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Original Research Article

Post Operative Respiratory Complications after Thyroidectomy-A Retrospective Study

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Conflict of interest: Nil

Abstract:

Background: Thyroidectomy, though commonly performed, poses a risk for post-operative respiratory complications due to the gland's close anatomical relationship with the trachea, larynx, and recurrent laryngeal nerves. These complications, including laryngeal edema, tracheomalacia, and recurrent laryngeal nerve (RLN) palsy, can result in significant morbidity. This study aimed to evaluate the incidence, causes, and outcomes of post-operative respiratory complications following thyroidectomy at a tertiary care centre.

Methods: This retrospective descriptive study was conducted at Government Medical College, Ernakulam, from December 2018 to July 2024. Data from 520 patients who underwent thyroidectomy were reviewed from the anaesthesia register. Demographic details, anesthetic techniques, perioperative complications, interventions, and outcomes were analyzed using descriptive statistics.

Results: Of the 520 thyroidectomy cases, 473 (90.96%) were females and 47 (9.03%) males, with most patients aged 31–60 years (78.07%). Multinodular goitre accounted for 94.03% of cases, while papillary and follicular carcinomas constituted 3.26% and 2.69%, respectively. Post-operative respiratory complications occurred in 18 patients (3.46%). These included RLN palsy (0.38%), laryngeal edema (0.38%), tracheomalacia (0.57%), hematoma (0.38%), bronchospasm (0.57%), inadequate reversal (0.19%), and 0.96% with unexplained stridor. One patient required tracheostomy for bilateral RLN palsy; there was no mortality.

Conclusion: Post-operative respiratory complications following thyroidectomy are infrequent but potentially serious. Early identification, anticipation of airway problems such as tracheal compression, and vigilant post-operative monitoring can significantly reduce morbidity. The predominance of middle-aged female patients highlights a demographic trend consistent with global patterns of thyroid disease.

Keywords: Thyroidectomy, Respiratory complications, Laryngeal edema, Recurrent laryngeal nerve palsy, Tracheomalacia, Postoperative stridor.

Introduction

Thyroid diseases are common worldwide. India also has significant burden of thyroid diseases and according to a projection from various studies on thyroid disease, it has been estimated that approximately 42million people in India have various types of Thyroid diseases.[1] Surgery for thyroid swelling(thyroidectomy) is indicated in Thyroid nodules, Nodular or Diffuse Goiter or Thyroid cancer.

Thyroid gland is situated in the anterior part of neck in close relation to the trachea, larynx, major blood vessels, parathyroids and recurrent laryngeal nerve which supply the muscles of larynx. Hence thyroid surgery is more prone for complications such as laryngeal edema, post-operative hematoma, hypocalcemia and vocal cord palsy. Long standing thyroid swellings and retrosternal goiters may result in tracheomalacia, tracheal deviation and recurrent laryngeal nerve palsy due to its compression effects. The above-mentioned factors along with other postoperative effects of general anaesthesia make thyroid surgery particularly prone for airway obstruction and respiratory compromise in the immediate postoperative period. An assessment of these post-operative respiratory complications and

their incidence will help to anticipate these complications and take necessary precautions and do appropriate interventions.

Objectives of the Study

Primary: To study the pattern of immediate post operative respiratory complications and outcome after thyroidectomy among the patients who had undergone thyroidectomy at Government Medical College Ernakulam

Secondary: To study the demographic profile and anesthetic medications used among the above population.

Materials and Methods

Study Setting: The current Retrospective record based descriptive study was conducted between August 2024 to July 2025 in Government medical college, Ernakulam.

Inclusion Criteria: Patients who underwent thyroidectomy at Government Medical College, Ernakulam.

Exclusion Criteria: Cases with incomplete data/details will be excluded.

Sample Size: As per the study conducted by Thomusch et al (22), the rate of respiratory complications was 6%. Taking this as p and absolute allowable precision 2%, the sample size was calculated using the formula $4pq/d^2$and it was calculated to be a minimum of 489. However, 520 cases were available from the data collected in the period December 2018 to July 2024. Hence the final sample size was 520.

Sampling Technique: All entries of Thyroidectomy cases in Anaesthesia register as per inclusion criteria were taken from July 2024 backwards till an adequate sample size was achieved.

Study Procedure: As per the department protocol, Anaesthesia register of the Department. records the details of peri operative period such as Demographic profile, Details of Anesthesia technique and Drugs, Intra and post operative complications, interventions done and the outcome. All entries of Thyroidectomy cases in Anesthesia register as per inclusion criteria were taken from July 2024 backwards till December 2018 by which an adequate sample size was attained. Thyroidectomy cases were reviewed and recorded for following details. (1) The clinical and Demographic profile of Thyroidectomy cases; (2) Clinical presentation of respiratory complications in the post operative period; (3) Interventions done (4) Outcome of complications; (5) Type/ Category (Inference) of complication; (6) Drugs used. The data was recorded in MS EXCEL SHEET and analysed.

Data Analysis: Qualitative data was analyzed as frequency and percentage.

Ethical consideration: Institutional Ethical Committee clearance was obtained.

Results

520 Cases were included in the study.

Table 1: Age in years of thyroidectomy cases n (%)

<20	21-30	31-40	41-50	51-60	61-70	71-80	>80	Total
6 (1.15%)	38 (7.30%)	111 (21.34%)	164 (31.53%)	131 (25.19%)	58 (11.15%)	11 (2.11%)	1 (0.19%)	520 (100%)

Table 2: Demographic profile (Age & Gender) of Thyroidectomy cases

Gender N (%)	Age group (in years) n (%)							
	< 20	21-30	31-40	41-50	51-60	61-70	71-80	> 80
Female 473(90.96%)	6 (1.26 %)	35 (7.39 %)	104 (21.98 %)	149 (31.50 %)	118 (24.94 %)	51 (10.78 %)	9 (1.90 %)	1 (0.21 %)
Male 47(9.03%)	-	3 (6.38 %)	7 (14.89 %)	15 (31.91 %)	13 (27.65 %)	7 (14.89 %)	2 (4.25 %)	-
Total 520(100%)	6 (1.15 %)	38 (7.30 %)	111 (21.34 %)	164 (31.53 %)	131 (25.19 %)	58 (11.15 %)	11 (2.11 %)	1 (0.19)

Table 3: Demographic profile (Age and Sex) of Thyroidectomy cases

Gender n(%)	Age group in years n (%)			Total n(%)
	<30	31 to 60	>61	
Female 473 (90.96%)	41 (8.66%)	371 (78.43%)	61 (12.89%)	473 (100%)
Male 47 (9.03%)	3 (6.38%)	35 (74.46%)	9 (19.14%)	47 (100%)
Total 520 (100%)	44 (8.46%)	406 (78.07%)	70(13.46%)	520 (100%)

In the age group below 30 years, 38 out of 520 (7.30%) were between 21 to 30 years and6 cases (1.15%) were below 20 years.

In the cases between 31 to 60 years,406 out of 520 cases were between 31 to 60 years (78.07%)44 out of 520 cases were below 30 years (8.46%), 70 out of 520 cases (13.46) were above 61 years.

In the cases above 61 years,58 out of 520 cases (11.15%) were between 61 to 70 years, 11 cases (2.11%) were between 71 to 80 years and one case (0.19%) above 80 years.

Table 4: Sex and Age distribution of Benign (MNG), malignant (papillary/Follicular)

Type of Thyroid swelling n(%)	Sex		Age n (%)							
	M	F	<20	21-30	31-40	41-50	51-60	61-70	71-80	80
MNG = 489 (94.03%)	41 (8.58)	448 (91.41)	5 (1.02)	37 (7.11)	106 (20.38)	153 (29.42)	120 (23.07)	56 (10.76)	11 (2.11)	1 (0.19)
Papillary 17 (3.26%)	3 (17.64)	14 (82.35)	-	-	4 (23.52)	5 (29.41)	6 (35.29)	2 (11.76)	-	-
Folicular 14 (2.69%)	3 (21.42%)	11 (78.57)	1 (7.14)	1 (7.14)	1 (7.14)	6 (42.85)	5 (35.71)	-	-	-
Total 520 (100%)	47 (9.03)	473 (90.06)	6 (1.15)	38 (7.30)	111 (21.34)	164 (31.53)	131 (25.19)	58 (11.15)	11 (2.11)	1 (0.19)

Age in Papillary CA Males-3-45yrs/51yrs/49yrs; Age in Follicular CA Males-3-46yrs/ 45yrs/42yrs

Table 5: Demographic Profile (Age group & Gender) vs Preoperative Diagnosis

Pre Operative Diagnosis- n (%)	Sex	Age (in years) n (%)			
		< 30 years	31 – 60 years	> 61 years	Total
MNG 489 (94.03%)	Female	39 (7.97 %)	350 (71.57 %)	59 (12.06 %)	448 (91.61 %)
	Male	3 (0.61 %)	29 (5.93 %)	9 (1.84 %)	41 (8.38 %)
	Total	42 (8.58 %)	379 (77.50 %)	68 (13.90 %)	489 (100 %)
Papillary Carcinoma 17 (3.26%)	Female	-	12 (70.58 %)	2 (11.76 %)	14 (82.35 %)
	Male	-	3 (17.64 %)	-	3 (17.64 %)
	Total	-	15 (88.23 %)	2 (11.76 %)	17 (100 %)
Follicular Carcinoma 14 (2.69%)	Female	2 (14.28 %)	9 (64.28 %)	-	11 (78.57 %)
	Male	-	3 (21.42 %)	-	3 (21.42 %)
	Total	2 (14.28 %)	12 (85.71 %)	-	14 (100 %)
Total 520 (100%)		44 (8.46 %)	406 (78.07 %)	70 (13.46 %)	520 (100 %)

Table 6: Demographic profile (Age & Gender) in Multinodular Goitre

Gender	Age group (in years) n (%)								
	< 20	21-30	31-40	41-50	51-60	61-70	71-80	> 80	Total
Female	5 (1.20 %)	34 (6.95 %)	99 (20.24 %)	143 (29.24 %)	108 (22.08 %)	49 (10.02 %)	9 (1.84 %)	1 (0.20 %)	448 (91.61 %)
Male	-	3 (0.61 %)	7 (1.43 %)	10 (2.04 %)	12 (2.45 %)	7 (1.43 %)	2 (0.40 %)	-	41 (8.38 %)
Total	5 (1.02%)	37 (7.56 %)	106 (21.67 %)	153 (31.28 %)	120 (24.53 %)	56 (11.45 %)	11 (2.24 %)	1 (0.20)	489 (100 %)

Table 7: Demographic profile (Age & Gender) in Papillary Carcinoma

Gender	Age group (in years) n (%)								
	< 20	21-30	31-40	41-50	51-60	61-70	71-80	> 80	Total
Female	-	-	4 (23.52 %)	3 (17.64 %)	5 (29.41 %)	2 (11.76 %)	-	-	14 (82.35 %)
Male	-	-	-	2 (11.76 %)	1 (5.88 %)	-	-	-	3 (17.64 %)
Total	-	-	4 (23.52 %)	5 (29.41 %)	6 (35.29 %)	2 (11.76 %)	-	-	17 (100 %)

Table 8: Demographic profile (Age & Gender) in Follicular Carcinoma

Gender	Age group (in years) n (%)								
	< 20	21-30	31-40	41-50	51-60	61-70	71-80	> 80	Total
Female	1 (7.14 %)	1 (7.14 %)	1 (7.14 %)	3 (21.42 %)	5 (35.71 %)	-	-	-	11 (78.57 %)
Male	-	-	-	3 (21.42 %)	-	-	-	-	3 (21.42 %)
Total	1 (7.14 %)	1 (7.14 %)	1 (7.14 %)	6 (42.84 %)	5 (35.71 %)	-	-	-	14 (100 %)

Results

Description of Postoperative Respiratory Complications after Thyroidectomy: Description of demographic profile/ pre-operative clinical features(D/C), Clinical presentation of Complications (CP), Intervention (INT), Outcome (O) and Inference (INF)

Abbreviations

1. Demographic/ Pre-operative clinical Features- D/C
2. Clinical presentation of complications- CP
3. Intervention-INT
4. Outcome-O
5. Inference-INF
6. Male-M
7. Female-F
8. Multinodular goiter-MNG
9. Injection-Inj
10. Endotracheal tube-ETT

Case No. 1. **D/C** -65yrs **F**/ **MNG**-Long duration large thyroid/ Total thyroidectomy/

CP-stridor dyspnoea and desaturation immediately after extubation

INT-Reintubated /Nasal ETT/T-piece/oxygen/Inj.Dexamethasone 8mg 8hrly

O-Trial Extubation after 48hrs-stridor and dyspnea persisted. D/L Scopy-B/L vocal cord palsy. Tracheostomy done.

INF-Bilateral RLN vocal cord palsy.

Case No:2. **D/C**-61yr **F**/MNG/Total thyroidectomy

CP- Stridor/Dyspnoea and Desaturation immediately after extubation. Sluggish vocal cord movement of (R) side on D/L scopy.

INT-Reintubated Nasal ETT-T-piece-oxygen-Inj Dexamethasone 8mg 8th hrly/Inj.Calcium gluconate-

O-Extubated after 24hrs. Relieved of stridor, dyspnea & desaturation.

INF-Unilateral vocal cord palsy(R)

Case No.3.D/C-51yr/ **F**. MNG/Total thyroidectomy

CP-Stridor/Dyspnoea and Desaturation after extubation in recovery room.

INT-Reintubated with Nasal ETT and put on T-piece/oxygen, Inj.Dexamethasone 8mg8th hrly.

O-Extubated after 24 hours. Relievedof stridor and dyspnea. D/L scopy. Normal vocal cord movements.

INF-No definite cause for stridor identified.

Case No. 4. D/C-36yr/**F**/MNG/Total thyroidectomy

CP- Dyspnoea/Stridor/Desaturation after extubation

INT- Reintubated (Nasal ETT)-put on T-piece with oxygen / Inj.Dexamethasone 8mg 8th hrly

O- Extubated after 24 hours. Relieved of stridor/Dyspnoea. D/L scopy - vocal cords movements normal

INF-No definite cause for stridor identified.

Case No.5.D/C-29yr/**F**/MNG/Total thyroidectomy

CP-Dyspnoea/Stridor and Desaturation after extubation

INT- Reintubated/ Nasal ETT/ T-piece with oxygen/ Inj.Dexamethasone 8mg 8th hrly

O- Extubated after 48 hours. Relieved stridor and dyspnea. D/L scopy-Normal vocal cord movement.

INF-No definite cause for stridor identified.

CaseNo.6. D/C-35/**F**/MNG/Total thyroidectomy

CP-Dyspnoea/Stridor and Desaturation after extubation

INT-Reintubated Nasal ETT/ T-piece with oxygen/Inj.Dexamethasone 8mg 8th hrly/Inj.Hydrocortisone 100mg.

O-Extubated after 24 hours.Relieved of stridor and dyspnea. D/L scopy –Normal vocal cords

INF-No definite cause for stridor identified

Case No. 7. 39yr/**F**/MNG /Total thyroidectomy.

CP-Stridor/Dyspnoea/Desaturation after extubation.

INT- Reintubated Nasal ETT/ T-piece oxygen/ Inj.Dexamethasone 8mg 8th hrly

O-Extubated after 48 hours. D/L scopy- showed normal vocal cords and Relievedof stridor and dyspnea.

INF- No definite cause for stridor identified

Case No.8. D/C-39yrs/**F**/MNG (Preoperative evaluation showed normal vocal cords/No tracheal compression deviation) Total thyroidectomy

CP-Stridor gradually increased /Dyspnoea/Desaturation after extubation

INT- Reintubated Nasal ETT /T-piece oxygen/ Inj.Dexamethasone 8th hrly.Laryngeal oedema noted. D/L scopy.

O- Extubated after 24 hrs. Relieved of stridor and dyspnea.D/Lscopy-Normal vocal cord movements.Laryngeal oedema resolved.

INF-Post operative laryngeal oedema

Case No. 9.D/C-60yr/**F** /MNG-Total thyroidectomy

CP- Mild stridor/saturation-93-97%after extubation

INT-Monitoring/Nebulization with Budesonide/Adrenaline/Inj.Dexamethasone8mg 8th hrly

O-Relieved of stridor and dyspnea within 2-3 hours.

INF-Post-operative Laryngeal oedema(mild)

Case No. 10. D/C-62/**F**/ MNGL/Long duration, Pre-operative -Tracheal deviation and compression radiologically. Pre-operative suspicion of tracheomalacia/Total thyroidectomy.

CP- Tracheomalacia confirmed intra operatively by operating surgeon.

INT-converted to Nasal ETT after surgery /T-piece/O2/Inj.Dexamethasone8mg 8th hrly.

O-Extubated after 24 hrs.No stridor/Dyspnoea or respiratory symptoms after extubation

INF-Tracheomalacia

Case No.11. D/C- 29 **F** /MNG/Large thyroid/Tracheal compression/Deviation/ Radiologically Pre-operative suspicion of tracheomalacia/ Total thyroidectomy.

CP- Tracheomalacia confirmed Intraoperativelyby operating surgeon.

INT-Converted to nasal ETT after surgery/T-piece/O2/Steroids.

O-Extubated after 24 hrs.No dyspnea/stridor after extubation

INF-Tracheomalacia

Case No.12. D/C- 55yr /**F**/MNG /Retrosternal extension and tracheal compression clinically and radiographically/Total Thyroidectomy

CP- Tracheomalacia confirmed intraoperatively by operating surgeon

INT-Converted to Nasal ETT after surgery/T-piece O2/Inj.Dexamethasone 8mg 8th hrly

O- Extubated after 24 hrs. No dyspnea/Stridor after extubation.

INF-Tracheomalacia

Case No.13. D/C-48 F MNG/Total thyroidectomy.

CP-Patient extubated after surgery. Rebleeding from surgical site Drain

INT- Reintubated with Propofol-Atracurum-(oralETT). Surgical re-explorationunder GA

O–Bleeding controlled by re-exploratory surgery. Extubated and shifted to recovery room

INF-Rebleeding/Post operative Haematoma

Case No.14. D/C- 59 yr **F** MNG/Total thyroidectomy.

CP- Extubated after surgery. Rebleeding from surgical site drain in post-operative recovery room. Hypotension and dyspnoea. Bradycardia. Drain 500ml.

INT-Reintubated with Ketamine/Scholine(oral ETT). Surgical re-exploration under GA.

O-Bleeding controlled by re exploratory surgery. Vitals Stable-Extubated and shifted to recovery room.

INF-Post operative re bleeding/Haematoma

Case No.15. D/C-59 **M**/MNG, Type II DM./Total thyroidectomy. Bleeding Intraoperatively-Duration of surgery 3hrs 20mts

CP-Post operative Dyspnoea/Wheezing. (B/L Rhonchi) Desaturation after extubation (in recovery room).

INT- Nebulization with Budesonide and Salbutamol/ oxygen/Inj.Hydrocortisone, Inj.Deriphylline

O-Relieved

INF-Post-operative Bronchospasm

Case No.16. D/C- 48yr F/ Papillary Ca.Thyroid/Total thyroidectomy with lymph node dissection

CP-Dyspnoea/ Wheezing/Bilateral Rhonchi/ Desaturation after extubation (in recovery room).

INT- Nebulization with Budesonide and Salbutamol/ Inj.Deriphylline, Inj.Hydrocorstione.

O-Relieved

INF-Bronchospasm.

Case No.17.D/C-53yr F/ MNG/Total thyroidectomy.

CP- Dyspnoea/Desaturation/Wheezing/B/L Rhonchi after extubation

INT- Nebulization with Budesonide and Salbutamol /Inj.Deriphylline,Inj.Hydrocorstione 100mg

O-Relieved

INF- Bronchospasm

Case No.18.D/C- 52 yr **F**/ MNG/Total thyroidectomy.

CP-Dyspnoea/Desaturation/Shallow breathing in recovery room, reduced muscle power-Neuromuscular junction-monitoring showed residual muscle paralysis/Inadequate reversal

INT-Reintubated with Nasal ETT with Propofol and put on ventilator support (pressure support ventilation -CPAP

O-Extubated after 2 hours with adequate muscle power and adequate spontaneous breathing.

