



Subcapsular dissection approach to the intrathoracic goiter: Safe Method

Authors

**Dr Pandu Dasappa¹, Dr Bhagvan B C^{2*}, Dr Navajith A. Mani³, Dr Rashmi Raparla⁴,
Dr Hithashree Lingaiah⁵, Dr Mrinal J Oble⁶**

Department of General Surgery, KIMS Hospital, Bangalore, India

*Corresponding Author

Dr Bhagavan B C

Professor, Department of General Surgery, Kempegowda Institute of Medical Sciences, Bengaluru,
Karnataka, India- 560004

Summary

The definition of an intrathoracic goitre is a thyroid gland with more than 50% of its mass located below the thoracic inlet. Surgical resection is recommended in case of morbidity associated with the goiter's mass effect or for suspicion of malignancy, in majority, the retrosternal goitre can be removed via a subcapsular dissection cervical approach to avoid sternotomy or thoracotomy. Surgical technique, results, and postsurgical complications were assessed. The study consisted of 20 patients of cervicomediastinal goiters (CMGs) who underwent total thyroidectomy between 2017 to 2019. The following parameters were analysed- symptoms, gender, age, operative time, duration of drain, length of hospital stay, malignancy and outcome.

Symptoms, malignancy, overall morbidity, hypoparathyroidism, RLN palsy and hematoma are increased in cases of substernal goiter.

Keywords: *Thyroid, Goiter, mediastinum, Retrosternal goitre, Surgical treatment, Complications.*

Introduction

Retrosternal goitre (RG) was first described by Albrecht von Haller in 1749, as the extension of the thyroid tissue below the upper opening of the chest.⁽¹⁾ There is no standard definition for Cervicomediastinal goiter (CMG)^(2,3,4,5,6). Retrosternal, substernal, and intrathoracic have are terms used to define an extension of >50% of the thyroid gland beyond the thoracic inlet^(6,7). Most intrathoracic goitres are found in the superior and anterior mediastinum⁽⁸⁾. Cervicomediastinal goitre (CMGs) classified as primary or secondary based on blood supply. Primary substernal goitre arising from ectopic thyroid tissue in the mediastinum,

accounts for 1%, with blood supplied by nonanatomic mediastinal vessels. Secondary substernal goitres arise from the normal cervical tissue, they receive their blood depending on cervical vessels, mostly by branches of the inferior thyroid artery. Dyspnoea, choking, inability to sleep comfortably, dysphagia and hoarseness are the most common symptoms associated with compression of esophagus and the airways by the retrosternal goitres. Superior vena cava obstruction, