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Original Research Article

A Clinical Study on the Complications of Thyroidectomy in a Tertiary Care Hospital

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Conflict of interest: Nil

Abstract:

Background: Thyroidectomy is a procedure commonly performed by ENT surgeons. Thyroidectomy is indicated for different benign and malignant diseases of the Thyroid. Complications of Thyroidectomy are unique that it produces metabolic disturbances also.

Aim of the study: To study the various complications of Thyroidectomy, its frequency, and management of postoperative complications after thyroid surgery; to correlate these complications with the extent of the surgery; and clinical overview of evolution of thyroid surgery.

Objectives: To study the effect of management and follow up of the patients up to 1 year post-operative period in patients undergoing thyroidectomy.

Materials: An analytical study was carried out at a tertiary care center over a period of 12 months. The mean age of the patients was 34.58±6.14 years. 70.82% of the patients were aged 26 to 46 years. 37.5% of the patients were males and 62.5% of the patients were females with a male to female ratio of 1:1.30.

Results: The types of Thyroidectomy surgeries undertaken in this study were Hemithyroidectomy (48.34%), Total Thyroidectomy (29.45%), Isthumusectomy (16.18%), and Excision of the Adenoma (06.03%) in the affected Lobe. Postoperative hypocalcemia and recurrent laryngeal nerve injury occurred in 06.25%, 02.08% of the patients and Hypothyroidism in 02.08% of patients.

Conclusion: Complications of Thyroidectomy surgeries are still common and the most dreaded one for the surgeon was RLN Injury. The complications can be minimized by keeping the operative field blood less, by dissecting the tissue carefully, and promptly identifying the RLN and preserving it. Use of cauterization used less frequently in the vicinity of RLN would help in preventing it's injury.

Keywords: Thyroid, Thyroidectomy, hypocalcemia, RLN injury, hoarseness of voice, superior laryngeal nerve injury.

Introduction

Thyroid gland diseases account for the second commonest endocrine dysfunctions after Diabetes Mellitus in the daily clinical practice. [1] The surgical intervention as the choice of treatment is indicated usually in either benign or malignant tumours of Thyroid. [2] Swelling of the Thyroid in the form of colloid Goiter, breathing or swallowing difficulties and voice abnormality are other indications for Thyroid surgeries. [3]

Hormonal imbalances producing Hyperthyroidism, is another indication. [4] Cosmetic reason also is considered in very large swellings of thyroid gland especially in women. [5] The different Thyroid surgeries include removal of nodule, Lobectomy, Hemithyroidectomy and subtotal thyroidectomy or Total thyroidectomy. The last two are supplemented by Neck dissection in the malignant cases. [6] The high mortality (nearly 40%), morbidity, Hemorrhage, sepsis reported form the 18th century literature is not seen in the modern times due to the advent of better anesthesia techniques like hypotensive techniques, antibiotics, hemostatics, better surgical instrumentation, hormonal assays, and better post-operative care. [7] But the major postoperative complications of thyroid surgeries even now include wound infection, hematoma/ hemorrhage causing airway compromise, hypocalcaemia, recurrent or superior laryngeal nerve injury, and thyroid storm. [8]

To keep lower rates of complications, the anatomical knowledge and surgical techniques are required while doing Thyroidectomy. [9] Authors by name Ramirez et al [10] opined that the nature and number of complications are directly proportional to the correct surgical knowledge of the surgeon and the extent of dissection during Thyroidectomy. [11]

The present study was conducted in this context to study the various complications of Thyroidectomy, its frequency, and management of postoperative complications after thyroid surgery; to correlate these complications with the extent of the surgery in a tertiary care center.

Study Design: A cross sectional analytical study.

Study Setting: Department of ENT, Viswabharathi Medical College Hospital, Kurnool

Study Duration: 15 months (July 2022 to November 2023)

Study Population: All the patients diagnosed with tumours of Thyroid, Swellings of the thyroid undergoing Thyroidectomy at Viswabharathi Medical College Hospital, Kurnool.

