

A Prospective Study on Post-Operative Complications Following Thyroid Surgery Conducted in a Tertiary Care Hospital in Tirupati

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ABSTRACT

BACKGROUND

Thyroidectomy is a surgical procedure which is commonly performed by surgeons worldwide, but the outcome and complication rates were mainly dependent on the surgeon's skill and experience, indication and the extent of surgery and the number of thyroid surgeries performed at that particular centre. The aim of this study was to assess the frequency of the postoperative complications after thyroid surgery in Sri Venkateswara Ramnaraian Ruiya Government General Hospital, Tirupati.

METHODS

A prospective study conducted on 100 patients with thyroid swelling who attended the Sri Venkateswara Ramnaraian Ruiya Government General Hospital, Tirupati. Patient age, sex, rural/urban origin, history, diagnosis, type of surgery, laboratory investigation such as complete blood, serum calcium, thyroid function test, us culture and sensitivity test in wound infections and indirect laryngoscopy for all pre-operative patients and postoperative voice change patients. Outcomes recorded as a complication of thyroid surgery within one week.

RESULTS

Totally 100 patients were enrolled in the study. Thyroid enlargement was more common in females (F: M =5.6:1) presenting in 3rd and 4th decades mostly with the mean age and standard deviation were 42.92 years and 13.097 years respectively. Total thyroidectomy was the most common procedure performed (44 %) followed by hemithyroidectomy (31 %), subtotal thyroidectomies (29 %) and near total thyroidectomy (5 %). On histopathological examination most common finding was multinodular goiter (54 %) followed by nodular goiter (33 %) and malignancies (10 %). The overall postoperative complication rate was 47 %. The most common postoperative complications after thyroidectomies were seroma formation in wound complication (27 %), followed by hypocalcemia (11 %), recurrent laryngeal nerve (RLN) injury (3 %), and surgical site infection (2 %). Majority of these complications were found to be associated with total thyroidectomy, female population, and in patients with age more than 30 years.

CONCLUSIONS

Seroma formation in wound complication is the commonest post thyroidectomy complication. Female gender, old age, and extensive thyroid surgery were associated with increased complication rate.

KEYWORDS

Post-Operative Complications, Thyroid Surgery

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BACKGROUND

Thyroidectomy is a conventional surgery with extremely low mortality. The experience of the surgeon plays an important role in specific complications (morbidity) related to thyroidectomy. The operation of the thyroid gland has followed all the steps of progression to reach the time of endoscopic surgery.¹ Thyroid surgery is associated with fewer complications and no fatality. Genius attitude and surgical skill of Theodor Kocher of Berne, Switzerland, raised thyroid surgery to a scientific level, brought surgical expertise on the summit of surgical art pyramid, and brought him personally to Nobel Prize in 1909. His skilful work in this regard led to a decline in the mortality from 50 % to less than 4.5 %.² Postoperative complications may be insignificant as oedema of the flap or as dangerous and life-threatening complication as bleeding or respiratory obstruction.³ Surgical complications are relatively uncommon and this should be kept in mind when a study is designed to analyse the outcome of an operation, but also when a comparison between surgical techniques is needed. Even the rarest events should be analysed through the inferential statistics and/or a thorough epidemiological analysis that can be more or less complicated.³ For example, one should consider epidemiological data (gender, age of patients), temporal circumstances influencing surgery (different surgeons operating, different techniques or instruments), and other factors when two different techniques need to be compared. A sporadic event should never be statistically analysed on the grounds of its rarity; on the contrary, a more careful and precise analysis is needed to obtain reliable results.⁴ Complications are less with sound surgical techniques and good preoperative preparation. The patient will be euthyroid at the time of surgery with proper preoperative preparation. In hyperthyroid patient, respiratory difficulties may develop due to laryngeal oedema. 1 Massive postoperative haemorrhage, recurrent laryngeal nerve paralysis, both, causing respiratory distress are results of improper technique may. Removal of too little or too much tissue or possibly all parathyroid glands, resulting in myxoedema, recurrent hyperthyroidism, or parathyroid deficiency are seen due to improper technique and inexperience hands.⁵ The complication of the thyroid surgery can be made out only through the follow up of cases operated and analysis.