INF- Inadequate reversal of muscle relaxants

Table 9: Summary of Post operative Respiratory complications after thyroidectomy

Sl.No	Age	Sex	Diagnosis	Procedure	Clinical Features	Intervention	Outcome	Diagnosis/ Clinical Sign
1	65 yr	F	MNG Long duration large thyroid	Total thyroidectomy	Stridor, dyspnea, desaturation immediately after extubation	Reintubated (Nasal ETT) and put on T-piece with oxygen; inj. Dexamethasone	Extubated after 48 hrs, stridor persisted; B/L vocal cord palsy → tracheostomy	Bilateral RLN palsy
2	61 yr	F	MNG	Total thyroidectomy	Stridor / Dyspnoea / Desaturation after extubation sluggish vocal cord movement(R) D/L scopy	Reintubated (Nasal ETT); T-piece; inj. Dexamethasone + Calcium gluconate	Extubated after 24 hrs. No stridor Relieved	Unilateral (R) RLN palsy
3	51 yr	F	MNG	Total thyroidectomy	Stridor / Dyspnoea / Desaturation after extubation	Reintubated (Nasal ETT) and put on T-piece with oxygen; inj. Dexamethasone 8th hourly	Extubated after 24 hrs. relieved	No definite cause of stridor detected
4	36 yr	F	MNG	Total thyroidectomy	Dyspnea,Stridor, Desaturation after extubation	Reintubated (Nasal ETT); put on T-piece	Extubated after 24 hrs. No	No definite cause of stridor detected

						with oxygen; inj. Dexamethasone 8 hourly	stridor; Dyspnea relieved	
5	29 yr	F	MNG	Total thyroidectomy	Dyspnoea / Stridor / Desaturation after extubation	Reintubated (Nasal ETT), Inj. Dexamethasone 8mg 8th hrly T-piece O_2	Extubated after 24 hrs Relieved	No definite cause of stridor detected
6	35 yr	F	MNG	Total thyroidectomy	Desaturation,Stridor,Dyspnoea after extubation	Reintubated Nasal ETT ,O_2 Inj.Dexamethasone	Extubated after 24 hrs Relieved	No definite cause of stridor detected
7	39 yr	F	MNG	Total thyroidectomy	Stridor / Dyspnoea / Desaturation	Reintubated (Nasal ETT), oxygen ,T piece,Inj. Dexamethasone 8mg 8th hrly	Extubated after 24 hrs Relieved	No definite cause of stridor detected
8	39 yr	F	MNG	Total thyroidectomy	Gradually increasing Stridor / Dyspnoea / Desaturation after extubation	Reintubated (Nasal ETT),put on T-piece O_2 .D/L scopy:showed congestion and oedema of vocal cords.Inj. Dexamethasone 8mg 8th hrly	Extubated after 24 hrs Relieved	Laryngeal oedema
9	60 yr	F	MNG	Total thyroidectomy	Mild stridor, desaturation (SpO_2 92–93%) after extubation	Nebulization with Budecort and Adrenaline , Inj. Dexamethasone	Relieved	Laryngeal oedema (mild)
10	62 yr	F	MNG Total thyroidectomy	Long duration Tracheal compression & deviation radiologically Tracheo	Tracheomalacia confirmed intraoperatively by surgeon	Converted to nasal ETT after surgery, T-piece oxygen, Inj. Dexamethasone	Extubated after 24 hrs	Tracheomalacia

				malacia, suspected				
11	29 yr	F	Large,Longstandingthyroid.Tracheal compression &deviation radiologically	Total thyroidectomy	Tracheomalacia confirmed by surgeon	Converted to nasal ETT, Inj. Dexamethasone	Extubated after 24 hrs Relieved	Tracheomalacia
12	55 yr	F	MNG Retrosternal extension and tracheal compression clinically and radiologically	Total thyroidectomy	Tracheomalacia confirmed by surgeon	Converted to nasal ETT, Inj. Dexamethasone	Extubated after 24 hrs	Tracheomalacia
13	48 yr	F	MNG	Total thyroidectomy	Post-op surgical site bleeding (Drain)Dyspnoea	Surgical exploration – hematoma evacuation under GA	Relieved Extubated after re exploration	Post.op hematoma. Bleeding
14	59 yr	F	MNG	Total thyroidectomy	Post-op surgical site bleeding, Dyspnoea	Surgical exploration – hematoma evacuation	Relieved Extubated after re exploration	Post.op hematoma. Bleeding
15	59 yr	M	MNG Type2DM	Total thyroidectomy	Dyspnoea, wheezing (B/L), reduced SpO_2 in recovery room	Nebulization with Budecort, Salbutamol, Inj. Hydrocortisone	Relieved within 3-4hours	Post operative Bronchospasm
16	59 yr	F	Papillary Ca thyroid	Total thyroidectomy with CLN dissection	Dyspnoea, wheezing (B/L), reduced SpO_2 in recovery room	Nebulization with Budecort, Salbutamol, Inj. Hydrocortisone	Relieved in 2-3 hours	Post operative Bronchospasm
17	53 yr	F	MNG	Total thyroidectomy	Dyspnoea, wheezing (B/L), Desaturation,	Nebulization with Budecort, Salbutamol, Inj. Hydrocortisone	Relieved in 2-3 hours	Post op Bronchospasm
18	52 yr	F	MNG	Total thyroidectomy	Dyspnoea - Desaturation. Reduced spontaneous breathing	Reintubated, Ventilatory SIMV-PSV-CPAP neostigmine + glycopyrrolate,	Extubated after 3 hours	Residual muscle paralysis Inadequate reversal

Table 10: Post operative Respiratory complications Duration of surgery and Anaesthetic drugs used

Case no.*	Duration of Surgery	Anaesthetic / Adjuvant drugs
1	2h 35min	Propofol, Scholine, Vecuronium, Fentanyl, Dexamethasone, Isolurane
2	2hr	Propofol, Scholine, Morphine, Vecuronium, Dexamethasone, Calcium Gluconate, Isolurane
3	3hr35 min	Propofol, Scholine, Vecuronium, Fentanyl, Dexamethasone, Isolurane, Deriphyline
4	2hr 10min	Propofol, Scholine, Morphine, Vecuronium, Dexamethasone, Isolurane
5	2hr 25min	Propofol, Scholine, Fentanyl, Dexamethasone, Isolurane, Vecuronium,
6	2hr	Propofol, Scholine, Fentanyl, Dexamethasone, Isolurane,Atracurium, Hydrocortisone
7	1hr 50 min	Propofol, Scholine, Fentanyl, Dexamethasone, Isolurane, Vecuronium
8	2 hr 25min	Propofol, Scholine, Fentanyl, Dexamethasone, Isolurane, Vecuronium
9	2hr 20 min	Propofol, Scholine, Fentanyl, Dexamethasone, Isolurane, Vecuronium,Nebulisation
10	1hr 50 min	Propofol, Scholine, Fentanyl, Dexamethasone, Isolurane, Vecuronium, InjParacetamol.
11	2hr15min	Propofol, Scholine, Fentanyl, Dexamethasone, Isolurane, Vecuronium,
12	2hr55min	Propofol, Scholine, Fentanyl, Dexamethasone, Isolurane, Vecuronium
13	2hr 25min	Propofol, Scholine, Fentanyl, Dexamethasone, Isolurane, Vecuronium
14	2hr 10 min	Propofol, Scholine, Fentanyl, Dexamethasone, Isolurane, Vecuronium, Hydrocortisone
15	3hr 20 min	Propofol, Scholine, Morphine, Dexamethasone, Isolurane, Vecuronium, Hydrocortisone, Deriphyline
16	2hr 35 min	Propofol, Scholine, Dexamethasone, Isolurane, Vecuronium, Hydrocortisone, Deriphyline, Pethidine
17	3hr	Propofol, Scholine, Dexamethasone, Sevoflurane, Vecuronium, Hydrocortisone, Deriphyline, Pethidine
18	2hr 50min	Propofol, Scholine, Isolurane, Vecuronium, Hydrocortisone, Fentanyl.
* Case No. Refer Table for details		