Sampling sample size: Sample size is calculated by the formula N= 4pq/d2;

Where p = 25%, prevalence taken from the study
q=70%, d=10
Hence n=48

Materials: Between July 2022 to November 2023, 48 patients were operated for benign and malignant thyroid disorders. This analytical study was done to study the various complications of Thyroidectomy, its frequency, and management of postoperative complications after thyroid surgery; to correlate these complications with the extent of the surgery in a tertiary care center and clinical overview of evolution of thyroid surgery. An Institutional ethics committee approval was obtained before commencing the study.

Inclusion Criteria: Patients admitted and positively diagnosed as having thyroid swellings/ tumours requiring surgical management and willing for surgery were included. Patients who underwent thyroidectomy and attended follow up for 1 year after discharge were included. Patients aged between 16 years to 66 years were included. Patients of both genders were included. Patients with complications following Thyroidectomy were included.

Exclusion Criteria:

Patients with thyroid swellings presenting with RLN palsy were excluded. Patients who have undergone thyroidectomy and who were lost for follow-up were excluded. All the patients were subjected to thorough clinical history taking, examination of Neck, eyes, Ear Nose, Throat and Indirect Laryngoscopy. All the laboratory tests including hematological, renal, liver and thyroid function tests were undertaken.

Radiological investigations like Ultrasound examination of the neck, CT scan, MRI wherever necessary were done especially in patients with suspected retrosternal extension of the tumours, extra-large thyroid masses causing compressive symptoms. Patients with hoarseness of voice, respiratory difficulty, and swallowing problems were assessed by pan endoscopy. All surgeries were performed by the ENT surgeons.

Operative protocol: In the present study the indication was benign lesions in 72.14% and malignant in 27.86 %. In all the cases RLN and SLN were identified and separated to prevent damage. At most care was taken to identify and preserve the parathyroid glands (at least two). Where accidental excision was done the parathyroid glands were re-implanted in the thigh region.

Total thyroidectomy (TT) with or without neck dissection, Near-total thyroidectomy (NTT), subtotal thyroidectomy (STT), Hemithyroidectomy, and Isthmusectomy were the surgeries undertaken. The types of HPE reports received were colloid goiter, nodular goiter, hyperplastic nodule, and papillary and follicular carcinoma.

In all the cases IDL was done immediately 24 hours after the surgeries. Any dysfunctions of the voice 06 months after conservative treatment were labeled as permanent paralysis. In all cases serum calcium levels were assayed after 24 hours except after Isthmusectomy surgery.

Serum calcium levels less than 8.5 mg/dL were considered as Temporary hypoparathyroidism (HPT) especially when associated with muscle spasms, perioral numbness, and tingling sensation and which responded to exogenous calcium supplementation. It was considered as permanent HPT if the low calcium levels persist after 06 months despite regular calcium and vitamin D supplementation. Follow up of all the patients was done for 6 to 9 months.

Results

In this study 48 patients with various thyroid swellings attending the ENT Department of Viswabharathi Medical College were subjected to different thyroid surgeries. Patients aged between 16 and 66 years were included in the study with a mean age of 34.58±6.14 years. 70.82% of the patients were in the age group of 26 to 46 years. 25% of the patients were males and 75% of the patients were females with a male to female ratio of 1:3.

33.33% of the patients were living in urban and 68.75% of the patients were from rural areas.

43.75% of the patients were belonged to low socio-economic group, 39.58% belonged to the middle income group and 16.66% of the patients belonged to the high income group. 47.91% of the patients had their BMI between 18 and 25 and 52.08% of the patients had their BMI above 25. 51.16% of the patients had normal thyroid function tests, 39.58% of the patients had hypothyroid function values and 06.25% had hyperthyroid status. Diabetes mellitus was present in 27.08% and absent in 72.91%. (Table 1)

T test calculator for single sample was used to find the statistical significance, the age and gender variables were found to be significant as the p value was <0.05.

The remaining variables were not significant in this study.

Table 1: Showing the Demographic data of the subjects (n-48).