This study has been taken up in order to study the most common complications encountered by a surgeon in the very commonly done thyroid surgery a knowledge of possible complications helps the surgeon to anticipate possible complications and can choose methodology so as to prevent before complications occur and treat suitably if they occur. Currently more than 30 thyroid surgeries are conducted per month in our hospital. The present study analyses the clinical audit of thyroid surgery for adult patients undertaken at the Sri Venkateswara Ramnaraian Ruya Government General Hospital, Tirupati. Thyroidectomy complications are highlighted and compared with the published data. We are hopeful the study enlightens this area of thyroid surgery further and contributes valuable scientific data for surgical community and for benefit of patients.

Aim

To study the post-operative complications following thyroid surgery.

Objectives

1. To assess the nerve paralysis in the post-operative period.
2. To estimate the post-operative hypocalcemia and complications based on type of thyroid disease and type of thyroid surgery.
3. To assess the respiratory obstruction in the postoperative period.

METHODS

This is prospective study conducted among 100 patients who underwent thyroid surgery in the Department of General Surgery, Sri Venkateshwara Ramnaraian Ruya Government General Hospital, Tirupati, over a period of one year from February 2019 to February 2020 after obtaining approval from the ethical and scientific committee.

Study Methods

Detailed history, Diagnosis, Type of surgery, Laboratory investigation, Complete blood count, Serum calcium Thyroid function test, Pus culture and sensitivity test in wound infections, Indirect laryngoscopy.

Methodology

A longitudinal study was conducted on one hundred patients who underwent thyroid surgery, for various thyroid disorders, at the Sri Venkateshwara Ramnaraian Ruya Government General Hospital, Tirupati, India between March 2019 to February 2020 after obtaining ethical committee approval from the institutional ethics committee IEC no: Lr.No.57/2019. Various professors, Assistant professors and also by surgical postgraduates supervised by Assistant professors using various surgical techniques had done operations. Fifty-four patients with nontoxic multinodular goitre (MNG), three patients with toxic multinodular goitre, thirty-three patients with nontoxic solitary nodular goitre, ten patients with carcinoma are the indications for surgery in this study group. Of these one hundred patients, eighty-eight patients were female and twelve patients were male. A thorough history, complete physical examination, basic biochemical and haematological investigations were done for all selected patients. Special investigations like thyroid hormone profile and serum calcium estimation done. Indirect laryngoscope is used preoperatively to examine vocal cords in all the patients and only when hoarseness is present post operative vocal cord examination done.

Inclusion Criteria

1. Patient with goiter above the age of 20 years who were undergoing thyroid surgery (e.g., hemithyroidectomy, Near total thyroidectomy, subtotal thyroidectomy, total thyroidectomy).
2. Patient giving informed and written consent.

Exclusion Criteria

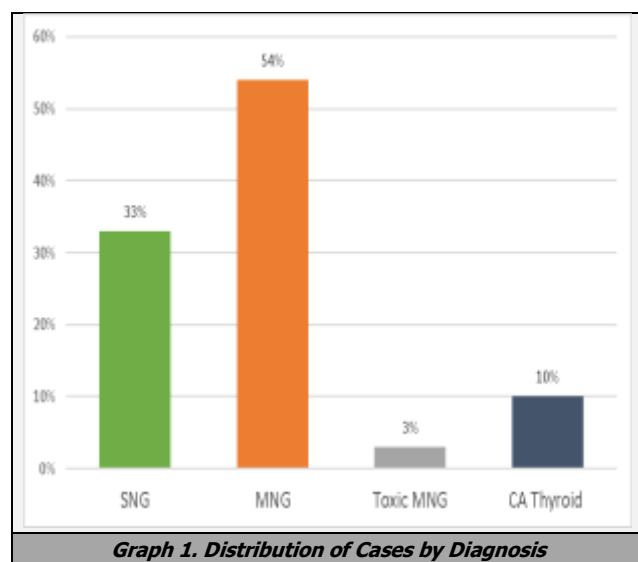
Patient with anesthetic and cardiovascular complications are excluded.