Table 11: Category of respiratory complication (Total 520 cases)

Sl.No	Clinical Presentation	n (%)	Diagnosis n (%)
1	Stridor / Dyspnea/Desaturation	8 (1.53 %)	Bilateral RLN Palsy - 1 (0.19 %)
			Unilateral RLN Palsy -1 (0.19 %)
			No identifiable definite cause - 5 (0.96 %)
			Laryngeal edema - 1 (0.19 %)
2	Stridor / Desaturation (mild)	1 (0.19%)	Laryngeal edema (mild) - 1 (0.19 %)
3	Tracheomalacia (confirmed intra operativley)	3 (0.57 %)	Tracheomalacia - 3 (0.57 %)
4	Postoperative bleed / Hematoma	2 (0.38 %)	Postoperative Hematoma – 2 (0.38 %)
5	Dyspnea / Desaturation / Wheezing	3 (0.57 %)	Bronchospasm – 3 (0.57 %)
6	Dyspnea / Desaturation / Muscle Weakness	1(0.19 %)	Residual muscle Paralysis – 1 (0.19 %)
7	Total (Postoperative Respiratory Complications)	18(3.46 %)	

Table 12: Respiratory complications after Thyroidectomy Total: 520 cases n (%)

Bilateral RLN palsy	Unilateral RLN palsy	Laryngeal oedema	Tracheo malacia	Post op. Haematoma	Broncho spasm	Inadequate reversal	No cause identified for stridor and dyspnoea	Total
1 (0.19%)	1 (0.19%)	2 (0.38%)	3 (0.57%)	2(0.38%)	3 (0.57%)	1 (0.19%)	5 (0.96%)	18/520 (3.46%)

Table 13: Interventions for Post operative Respiratory complications (total 520 cases)

	Intervention	N (%)
1.	Emergency Reintubation for stridor/ Dyspnoea and Desaturation	8(1.53%)
2.	Nasal Reintubation for Tracheomalacia	3(0.57%)
3.	Reintubation for surgical re-exploration for post-operative bleeding	2(0.38%)
4.	Reintubation for ventilation for Inadequate reversal	1(0.19%)
5.	Nebulization with steroid & Dexamethasone for stridor	1(0.19%)
6.	Nebulization with steroids &Bronchodilators for Bronchospasm	3(0.57%)
7.	Total	18(3.46%)

Table 14: Outcome of thyroidectomy complications

Sl. No.	Outcome	n (%)
1	No respiratory complication	502(96.53%)
2	Relieved of signs and symptoms	17(3.26%)
3	Tracheostomy	1(0.19%)
4	Mortality	0(0%)
	Total	520(100%)

Table 15: Anaesthetic Drugs used in Thyroidectomy

Sl. No	Drug	n (%)
1	**Induction agents**	Total-520
	I) Propofol	515 (99.06%)
	II) Etomidate	5(0.96%)
	Total	520 (100%)
2	**Inhalational agents**	n (%)
	I) Nitrous oxide + oxygen	520 (100%)
	II) Volatile agents 1) Isoflurane	226 (43.46)
	2) Sevoflurane	294 (56.53)
	Total	520 (100%)
3	**Muscle relaxant for intubation**	Total-520
	I) Succinyl Choline	D/L Scopy-490; VDL scopy-3 Total-493(94.8%)
	II) Vecuronium	D/L Scopy 25 (4.8%)
	III) No muscle relaxant	FOB Scopy 2 (0.38%)
	Total	520 (100%)
4	**Opioids**	Total-520 n(%)
	I) Morphine	233 (44.80)
	II)Pethidine	122(23.46)
	III)Fentanyl	165 (31.73)
	Total	520 (100)
5	**Adjuvant Drugs***	Total-520
	I) Inj Paracetamol	98 (18.84)
	II) Inj Dexamethasone	178 (34.23)
	III) Inj Dexmedetomidine	24 (4.61)
	IV) Inj Tanexamic acid	14 (2.69)

* Adjuvant drugs were used in various combinations.

Discussion

This record based retrospective study was conducted at Government Medical College, Ernakulam. 520 cases of thyroidectomy were reviewed retrospectively for their post-operative complications, demographic profile and anesthetic medications used.

Demographic profile-473 out of 520 thyroidectomy cases (90.96 %) were females and 47 out of 520 (9.03%) were males showing a preponderance of females in patients who underwent thyroidectomy.

On analysis of the age groups (Table no1-3) it was found that, most of the thyroidectomy cases (78.07 %) were in the age group 31 to 60 years. Lesser percentage of cases was found above 60 years (13.46%) and below 30 years (8.46%) with a tendency for still lesser number of cases towards extremes of age-2.11% between 71 of 80 years; 0.19% above 81 years; and 1.15% below 20 years. The pattern of middle age preponderance was found in all types of thyroid swellings concerned -viz MNG, Papillary carcinoma and Follicular neoplasm. (Table 4-8). This point towards a higher prevalence of thyroid diseases requiring thyroidectomy in the middle age group and lesser prevalence in younger and older age groups. There was also a preponderance of females in all age group of patients who underwent thyroidectomy (Overall 90.96% in females Vs 9.03% in males) (Table no 2-3) and this female preponderance was found to be true for all types of thyroid swellings – (91.61%, 82.35%and 78.57% respectively for MNG Papillary Ca and Follicular neoplasm) (Table 4-8).

The age and gender pattern of thyroidectomy cases found in our study is in concordance with previous study literature. As per a review article published in medical clinics of North America,[2] the thyroid diseases are more common in females than in males, because thyroid diseases have an autoimmune nature and females have a propensity for autoimmune diseases and consequently thyroid diseases are more common in females. The article also reports that women have a higher frequency of palpable nodules ranging from 5.3 to 6.4%.

A report by NFHS IV [3] have shown that amongst individuals between the age group of 15-49 years, the self-reported prevalence of goiter or thyroid disorders is nearly 2% in females, where as it is less than 1% for males. Also, it reported that the prevalence of goiter increased with age for females (15-19yrs-0.7%; 20-34 years-1.8%; 35-49 years-3.4%).