Observation	Number	Percentage	P value
Age			
16 to 26	03	06.25	
26 to 36	14	29.16	0.001
36 to 46	20	41.66	
46 to 56	06	12.5	
56 to 66	05	10.41	
Gender			0.001
Male	12	25	
Female	36	75	
Living			0.143
Urban	15	31.25	
Rural	33	68.75	
Socio-economy			0.151
Low	21	43.75	
Middle	19	39.58	
High	08	16.66	
BMI			0.131
18 to 25	23	47.91	
Above 25	25	52.08	
Diabetes Mellitus			0.171
Present	13	27.08	
Absent	35	72.91	
Thyroid functions			0.138
Normal	26	51.16	
Hypo	19	39.58	
Hyper	03	06.25	

Analysis of the presenting symptoms in the subjects with thyroid swelling showed that swelling in front of the necks was most common with 75% patients having it. Hypothyroidism was present in 39.58% of the patients. Dysphagia was seen in 22.9%, Dyspnea in 12.5%, pain in the neck in 22.9% of the patients. **(Table 2)** T test calculator for single sample was used to find the statistical significance, it was found to be significant as the p value was <0.05.

Table 2: Showing the symptomatology in the subjects (n-48).

Symptoms	Number	Percentage	P value
Duration			
01 to 06 months	15	31.25	0.001
06 to 12 months	21	43.75	
More than 12 months	13	27.08	
Swelling in the Neck	36	75	0.001
Dysphagia	11	22.9	0.001
Dyspnea	06	12.5	0.001
Hoarseness of voice	07	14.58	0.001
Hypothyroidism	19	39.58	0.001
Hyperthyroidism	03	06.25	0.001
Loss of weight			
Aesthetic appearance	09	18.75	0.001
Pain in the neck	11	22.91	0.001
Site			0.001
Left lobe	18	37.5	
Right lobe	16	33.33	
midline	14	29.16	

The FNAC reports of the patients showed that 45.81% had Multinodular Goiter. 20.83% showed Follicular Adenoma, 12.5% of the patients showed papillary cell carcinoma, 08.33% showed Follicular thyroid carcinoma, 08.33% showed Hurthle cell tumour and 04.16% patients showed suspected malignant tumor findings. (Table 3) T test calculator for single sample was used to find the statistical significance, it was found to be significant as the p value was <0.05.

Table 3: Showing the pre-operative diagnosis in the subjects on FNAC (n-48).

Diagnosis	Number	P value
Multinodular Goiter	22 (45.83%)	0.001
Follicular Adenoma	10 (20.83)	0.001
Papillary cell carcinoma	06 (12.5%)	0.001
Follicular thyroid carcinoma	04 (08.33%)	0.001
Hurthle cell tumour	04 (08.33%)	0.001
Suspected malignancy	02(04.16%)	0.001

Excision biopsy specimens were subjected to HPE and it was found that 20/22 patients with FNAC showing Multinodular Goiter were confirmed, the other two were reported as Hurthle cell tumours.

All the patients with Follicular adenoma reported on FNAC were confirmed by HPE also. 05 out of 06 patients with papillary cell carcinoma were confirmed and one was reported as multinodular Goiter. All the Follicular thyroid carcinoma and Hurthle cell tumour reports on FNAC were confirmed on HPE.

Two cases of suspected malignancy reports on FNAC were confirmed as papillary cell carcinoma. (Table 4) T test calculator for single sample was used to find the statistical significance, it was found to be significant as the p value was <0.05.

Table 4: Showing the difference between FNAC and HPE ion the study (n-48)

FNAC Diagnosis	Number	HPE Diagnosis	P value
Multinodular Goiter	22 (45.83%)	20 (41.66%)	0.001
Follicular Adenoma	10 (20.83)	10 (20.83%)	0.001
Papillary cell carcinoma	06 (12.5%)	05 (10.41%)	0.001
Follicular thyroid carcinoma	04 (08.33%)	04 (08.33%)	0.001
Hurthle cell tumour	04 (08.33%)	04 (08.33%)	0.001
Suspected malignancy	02(04.16%)	01 (02.08%)	0.001

The types of Thyroidectomy surgeries undertaken in this study were Hemithyroidectomy (48.34%), Total Thyroidectomy (29.45%), Isthumusectomy (16.18%), and Excision of the Adenoma (06.03%) in the affected Lobe.

Intra-operative complications noted in the study were bleeding in 02.08%, recurrent laryngeal nerve paralysis in 04.16%, and Tracheal injury in 02.16% and adhesions in 02.16% of the patients. Postoperative complications noted were hematoma in 04.16%, sepsis in 02.08%, unilateral transient RLN palsy in 02.08%, flap necrosis in 02.08%, airway obstruction in 02.08%, wound dehiscence in 02.08% and persisting hoarseness of voice in 04.16% of the cases. Both Hypothyroidism and Hypocalcemia were observed in 03 patients each in this study (06.25%), (Table 5). T test calculator for single sample was used to find the statistical significance, it was found to be significant as the p value was <0.05.

There were no complications observed after follow up of 06 months in this study. The mean time of occurrence of complications in the present study was hematoma in 04.20Hrs±8.50 min, Unilateral transient RLN palsy in 05.24Hrs±7.90 min, Airway obstruction in 08.25Hrs±6.45 min, Persisting hoarseness of voice in 09.50Hrs±8.25 min, Wound dehiscence in 02 days±10 hrs, Flap necrosis in 04 days±16 Hrs, Hypocalcaemia in 03 days±10 Hrs and Hypothyroidism in 03 days±02 Hrs (Table 5).

Table 5: Showing the complications and their frequencies (n-48)

Complication	Mean Time of complication	Number	%	P value
Intra-operative				**0.001**
Bleeding	**15.75±2.30 min**	**02**	**02.08**	
Tracheal injury	**40.15±1.75 min**	**01**	**02.16**	
Adhesions	**41.35±2.10 min**	**01**	**02.16**	
Total		**08**		
Post-operative				**0.001**
Hematoma	**4.20Hrs±8.50 min**	**02**	**04.16**	
Unilateral transient RLN palsy	**5.24Hrs±7.90 min**	**01**	**02.08**	

Airway obstruction	**8.25Hrs±6.45 min**	**01**	**02.08**	
Persisting hoarseness of voice	**9.50Hrs±8.25 min**	**02**	**024.16**	
Wound dehiscence	**2 days±10 hrs**	**01**	**02.08**	
Sepsis	**3 days± 14 Hrs**	**01**	**02.08**	
Flap necrosis	**4 days±16 Hrs**	**01**	**02.08**	
Hypocalcaemia	**2 days±10 Hrs**	**03**	**06.25**	
Hypothyroidism	**3 days±02 Hrs**	**03**	**06.25**	
Complications after 06 months		**00**	**00**	**00**
Total		**15**	**31.25**	

Discussion

In recent times complications after Thyroidectomy Surgeries are fewer as there are improvements in anaesthetic techniques, surgical instrumentation, and skills of surgeons. In the literature there is less information about the timing of these complications. This study was conducted on 48 patients who underwent Thyroidectomy surgeries in a tertiary care and an attempt is made to identify the time course of these complications. It also made an attempt to predict the surgical complications. In this study the mean age of the patients was 34.58±6.14 years. 70.82% of the patients were aged 26 to 46 years. 37.5% of the patients were males and 62.5% of the patients were females with a male to female ratio of 1:3. In a study by Zambudio AR, Rodríguez J, Riquelme J et al [12] female patients were 90% and male patients 10%.

The present study had 33.33% of the patients were living in urban and 68.75% of the patients were from rural areas. 43.75% of the patients were belonged to low socio-economic group, 39.58% belonged to the middle income group and 16.66% of the patients belonged to the high income group. 47.91% of the patients had their BMI between 18 and 25 and 52.08% of the patients had their BMI above 25. 51.16% of the patients had normal thyroid function tests, 39.58% of the patients had hypothyroid function values and 06.25% had hyperthyroid status.

Diabetes mellitus was present in 27.08% and absent in 72.91%. (Table 1) T test calculator for single sample was used to find the statistical significance, the age and gender variables were found to be significant as the p value was <0.05. The remaining variables were not significant in this study. T test calculator for single sample was used to find the statistical significance, it was found to be significant as the p value was <0.05. In a similar study by Apoorva Kumar Pandey, Tripti Maithani et al., (13) they observed 70 out of 80 patients were females (87.5%) and 12/80 (12.5%) were males. The female to male ratio was 5.83:1, and the mean age was 39.29 years. The presenting symptoms in this study were swelling in front of the neck in 75% patients followed by Hypothyroidism in 39.58%, Dysphagia in 22.9%, Dyspnea in 12.5%, pain in the neck in 22.9% of the patients. (Table 2) T test calculator for single sample was used to find the statistical significance, it was found to be significant as the p value was <0.05. E. M. Der, E. Quayson, J. N. Clegg-Lamptey et al (16) observed that the prevalence of thyroid diseases was increasing with the age of the patients and more common in women. Apoorva Kumar Pandey, Tripti Maithani et al., [13] found from their study that most of their cases presented with obvious neck swelling. 12.36% of the patients presented with Dysphagia. 06.72% of the patients presented with Dyspnea. Hypocalcemia was noted in 11.57% and Hyperthyroidism in 04.37% of the patients. FNAC reports in the present study showed 45.81% had Multinodular Goiter, 20.83% showed Follicular Adenoma, 12.5% of the patients showed papillary cell carcinoma, 08.33% showed Follicular thyroid carcinoma, 08.33% showed Hurthle cell tumour and 04.16% patients showed suspected malignant tumor findings. (Table 3)

In a similar study by Apoorva Kumar Pandey, Tripti Maithani et al., [13] the preoperative diagnosis of tumours were 88.75% benign and 11.25% malignant types. The commonest tumour in their series was MNG in 47.5% patients, papillary carcinoma in 08.75% patients. The types of Thyroidectomy surgeries undertaken in this study were Hemithyroidectomy (48.34%), Total Thyroidectomy (29.45%), Isthumusectomy (16.18%), and Excision of the Adenoma (06.03%) in the affected Lobe. In the study by Apoorva Kumar Pandey, Tripti Maithani et al [13] the most common surgery was Hemithyroidectomy in 45% patients with a complication rate of 20%. The types of Thyroidectomy surgeries undertaken in this study were Hemithyroidectomy (48.34%), Total Thyroidectomy (29.45%), Isthumusectomy (16.18%), and Excision of the Adenoma (06.03%) in the affected Lobe. Intra-operative complications noted in the study were bleeding in 02.08%, recurrent laryngeal nerve paralysis in 04.16%, and Tracheal injury in 02.16% and adhesions in 02.16% of the patients. Postoperative complications noted were hematoma in 04.16%, sepsis in 02.08%, unilateral transient RLN palsy in 02.08%, flap necrosis in 02.08%, airway obstruction in 02.08%, wound dehiscence in 02.08% and persisting hoarseness of voice in 04.16% of the cases.

Both Hypothyroidism and Hypocalcemia were observed in 03 patients each in this study (06.25%), (Table 6). In the study by Apoorva Kumar Pandey,

Tripti Maithani et al [13] Hypocalcemia and unilateral recurrent laryngeal nerve injury (RLNI) were noted in 07.5% out of 20% of the total complications. In a study by Zambudio AR, Rodríguez J, Riquelme J etal [12] the variables studied were in patients with post-operative complications the hyperthyroidism showed a p value of 0.0033, compressive symptoms (Dyspnea) showed p as 0.0455), intrathoracic component showed p value of 0.0366, goiter grade showed p value of 0.0195. In the study by Apoorva Kumar Pandey, Tripti Maithani et al., among their 80 patients, 70 females were present (87.5%) and 12 male patients (12.5%) with female-to-male ratio of 5.83:1, and the mean age was 39.29 years.

The ratio between benign and malignant tumours was 7.88:1 (females- 88.75 and males- 11.25%). Most common pathological diagnosis observed in our series was colloid goiter (multinodular goiter, MNG) occurring in 47.5% of cases, whereas papillary carcinoma accounting for 8.75% was the commonest malignant lesion (Table 1). Majority of cases presented as obvious neck swelling. The commonest operation performed was hemithyroidectomy (45%). The recurrent laryngeal nerve injury observed was permanent in 05% and transient in 02.5% of the patients. Delbridge et al [15] in their study of 3089 thyroidectomies (1838 STs and 1251 TTs) observed 0.5% permanent RLN injury and 0.4% hypoparathyroidism.

