COMPLICATIONS	Total Thyroidectomy in MNG (n = 782)	Total thyroidectomy in malignancy (n=62)	Total thyroidectomy + MRND (n=87)	MRND (n=33)	Completion thyroidectomy (n=493)	Completion thyroidectomy + MRND (n=78)	Open lobectomy (n = 472)	Endoscopic lobectomy (n = 15)	Total thyroidectomy in recurrent goiter (n = 72)
Transient hypocalcemia	89 (11.3%)	3 (0.39%)	6 (0.79%)	3 (0.39%)	22 (2.92%)	7 (0.92%)	11 (2.33%)	0%	9 (12.5%)
Permanent hypocalcemia	1 (0.12%)	0%	0%	0%	0%	0%	0%	0%	0%
Temporary voice change	10 (1.27%)	1 (0.13%)	2 (0.26%)	1 (0.13%)	7 (0.92%)	3 (0.39%)	2 (0.42%)	2 (13.3%)	1 (1.38%)
Permanent hoarseness	0%	0%	0%	0%	1 (0.2%)	0%	0%	0%	0%
Wound infection	10 (1.27%)	1 (0.13%)	3 (0.39%)	2 (0.26%)	8 (1.06%)	4 (0.53%)	3 (0.63%)	0%	0%
Seroma formation	7 (1.45%)	0%	2 (0.26%)	1 (0.13%)	7 (0.92%)	3 (0.39%)	11 (2.3%)	2 (13.3%)	3 (4.1%)
Thoracic duct injury	0%	0%	2 (0.26%)	1 (0.13%)	0%	4 (0.53%)	0%	0%	0%

presentation of patients with single nodules progressing to involve entire gland leading to development of multiple nodules in the gland.

Thyroid carcinoma is found to be the most common endocrine tumor accounting for > 90% of endocrine tumors. Papillary carcinoma is most common variant of thyroid malignancy, comprising 60–65% of all thyroid cancers [13]. Follicular carcinoma is the second most common malignancy accounting for 15 of the cases [14]. A difference in trend is noted in our study with papillary carcinoma being the most common variant with a frequency of 83.1% followed by medullary carcinoma being the second most common with the rate of 9.9% followed by follicular carcinoma with frequency of 6.9%. In Pakistan thyroid cancer is responsible for 1.2% cases of all malignant tumors [15]. Previous reports from this region show papillary thyroid cancer to constitute 57 to 89% of all thyroid malignancies [15–17]. The incidence of papillary carcinoma in this study is 83.1% which is similar to the previous studies making it the most common variant of thyroid carcinoma.

Thyroid surgery is relatively safest surgery and the mortality rates has been fallen in recent years from 40% in 1800s to 0–0.05% in recent years, owing to better preoperative preparations and improved surgical techniques resulting in minimum complications [18–20]. Our data shows differs in these figures as we found 3 deaths and mortality rate of 0.14% in 2094 patients due to our large sample size.

Even though the thyroid surgery is quite safe, hypoparathyroidism is the most feared complication of thyroid surgery. It is most common in total thyroidectomy [21]. In a study conducted in 2002 the reported incidence varies between 0.4% and 13.8% for permanent hypoparathyroidism and is directly correlated with the extent of thyroidectomy [22]. Another study showed that after performing thyroidectomy for large multinodular goiter, temporary hypocalcaemia requiring calcium replacement occurred in 20% of patients. This usually occurs about 36 h postoperatively. Only up to 3% of patients had persistent hypocalcemia [20]. Chronic hypoparathyroidism with unrecovered normal function after 6 months was reported in 1.4% of cases and found in more extensive type of surgery [23,24]. A mitigating trend has been noted in our study with incidence of transient hypocalcaemia being 12.5% for total thyroidectomy in recurrent thyroid goitres, 11.3% for benign multinodular goitres, 5.41% for malignant goitre while 2.33% for lobectomies. The incidence of permanent hypothyroidism is found to be 0.12%. This difference can be due to preoperative routine assessment and correction of serum calcium and vitamin D levels and a difference in surgical technique as we practice a medial to lateral approach in space of Reeves while dissecting the upper pole of thyroid.