Statistical Analysis

All the data were entered into excel sheet and T test and chi-square test were done wherever applicable and p value of <0.05 is considered as significant.

RESULTS

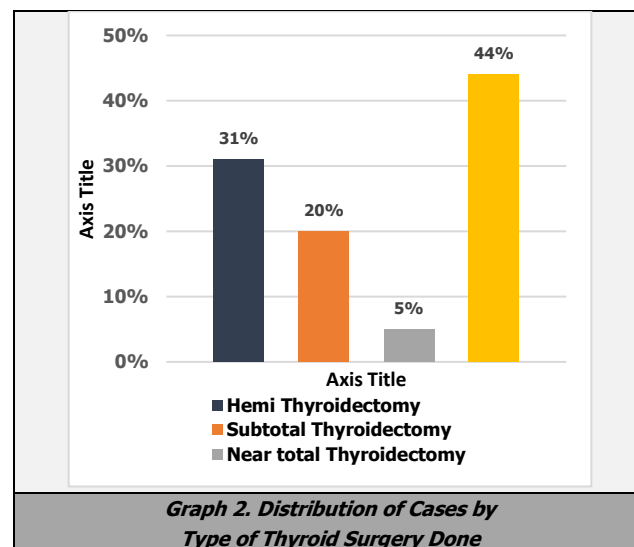
In the present study majority, 77 % of the patients were in the age group of above 30 years and 23 % in the age group of <30 years. The mean age and standard deviation were 42.92 years and 13.097 years respectively. 88 % of the patients were females and 12 % were males. Majority (54 %) of cases were of Multinodular goiter type, followed by 33 % of Solitary Nodule and 10 % of carcinoma Thyroid. Toxic Multinodular goiter was the least common with 3 % of cases.



Graph 1. Distribution of Cases by Diagnosis

In the present study, 90.9 % of the cases where Hypocalcemia was seen were in the age group of >30 years and 90.9 % were females. In the present study, 81.8 % of the cases with Hypocalcemia were seen in cases presenting with Carcinoma Thyroid and underwent Total Thyroidectomy. In the present study, Tracheomalacia was present in 5 % of the patients. In the present study, Hemorrhage was seen Postoperatively in 1 % of the patients. In the present study, 70 % of oedema was seen in cases with Multinodular goiter and 30 % in Carcinoma Thyroid cases. 73.3 % of Seroma formation was seen in cases with Multinodular Goiter and 20 % in Solitary Nodule

cases. 100 % of wound infection was seen in cases with Toxic Multinodular goiter.



Graph 2. Distribution of Cases by Type of Thyroid Surgery Done

Nerve Involved	Number of Patients	%
Recurrent Laryngeal nerve (RLN)	3	3 %
Superior Laryngeal nerve (SLN)	1	1 %
None	96	96 %
Total	100	100 %

Table 1. Distribution of Cases by Nerve Palsy

		Hypocalcemia		Total
		Present	Absent	
Diagnosis	SNG n=33	0	33 (1.1 %)	33 (100 %)
	MNG n=54	0	54 (60.7 %)	54 (54 %)
	Toxic MNG n=3	2 (18.2 %)	1 (1.1 %)	3 (3 %)
	CA Thyroid n=10	9 (81.8 %)	1 (1.1 %)	10 (10 %)
	Total	5 (100 %)	95 (100 %)	100 (100 %)
Type of Surgery	Hemi Thyroidectomy	0	31 (34.8 %)	31 (31 %)
	Subtotal Thyroidectomy	2 (18.2 %)	18 (20.2 %)	20 (20 %)
	Near total Thyroidectomy	0	5 (5.6 %)	5 (5 %)
	Total Thyroidectomy	9 (81.8 %)	35 (39.3 %)	44 (44 %)
	Total	5 (100 %)	95 (100 %)	100 (100 %)