The rate of RLN injury complication was zero (0) in this study. However the complication of Hypocalcemia and Hypothyroidism was seen in 03 patients each in this study (06.25%). The percentage of complications in this study including all types was 31.25%. Zambudio AR, Rodríguez J, Riquelme J etal [12] et al reported from their study a complications rate of 23.12%. They suggested that the literature showed a lower complications rate by many studies, but did not take into all the types complications and most of the complications were only transient and could be treated within 03 months interval. This also holds good for the present study. Fassas MD [a], Ishwarya Mamidi BS et al reported an overall complication rate of the overall complication rate was 3.28%. Out of 03.28% blood transfusion reactions occurred in (96%), hematoma in (68%), pneumonia in (53%), and cardiac arrest in (67%). They also reported 37%, unplanned reoperations in the hemithyroidectomy patients, and in 63% of the total thyroidectomy cohort before discharge.

All the complications in their study occurred within 7 days; the mean number of days for pneumonia was 03, for pulmonary embolism 06 days, for cardiac arrest 01 day, for myocardial infarction 02 day, for blood transfusions 0 (1-2 days), and for hematoma formation 0 (1-2 days), for Superficial surgical site infection 09 days occurred later. They also reported that the patients undergoing outpatient surgery had a low risk of complications (odds ratio 0.41) in the 7-day postoperative period. In the present study the mean time of occurrence of complications in the present study was hematoma in 04.20Hrs±8.50 min, Unilateral transient RLN palsy in 05.24Hrs±7.90 min, Airway obstruction in 08.25Hrs±6.45 min, Persisting hoarseness of voice in 09.50Hrs±8.25 min, Wound dehiscence in 02 days±10 hrs, Flap necrosis in 04 days±16 Hrs, Hypocalcaemia in 03 days±10 Hrs and Hypothyroidism in 03 days±02 Hrs (Table 5).

All the above authors concluded that the complication rate of all types could be minimized by maintaining a by operating in a bloodless field, with meticulous dissection, and promptly, carefully identifying and preserving recurrent and superior laryngeal nerves along with parathyroid glands. Deshmukh, Anuja; Gangiti, Kranthikumar et al reported certain rare complication like chyle leak in their study accounting to 03.21%. Thyroidectomy is the most common cause of RLN injury on both sides. [18] Especially in second surgeries on thyroid. [19] Thyroidectomy surgery is said to be the most common cause of bilateral vocal cord paralyses. Prevalence of postoperative Hypocalcaemia ranges from 0 % to 83%. The Hypocalcaemia could be temporary and permanent. [20] Hypocalcemia is commonly seen in Total Thyroidectomy for malignant tumours more frequently. It is less commonly with sub-total Thyroidectomy surgery.

In the present study the RLN injuries were transient and the incidence of Hypocalcaemia was 06.25%. Hypocalcemia is thought of when the postoperative serum calcium levels fall below 7.5 mg/dL or < 8.5 mg/dL with symptoms of hypocalcemia. IF the serum calcium remains below 8.5 mg/dL even after one year, it is taken as permanent hypocalcemia. [12] Hypocalcemia symptoms appear one or two days after Total Thyroidectomy. In this surgery 03 patients developed at a mean duration of 02 Hours and 10Hrs. The symptoms were sensation of paresthesia and numbness over fingertips and perioral area and muscle cramps. In a study, the risk factors observed were the extent of surgical resection, Grave's disease, recurrent goiter, female gender, and specimen weight above 45 gm. [12]

Conclusions:

Complications of Thyroidectomy surgeries are still common and the most dreaded one for the surgeon was RLN Injury.

The complications can be minimized by keeping the operative field blood less, by dissecting the tissue carefully, and promptly identifying the RLN and preserving it. Use of cauterization used less frequently in the vicinity of RLN would help in preventing it's injury.

References:

1. Gardiner KR, Russell CF. Thyroidectomy for large multinodular colloid goitre. J R Coll Surg Edinb. 1995; 40:367–370.
2. Liu Q, Djuricin G, Prinz R. Total thyroidectomy for benign thyroid disease. Surgery. 1998; 123:2–7.
3. Delbridge L, Guinea AI, Reeve TS. Total thyroidectomy for bilateral benign multinodular goiter. Arch Surg. 1999; 134:1389–1393.
4. Reeve TS, Delbridge L, Cohen A, Crummer P. Total thyroidectomy: the preferred option for multinodular goiter. Ann Surg. 1987; 206:782–786.
5. Wilson SB, Staren ED, Prinz RA. Thyroid reoperations: indications and risks. Am Surg. 1998; 64:674–679. [PubMed] [Google Scholar]
6. Harness JK, Fung L, Thompson NW, et al. Total thyroidectomy: complications and technique. World J Surg. 1986; 10:781–786. [PubMed] [Google Scholar]
7. Wagner HE, Seiler CA. Recurrent laryngeal nerve palsy after thyroid gland surgery. Br J Surg. 1994; 81:226–228. [PubMed] [Google Scholar]
8. Seiler CA, Glaser C, Wagner HE. Thyroid gland surgery in an endemic region. World J Surg. 1996; 20:593–597. [PubMed] [Google Scholar]
9. Thomusch O, Machens A, Sekulla C, et al. Multivariate analysis of risk factors for postoperative complications in benign goiter surgery: prospective multicenter study in Germany. World J Surg. 2000; 24:1335–1341. [PubMed] [Google Scholar]
10. Mishra A, Agarwal A, Agarwal G, Mishra SK. Total thyroidecotmy for benign thyroid disorders in an endemic region. World J Surg. 2001; 25:307–310. [PubMed] [Google Scholar]
11. Menegaux F, Turpin G, Dahman M, et al. Secondary thyroidectomy in patients with prior thyroid surgery for benign disease: a study of 203 cases. Surgery. 1999; 125:479–483.
12. Zambudio AR, Rodríguez J, Riquelme J, Soria T, Canteras M, Parrilla P. Prospective study of postoperative complications after total thyroidectomy for multinodular goiters by surgeons with experience in endocrine surgery. Ann Surg. 2004 Jul; 240(1):18-25.
13. Apoorva Kumar Pandey, Tripti Maithani, Alok Agrahari, Arvind Varma, Chetan Bansal, Aparna Bhardwaj, Virendra P Singh, Sonam Rathi. Postoperative Complications of Thyroid Surgery: A Corroborative Study with an Overview of Evolution of Thyroid Surgery, International Journal of Head and Neck Surgery, October-December 2015; 6(4):149-154.
14. E. M. Der, E. Quayson, J. N. Clegg-Lamptey, E. K. Wiredu, R. K. D. Ephraim, and R. K. Gyasi, "Thyroid disorders in Accra, Ghana: a retrospective histopathological study at the Korle-Bu teaching hospital," Journal of Medical and Biomedical Sciences, vol. 2, no. 1, pp. 1–7, 2013.
15. Delbridge L, Guinea AI, Reeve TS. Total thyroidectomy for bilateral benign multinodular goiter. Arch Surg. 1999; 134:1389–1393.
16. Fasas MD, Ishwarya Mamidi BS, Ryan Lee MBA, Luke Pasick MD, D anielA. Benito MD, Punam Thakkar MD, Arjun S. Joshi MD, Joseph F. Goodman MD. Postoperative Complications after Thyroidectomy: Time Course and Incidence before Discharge. Journal of Surgical Research**,** Volume 260, April 2021, Pages 210-219.
17. Deshmukh, Anuja; Gangiti, Kranthikumar; Pantvaidya, Gouri; Nair, Deepa; Basu, Sandip[1]; Chaukar, Devendra; Pai, Prathamesh; Nair, Sudhir; Hawaldar, Rohini[2]; Dusane, Rohit[2]; Chaturvedi, Pankaj; D'Cruz, Anil. Surgical outcomes of thyroid cancer patients in a tertiary cancer center in India. Indian Journal of Cancer 55(1):p 23-32, Jan–Mar 2018.
18. J. M. Feehery, E. A. Pribitkin, R. N. Heffelfinger et al., "The evolving etiology of bilateral vocal fold immobility," Journal of Voice, vol. 17, no. 1, pp. 76–81, 2003.
19. P. V. Pradeep, A. Agarwal, M. Baxi, G. Agarwal, S. K. Gupta, and S. K. Mishra, "Safety and efficacy of surgical management of hyperthyroidism: 15-year experience from a tertiary care center in a developing country," World Journal of Surgery, 2007,vol. 31, no. 2, pp. 306–312.
20. I. R. Gough and D. Wilkinson, "Total thyroidectomy for management of thyroid disease," World Journal of Surgery, vol. 24, no. 8, pp. 962–965, 2000.