In a systemic review and meta-analysis by Malboosbaf et al[4] it is reported that proportional prevalence of goiter is greater in females than males (overall for all age groups- 0.54 females' vs 0.46 males and in adults - 0.74 females' vs 0.26 males). The mean age of thyroidectomy cases as reported in a systemic review and meta-analysis by Ghaloo SK et al [5] was 55.8 +/- 7.7. In a prospective study by Vanslyckes et al [6] in 1500 thyroidectomy patients, 47.6% of the patients were between 40 to 59 years, 33.1% were above 60 years and 19.3% were below 40 years. The study also showed a female preponderance with 79.7% females. In another study by Abdul Zahra A.S et al [7] in 280 thyroidectomy patients, majority of patients who underwent thyroidectomy (84.29%) were between the age of 20 to 39 years and11.07% between 40 to 60 years. The cases below 20 years and above 60 years were only 3.21% and 1.43% respectively. The study also showed a female preponderance with 92.5% females. Similar age and gender distribution pattern were observed in some other studies also - Valizadeh et al[8] (Mean age 44.5+/- 13.8 with 81% females); Bellantone et al[9] (Mean age 44.5+/- 15.7 with 79.3% females); Sulaiman et al[10] (Mean age 48.7+/- 11.3 and females 67.5%);Bhattacharya et al[11] (mean age 48.7); Polyboyina et al[12] (mean age 34.58+/- 6.14 and females 62.5% M:F-1:1.3); Chahardahmasumi et al[13] (81.96% females); Pandey AK et al[14] (mean age 39.29); aL Fakhri N et al[15] Mean age 45 years)

It may be postulated from our study that thyroid diseases requiring surgery are more common in females of middle age group. This has important socio economic and public health implications and further studies focusing on pathophysiological basis of gender propensity for females for thyroid diseases and preventive social and community health interventions thereof, will be an important outcome of our observation.

In our study, out of 520 thyroidectomy cases, 489 (94.03% had multi nodular goiter (MNG-); 17(3.26%) had Papillary Carcinoma and 14 (2.69%) had Follicular neoplasms as pre-operative diagnosis. (Table 4-8) Papillary carcinoma and follicular neoplasm together constituted 5.95% of the total cases. In a study by Giri Pranav et al [16] the most common thyroid malignancy reported was Papillary Ca (91.8%), followed by Follicular Ca (5.1%). Insular Ca, Medullary Ca and Anaplastic Ca were reported 1.02% each for rest of the cases. The study concluded that thyroid carcinoma has a peak incidence in the fourth decade with female preponderance. Preoperative diagnosis in 48 cases of thyroidectomy in an analytical study by Polyboyna et al [12] were MNG-45.83%, Follicular adenoma-20.83%, Papillary carcinoma-12.5%, and Follicular Ca-8.3%. The reported incidence of preoperative diagnosis of cancer in a prospective study by Van Slyckes et al [6] in 1500 patients was 6.11%.

The preoperative diagnosis in our study was based on clinical features, ultrasound, CT-scan or FNAC.

However post-operative follows up for final pathological diagnosis report and confirmation of diagnosis was beyond the scope of our study, and hence the pattern of thyroid pathology observed in our study may not reflect the final diagnosis pattern.

Complications (Table No. 9-14): Post-operative respiratory complications were identified in 18 patients (3.4%). 8 patients presented with pattern of stridor, dyspnea and desaturation (Case no:1-8Table no 9). These cases were immediately reintubated nasally with Propofol and scholine and were put on T-piece with oxygen and Steroids (Dexamethasone). In a case No:1 (Table9) stridor persisted after extubation at 48 hours and Bilateral vocal cord palsy was noted on D/L scopy. This patient required tracheostomy. In case no: 2(Table 9) Right sided vocal cord palsy was noted on D/L Scopy. The patient was extubated after 24 hours and the Stridor and dyspnea was relieved.

In a study published in Diyala journal of medicine [7] it was found that, on follow up of 280 thyroidectomy patients 18(6,43%) had stridor in post-operative period. Higher BMI, hoarseness of voice, haematoma and more than one attempt of intubation were associated with more incidence of stridor.

The incidence of Bilateral recurrent nerve (RLN) palsy identified in our study was 0.19 and that of unilateral RLN was 0.19% and combined (Unilateral and Bilateral) 0.38%. (Table 11,12) The incidence of RLN palsy after thyroidectomy, reported across previous studies vary according to the study design and study population. As per a meta-analysis and review study by Jin S et al [17] the incidence of transient RLN palsy and permanent RLN palsy in literature varied between0 to 3% and 5 to 8% respectively. The overall incidence of RLN palsy reported in a study article published by Alexander Gunn et al [18] based on a 30 day follow up of 11370 thyroidectomy patients was 6%.

In a combined retrospective and prospective study by Ignjatovic M et al,[19] the incidence of post thyroidectomy RLN palsy was 9.3% and 6.3% according to the number of nerves exposed at risk in retrospective group; and 4.4% and 2.9% according to the number of nerves exposed in prospective group. Wagner HE et al [20] in a retrospective study which included 1026 thyroidectomy cases reported permanent RLN palsy in 2.4% and transient RLN in 3.5% (overall 5.9%). Another study published by L.Rosato et al [21] based on data on 5 year follow up of 14934 thyroidectomy patients reported transient RLN Palsy in 2% and permanent RLN palsy in 1%.

The incidence of RLN palsy as found in other studies include Thomush et al[22] (Prospective multi centre study 7266 patients –Permanent unilateral 1,1% Transient unilateral 2,1%); Vanslyke et al[6] (Prospective 1500 patients RLN palsy 1.8%);Efremidou et al (30) (932-benign thyroidectomy cases-Temporary and permanent unilateral RLN palsy 1.3% and 0.2% respectively); Bellantone et al[9] (Retrospective study 526 patients -Permanent RLN Palsy in 0.4%); Megherbi et al[23] (640 cases RLN palsy 2.6%).Duclos A.[24] (Prospective cross sectional study in 3575 patients-overall RLN palsy 2.08%); Chahardahmasumi et al[13] (Prospective cross sectional study in 204 patients-Persistent RLN palsy in 8.2% and unilateral RLN Palsy evidenced by hoarseness of voice in 33.3%.); Al Fakhri et al[15] (Unilateral temporary RLN palsy immediately after surgery in 4.3% and persistent in 1.7%); Zakharia H M et al[25] (Retrospective study in 340 patients-transient unilateral RLN palsy in 3.2%,Permanent unilateral in 0.3% and transient B/L vocal cord palsy in 0.58%); Bhattacharya et al[11] (Cross sectional 517 cases National data base thyroidectomy-Unilateral RLN Palsy in 0.77% and Bilateral in 0.39%);and Pandey A K et al[14] (Permanent RLN in 2.5% and temporary in 5%.);Poliboyna et al.[12]

Partial or selective injury to the abductor fibres of Recurrent laryngeal nerve leave the adductor fibers relatively unopposed and since the vocal cords occupy a midline position airway obstruction and stridor can occur. [26,27] However in selective injury of adductor fibres or in complete paralysis, the vocal cords occupy an abducted position and such cases may not have respiratory obstruction or stridor and present with aphonia. In unilateral palsy due to compensation by uninvolved cord there may not be any respiratory compromise and present only with hoarseness of voice or dysphonia. Such cases of RLN palsy may go undetected in the immediate post-operative period. [26,27] Our study may not have identified such cases of RLN palsy as our study reviewed only post-operative respiratory complications. Also, in five cases presented with sridor no definite cause of stridor was identified and it is possible that some of these cases may have transient RLN palsy as cause of stridor. (vide infra). Due to above reasons, the incidence of RLN palsy identified in our study may not reflect the actual incidence of Post thyroidectomy RLN palsy.