Chi square = 5.951, df = 3, p = 0.11

Table 2. Distribution of Cases by Hypocalcemia, Diagnosis, and Type of Surgery

Wound Complication	Number of Patients	Percentage
Oedema	10	37.1 %
Seroma formation	15	55.5 %
Flap necrosis	0	0 %
Wound infection	2	7.4 %
Total	27	100 %

Table 3. Distribution of Cases by Frequency of Wound Complications

		Respiratory Obstruction (Tracheomalacia)		Total
		Present	Absent	
Diagnosis	Solitary Nodule (SNG) n=33	0	33 (34.7 %)	33 (100 %)
	Multinodular goiter (MNG) n=54	5 (100 %)	49 (51.6 %)	54 (54 %)
	Toxic MNG n=3	0	3 (3.2 %)	3 (3 %)
	Carcinoma Thyroid n=10	0	10 (10.5 %)	10 (10 %)
	Total n=100	5 (100 %)	95 (100 %)	100 (100 %)
Type of Surgery	Hemi Thyroidectomy n=31	0	31 (34.7 %)	31 (31 %)
	Subtotal Thyroidectomy n=20	1 (20 %)	19 (20.0 %)	20 (20 %)
	Near total Thyroidectomy n=5	1 (20 %)	4 (4.2 %)	5 (5 %)
	Total Thyroidectomy n=44	3 (60 %)	41 (43.2 %)	44 (44 %)
	Total	5 (100 %)	95 (100 %)	100 (100 %)

Table 4. Distribution of Cases by Respiratory Obstruction (Tracheomalacia), Diagnosis, and Type of Surgery

In the present study, total thyroidectomy was most frequently performed surgery in both the genders (42 % of females and 58.3 % of males). Hemi Thyroidectomy was

done in 30.7 % of females and 33.3 % of males. Subtotal Thyroidectomy was done in 22.7 % of females. In the present study, 100 % of cases with Respiratory Obstruction (Tracheomalacia) had been diagnosed with Multinodular goiter and 60 % of the cases with Respiratory Obstruction were seen with Total Thyroidectomy.

DISCUSSION

Total thyroidectomy is the surgical treatment of choice for multinodular goitre and in thyroid malignancy. Non-malignant Solitary thyroid nodule usually requires hemithyroidectomy. Post thyroidectomy complications are common and is known to occur in both specialised and non-specialised centres. The study was conducted Between March 2019 and February 2020, one hundred patients underwent different thyroid operations ranging from unilateral lobectomy to total thyroidectomy. In this study, postoperative complications are assessed within one week of surgery. Post Thyroidectomy complications are related mainly to the magnitude of the thyroid disease and the experience of the surgeon involved. In the present study majority, 77% of the patients were in the age group of above 30 years and 23% in the age group of <30 years. The mean age and standard deviations were 42.92 years and 13.097 years, respectively, and 88% of the patients were females, and 12% were males. In the present study, the majority (54%) cases were of Multinodular goitre type, followed by 33% of Solitary Nodule and 10% of carcinoma Thyroid. Toxic Multinodular goitre was the least common with 3% of cases. The commonest operation done in our study, Total Thyroidectomy was done in 44% of cases, Hemi Thyroidectomy in 31%, subtotal thyroidectomy in 29% and Near-Total thyroidectomy in 5% of cases.

In our study, the overall postoperative complication rate was 47 %. In this study, the most common complication is seroma formation in wound complication. In wound complication, seroma formation (15 %) has mostly occurred in 80 % of the cases was seen in the age group of >30 years while 20 % in the age group <= 30 years. Females are more commonly affected (12 / 15) 80 % and males less commonly affected (3 / 15) 20 %, which are more frequently diagnosed with multinodular goitre 73.3 % to more frequent after total thyroidectomy but subsided rapidly. That complication was due to suction drain tube blockage. In this study, fifteen patients developed seroma formation. In these patients, needle aspiration was done, resulting in complete resolution.

The postoperative hypoparathyroidism is the next most common complication which occurred in eleven patients (11 %). Temporary hypoparathyroidism has been defined as decreased calcium levels occurring during the hospital stay and recovering within six months. Permanent hypoparathyroidism is one which persists for more than six months. The incidence of hypoparathyroidism depends on the type of surgery. It increases with the magnitude of the operation. It is not seen after hemithyroidectomy and subtotal thyroidectomy. The incidence is far greater after near-total and total thyroidectomy.

In our study, serum calcium level was done for all the cases on 3rd day of surgery. It was observed that 90.9 % of the patients were seen in the age group of >30 years, and 90.9 % were females who underwent total thyroidectomy for malignant thyroid disorders. This incidence is due to surgical clearance for malignant disease.

Every effort was made to preserve parathyroid glands with their blood supply; however, this might not be sufficient to prevent the occurrence of transient hypoparathyroidism and transient post - thyroidectomy hypocalcaemia, secondary to hypoparathyroidism. Delbridge et al.⁶ state that transient hypoparathyroidism should be an acceptable outcome of total thyroid surgery rather than a complication. It is noted that the degree and duration of hypocalcemia increase with the extent of thyroid surgery.⁷ The risk is higher for cancer surgery and ranges from 3 to 32 % 1, 2, 5-7, 13. Most published reports in the last five years, however, quoted below 10 %. Our results (11 %) concur with the literature with an incidence of temporary hypoparathyroidism increased.

The incidence of flap oedema in this study is 10 %, from that 90 % (9/10) of oedema seen in females and 10 % (1/10) seen in males. That too more frequent after total thyroidectomy (80 %), and after surgery done for multinodular goitre (70 %).

The incidence of respiratory obstruction due to tracheomalacia in this study is 5 %. All the cases of Respiratory Obstruction due to Tracheomalacia were seen in the age group >30 years, and all (100 %) were females. The respiratory obstruction due to tracheomalacia was seen in the long-standing case of multinodular goitre, which is seen in 60 % of total thyroidectomy and 20 % seen in subtotal thyroidectomy and near-total thyroidectomy. In this study, three patients were reintubated and maintained in positive pressure ventilation and recovered within 48hours of surgery. Two patients underwent intraoperative tracheostomy and recovered within one week.

If the diagnosis is made only clinically, most of the post thyroidectomy respiratory problems will be reported as tracheomalacia. Different rates of tracheomalacia following thyroidectomy in patients with large goitres have been reported in various studies from 0 to 5.3 and even as high as 10%.^{8,5,9} Bennett et al., in a study, shows that out of a total of 1969 cases of thyroidectomy, no cases of tracheomalacia and tracheal and airway collapse had occurred.

Sl. No.	Study	Tracheomalacia Incidence %
1	Present	5
2	Bennett et al	0
3	Findlay et al	0
4	Balasubramanian et al	3
5	Others	0-5.3

Furthermore, in Findlay et al. study, tracheomalacia incidence was about zero.⁸ Balasubramanian et al,¹⁰ also reported tracheomalacia in three patients (one with papillary thyroid carcinoma and lung metastasis, one with hypopharyngeal cancer, and one with papillary thyroid cancer with tracheal involvement). Supportive treatment with wet air, respiratory physiotherapy, and even continuous positive airway pressure through a mask for mild to

moderate cases were advised. For severe cases, in addition to the measures mentioned above, long-term intubation is considered necessary.

Damage to the recurrent laryngeal nerve can be unilateral or bilateral and temporary or permanent. The permanent recurrent laryngeal nerve (RLN) damage often manifests as an irreversible dysfunction of phonation. The frequency of this complication ranges from 0.5 to 5 % in different thyroid surgery centres and increases in case of both recurrent goitre and complete thyroidectomy due to thyroid cancer.¹⁰ Deliberate identification of RLN and meticulous dissection during surgery can prevent this complication.

In this study, the incidence of recurrent laryngeal nerve (vocal cord) palsy is 3 % and superior laryngeal nerve palsy in one patient (1 %). It was temporary neuropraxia in four patients who recovered within one month after surgery. RLN and SLN palsy mainly observed in female patients operated for total thyroidectomy for thyroid malignancy. Different studies reports show varying prevalence ranging from 0 – 14 %.^{11,12} This difference in complication rates reflects variation in surgical expertise, nature of the operation, the number of surgeries performed at that particular centre. In our study, the incidence of RLN 3 % and SLN 1 %, which was temporary nerve palsy noted. The temporary RLN palsy rate of 4 % in this study is also consistent with the findings observed in some national studies which have reported this rate to be up to 4.7 %.^{13,14} The temporary RLN palsy rate is reported to be 2.6 % to 5 % in international literature.^{15,16} Identification of RLN at surgery is the fundamental step in avoiding damage. If the nerve has not been identified, then paralysis will be permanent in up to one-third of patients whose nerves have been injured. Sharp dissection and careful usage of bipolar diathermy minimize the risks of RLN injury.

However, this incidence increases in malignant thyroid diseases, as noted in a recent international study.¹⁷ Re-operative surgery for recurrent goitres also contributes for increase in the rates of RLN injury which ranges between 4 % – 18 %. The incidence of symptomatic hemorrhage requiring reintervention amounts to 0.1 – 1.5 %. Respiratory distress, pain, or cervical pressure, dysphagia, and increased blood drainage reflects postoperative hemorrhage. The reported incidence of postoperative hemorrhage in the literature ranges from 0 to 5 %.^{18,7} The prevention of postoperative bleeding is dependent on adequate intraoperative haemostasis. The sound surgical technique is essential.

Limitations

1. Sample size was a limiting factor as the duration of the study was limited to twelve months, and controlled parameters are similar. If the parameters were more diverse, the sample size would be much even smaller, and this would have led to poor results.
2. This study is from a single centre. Hence, a better application of the results can be made if the study was a multicentre one encompassing a broader spectrum of the population.

3. Complication following minimally invasive and robotic techniques cannot be studied in this study due to non-availability of equipment in this setting.

CONCLUSIONS

This study shows that in cases of benign thyroid disease affecting the whole gland, total thyroidectomy or hemithyroidectomy can be done with a low complication rate. Wound complication, hypoparathyroidism induced hypocalcemia, recurrent laryngeal nerve palsy was occurring more commonly in total thyroidectomy procedure for malignant thyroid disorder patients than benign disorders. Risk factors for postoperative complication are thyroid carcinoma, multinodular goitre, toxic goitre and total thyroidectomy. Respiratory obstruction due to tracheomalacia is most commonly seen in female patients who underwent total thyroidectomy for multinodular goitre. Complications and sequelae of thyroid surgery can yet be reduced by careful evaluation of the surgical and medical therapeutic options to have more precise surgical indications, a thorough knowledge of the surgical anatomy, a rigorous surgical technique, a systematic dissection of recurrent laryngeal nerve and meticulousness during the procedure. Thereby I conclude that the determining factors for the complications in thyroidectomy procedures are operative skills and experience of the Surgeon and the malignant nature of the disease.

Data sharing statement provided by the authors is available with the full text of this article at jebmh.com.

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