Recurrent laryngeal nerve injury is another common complication encountered during thyroid surgeries and can jeopardize the quality of life. In addition to the hoarseness that occurs with unilateral RLNI, bilateral RLNI leads to dyspnoea and often life-threatening glottal obstruction [25,26]. The incidence of RLN injury has been found to be higher during re-explorations, Graves disease and thyroid carcinoma procedures

[27,28]. The incidence of Injuries to the recurrent laryngeal nerve has been reported between 1% to 2% from different endocrine surgery centres when performed by experienced neck surgeons. This incidence is higher when thyroidectomy is performed by a less experienced surgeon [29,30] or when thyroidectomy is done for a malignant disease. At times the nerve is sacrificed if it runs into an aggressive thyroid Cancer [31]. Another study conducted in 2013 showed the rate of permanent RLN paralysis and the incidence of transient RLN palsy after thyroidectomy as 0.3%–3% and 5%–8%, respectively [32]. A similar pattern of incidence has been noted in our study with frequency of recurrent nerve paralysis and hoarseness of 1.27% for total thyroidectomy in multinodular goitres, 1.83% in malignant goitres, 0.42% in open lobectomies and 1.38% in recurrent goitres. However permanent paralysis of about 0.2% has been reported in thyroid surgeries of malignant goitres due to involvement of nerve by tumor itself. The incidence is quite higher in endoscopic lobectomies with the frequency of 13.3%. This difference is due to small surgical field in endoscopic lobectomies and lack of nerve monitoring systems in our setup.

Wound infection is another complication reported although the thyroid surgery is a clean surgery and incidence is quite low. A study conducted in 2006 showed surgical site infections (SSI) affected 2% of patients [33]. Another study conducted in later years found that the cumulative incidence of surgical site infection within 30 days after thyroidectomy is quite low at 0.36% [34]. Our study resulted in a frequency of 1.27% of wound infection in multinodular goiters, 2.37% in malignancies and 0.63% in open lobectomies.

Thoracic duct injury is a rare but sometimes life threatening complication of thyroid surgery with a reported incidence of 0.5%–1.8% [35,36], and is typically seen in thyroidectomy associated with lateral neck dissection. Our study showed an incidence of 0.92% which is similar to the previous studies.

In patients with retrosternal extension midline sternotomy was performed in cases with difficulty in delivering the gland because of pear shape of enlarged gland. Cohen performed sternotomy only in presence of malignancy, extension of goitre below thoracic arch, involvement of posterior mediastinum and presence of ectopic thyroid [37]. Sternotomy was performed in only 3 (7.69%) patients in this study which is almost similar to other studies. Huins et al reported the need for sternotomy in 55 out of 2065 (2.7%) [38]. Landerholm performed sternotomy in 3% of patients with retrosternal goitre [39]. In another study, Sakkary reported that only one out of 73 patients needed sternotomy in patients with retrosternal goitre [40].

## Conclusion

Thyroid surgery is the treatment of choice for benign or malignant goiters where medical therapy is ineffective and not practical. Proper preoperative preparations, better understanding of anatomy, modification of surgical techniques, use of energy devices and intraoperative nerve monitoring and careful follow-up has lead to major decline in postoperative complications and better surgical results with more detail understanding of thyroid surgery.

## Highlights

1. Medullary carcinoma of thyroid is the second most common tumor in our setting after papillary carcinoma.
2. Rate of postoperative hypoparathyroidism is decreased due to expertise surgical technique.
3. Rate of recurrent laryngeal nerve damage is rare due to high volume thyroid surgery at our setup.
4. Recurrent thyroid surgery is safe in experienced hands at dedicated thyroid surgery units.

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