The risk factors identified in Bilateral RLN palsy in our series (case no 1 Table9) were long standing large thyroid swelling. In the case of unilateral RLN palsy (case no2 Table 9) no risk factors were identified.

Previous studies have identified risk factors associated with increased incidence of RLN palsy consequent to thyroidectomy. These include recurrent surgeries [15,19,20,25] Thyroid malignancy. [18,25,28] Graves' disease, lymphocytic thyroiditis [19]and large longstanding thyroid [28] and extensive surgical resection.[15]

Visualization of Recurrent laryngeal nerve during surgical resection reduced incidence of RLN palsy.[15]

In 5 cases which presented with stridor, dyspnea and desaturation no definite cause of stridor was identified or recorded. These patients were immediately reintubated on emergency basis nasally and put on T-piece, oxygen and steroids (Dexamethasone). They were extubated after 24 hours and there was no stridor after extubation. However, D/L scopy in these cases at extubation were normal (no vocal cord palsy/ oedema etc). In these cases, no definite cause for stridor were identified or recorded. The possible causes in these cases could be (i) transient recurrent recurrent RLN palsy due to perineural oedema or neuropraxia (ii) transient laryngeal oedema (iii) transient hypocalcemia (iv) paradoxical vocal cord dysfunction after thyroidectomy all of which can produce stridor.[26,27]

Transient vocal cord palsy due to Neuropraxia or perineural oedema might have been the cause of stridor in some of these patients which on resolution resulted in relief of stridor. The incidence of transient RLN palsy as per previous literature is discussed earlier (see paragraph Neuropraxia or perineural oedema can cause transient RLN palsy in thyroidectomy patients [27,28] and might have been the cause of stridor in some of these patients which on resolution resulted in relief of stridor. Injury to the recurrent laryngeal nerve may be neuropraxia, axonotmesis or complete division of the nerve.[28] Perineural oedema can also produce transient nerve palsy [26]. In neuropraxia injury to the myelin sheath occur, whereas in axonotmesis there is axonal rupture with an intact neural sheath. Spontaneous recovery of function may occur with neuropraxia within days, but in case of axontmesis recovery may be incomplete and take longer time. In smoking, diabetes, severe comorbidities and old age, spontaneous recovery of nerve function and axonal regrowth are poor.[29] The incidence of transient RLN palsy as per previous literature is discussed earlier in this section.

Transient hypocalcemia is a well-known entity as a cause of stridor after thyroidectomy. According to meta-analysis and review by Jin S et al [17] the incidence of transient hypocalcemia reported in previous studies vary from 1.2% to 40%. In a combined prospective and retrospective study by Ignjatovic et al[19] the incidence of transient hypocalcemia in retrospective group was 4.7% while in prospective group it was 5%.The incidence of temporary hypocalcemia or hypoparathyroidism as per other studies include L. Rosato et al[21] - 8.3%; Efremidou et al[30] 7.3%; Pandy A K et al [14] -3.75%; Chahardahmsumi et al[13] –serum calcium less than 7.5 mg/dl within 3 days in 17.1%; Poliboyina et al[12] early hypocalcemia in 6.25%. Transient hypocalcemia could be an attributable cause in some of these 5 cases which presented with stridor and in which no definite cause identified. Our study was limited to review of anaesthesia records (Registers) and did not include follow up of lab values of serum calcium and hence hypocalcemia as a cause of stridor was not ascertained in our study. This forms a limitation of our study.

Paradoxical vocal cord dysfunction has been described as a cause of post thyroidectomy stridor in literature. In a case series published by Samantha et al [31] paradoxical vocal cord dysfunction has been described as a cause as a cause of stridor in post-operative period after thyroidectomy. Six female patients in age groups 27-65 years, clinically and biochemically euthyroid who underwent total thyroidectomy for multinodular goiter developed stridor immediately after extubation. These patients had normal preoperative vocal cord assessment and had no difficulty in intubation. On laryngoscopy these patients had paradoxical movement of vocal cords during tidal breathing. Out of the 6 patients 3 were reintubated and other 3 were observed in ICU. Stridor resolved completely in all patients within 24 hours and reevaluation of vocal cords after 2 weeks revealed normal vocal cords.

In one of the patients (Case no8 Table9) who presented with stridor dyspnoea and desaturation, laryngeal oedema was noted at the point of re intubation. This patient was put on T piece with oxygen, Steroids (Dexamethasone)and on extubation after 24 hours there was no stridor and dyspnea and laryngeal oedema was found to be resolved.

One patient presented (Case no9 Table 9) with stridor in the post-operative recovery room. However, there was no significant desaturation (Oxygen saturation maintained 93 -98%) and this patient was managed with Nebulization (Dexamethasone, and Adrenaline), Inj Dexamethasone, Oxygen mask with close monitoring. The stridor was relieved within 2-3 hours and this patient is presumed to have laryngeal oedema as evidenced by stridor and response to steroids and nebulization and anti-oedema measures.

The two cases of documented laryngeal oedema in our study (0.38%) reflect only the cases having laryngeal oedema, severe enough to cause stridor and may not include milder forms of laryngeal oedema which might have had a subclinical presentation. In a retrospective analysis by Parle J H et al [32] in 343 patients who had neck dissection surgeries it was found that postoperative laryngeal oedema is common and occurred in 29.4% of patients undergoing any type of neck dissection. In a study by Christos Martis [29] on benign thyroid surgery patients, laryngeal oedema was noted in 54(13.5%) cases and occurred within first or second

post opearative day. The incidence of laryngeal oedema was higher in younger patients, patients with toxic goiter, extensive surgeries and intubation difficulties. In a meta-analytic study by Jin S et al,[17] the incidence of laryngeal oedema after thyroid surgery was found to be 3%. The causes identified were (i) repeated tracheal intubation (laryngeal contusion), (ii) hematomas/haemorrhage of larynx (iii) prolonged lymphatic leakage(iv)Prolonged surgical time and repeat surgeries(v) concurrent respiratory tract infection. In thyroidectomy extended position of neck, surgical manipulation of neck in close proximity to larynx and impairment of lymphatic drainage may be contributing factors for incidence of laryngeal oedema.

It may be inferred from our study that laryngeal oedema is a potential problem after thyroidectomy and if severe, can cause respiratory compromise and stridor and should be considered as a potential cause of post-operative stridor and respiratory compromise.

In our study, 3 patients (0.57%) found to have tracheomalacia. These patients had a high index of preoperative suspicion of tracheomalcia by long standing nature of thyroid swelling and radiological findings suggestive of tracheomalacia/compression or retrosternal extension. In these patients tracheomalacia was confirmed intra operatively by surgeon. Oral Endo tracheal tube was converted to Nasal Endo tracheal tube immediately after surgery and extubation was delayed electively in these patients for 24 hours and patients received Oxygen by T piece, Inj Dexamethasone. This precautionary measure of delayed extubation possibly averted post extubation respiratory obstruction due to tracheal collapse in these patients.

Tracheomalacia occur due to weakening of tracheal ring secondary to long standing compression of trachea due to thyroid swellings as Multi nodular goiter. The patency of tracheal lumen in these patients is maintained by support of the surrounding tissue and when the thyroid is removed the dependent support of trachea is lost and the softened trachea collapse causing airway obstruction.

In a systemic review and meta-analysis by Ghaloo SK et al [5] which included 17 studies with 1108 cases with mean age of 55.8+/-7.7 years, Tracheomalacia was reported in 146 patients (1.4%). The common management of tracheomalacia included prolonged endotracheal intubation or tracheostomy in resistant (severe) cases.

As per a prospective study in 103 patients who underwent thyroidectomy for large thyroids by Abdel Rahim et al [33] post-operative obstructive complications were observed in 24 patients and tracheomalacia was the cause of obstruction in 5 of these patients. The preoperative risk factors associated with development of serious post-operative obstruction were found to be 1) Goitre more than 5 years 2). Preoperative RLN palsy 3) significant tracheal narrowing and/or deviation 4) Retrosternal extension 5) Difficult endotracheal intubation 6) Thyroid cancer.

In a longitudinal cohort study published by Sulaiman A et al [10] on 40 patients with retrosternal goiter, 3 patients had tracheomalacia of which one required tracheal resection and anastomosis and two required tracheostomies. The incidence of tracheal instability reported in a study by Pandey AK et al [14] was 1.25%

Some other studies reported a low incidence of tracheomalacia after thyroid surgery. In a retrospective study by Findley et al [34] on 334 thyroidectomy patients with MNG, malignancy and thyroiditis in which 35 patients had tracheal compression between 6-10 mm and 18 patients' tracheal compression below 5mm as evidenced by CT scan the incidence of tracheomalacia was 0% with all patients recovering GA without requirement of tracheostomy. The study concluded that there is no evidence tracheomalacia in high-risk patients with tracheal compression. In another retrospective study by Valizadeh et al [8] in 1236 thyroidectomy patients between age 15-83 years, none of the cases had tracheomalacia.

Two patients (Case no 13,14 Table 9) in our study were found to have post-operative bleeding. One patient (case no13 presented with increased bleeding through the drain and patient was reintubated with Propofol and Atracurium. Other patient (Case no14) had hypotension due to surgical bleeding and this patient was reintubated with ketamine/scholine. Both patients underwent GA with Endotracheal intubation and underwent re exploratory surgery for control of bleeding and were extubated after surgery and were relieved of their symptoms and signs.

A meta-analysis and review by Jin S, et al [17] reported that incidence of post-operative bleeding/hematoma after thyroidectomy as per previous studies vary from 0 to 4.2% and higher incidence of bleeding was found to be associated with malignancy, male gender, anti-coagulants, old age, Grave's disease, cervical lymph node dissection and repeat surgery. Both patients in our study who had post-operative bleeding were females with ages of 48 years and 59 years and had Thyroidectomy (Primary). A study by Van slykes et al [6] has reported Female gender, higher BMI and large thyroids as protective for post-operative bleeding. In a retrospective study by Alqahtemi et al [35] with 372 consecutive patients who underwent thyroidectomy, it was found that 3 patients (0.8%) developed post-operative bleeding.2 of these patients had bleeding after 24 hours and was

managed conservatively. One patient had bleeding within 2 hours and needed re-exploratory surgery to control bleeding. The reported incidence of rebleeding /hematoma as per other studies include – ignjatovic et al [14] post-operative bleeding in 1.1%and hematoma 0,5%; Van slyckes et al [6] 2.6%; L. Rosato et al [21]1.2%; Efremidou et al [30] - Bleeding requiring repeat surgery in 0,2%; Pandey AK et al [14]1.25%; and Bhattacharya et al [11]1%.

3 patients (case No. 15 Table-9) had symptoms and signs suggestive of post-operative bronchospasm. These patients had no history of bronchial asthma. One patient (case no:15 Table -9) was male, had Type 2 Diabetes mellitus and was operated for MNG. This patient had surgical time of 3 hours 20 minutes and Morphine was the Opioid used (Table no 10). Another patient (case no:16 Table-9) was female operated for Papillary carcinoma- (Total Thyroidectomy with Central neck dissection). All patients were managed with Inj.Hydrocortisone, Inj Deriphyline nebulization with steroids and bronchodilators and all were relieved of symptoms and signs. It is reported in previous literature that patients with history of asthma have approximately 6% chances of bronchospasm in the post-operative period. Significant bronchospasm can occur in normal subjects without underlying lung disease, although with a lower frequency.[36]

One patient (Case no18 Table 9) had features of residual neuromuscular paralysis and presented with features of inadequate muscle paralysis reversal. This patient was reintubated for ventilator support and weaned off and extubated. Residual neuromuscular blockade may not be evident immediately after reversal, because Diaphragm recover earlier than Pharyngeal muscles and when Endo tracheal tube is in place the upper airway is patent and tidal volume and end tidal carbon di oxide may indicate adequate ventilation initially. However, after extubation the patency of upper airway is lost due to inadequate pharyngeal support and respiratory compromise can occur. Initially due to stimulation during extubation airway may be open and become evident only in the recovery room when stimulation is lost and patient is resting.[37] Vicious cycle of respiratory depression, hypercarbia, respiratory acidosis and alteredsensorium and further respiratory depression may ensue if not detected earlier.

The post-operative complications found in the study, Bronchospasm and Residual neuro muscular paralysis are general complications of General anesthesia and not specifically related to thyroidectomy.

Limitations of the Study

This being a retrospective record-based study, data is limited to documented record available in anesthesia register. In 5 cases of stridor, dyspnea and desaturation no definite cause was identified or diagnosed or recorded. The study may not include cases of Recurrent nerve palsy which had sub clinical presentation, as some cases of recurrent nerve palsy do not have obvious respiratory signs and symptoms. The follow up of laboratory values of Serum Calcium as a cause of stridor was beyond the scope of our study and not done. Final pathological diagnosis was beyond the scope of the study and hence incidence of different thyroid pathology in the study may not reflect the final diagnosis.

Conclusion

Recurrent laryngeal nerve palsy, Laryngeal oedema, post operative bleeding or Hematoma, Tracheomalacia in addition to general complications of General anesthesia such as Bronchospasm, Residual neuro muscular blockade are rare but potential post operative respiratory complications of Thyroidectomy. Thorough preoperative evaluation for problems such as tracheal compression, anticipation of complications and meticulous monitoring of patient in the post operative period and appropriate interventions are vital in management of Thyroidectomy.

There is preponderance of females in the middle age group in patients who underwent thyroidectomy.

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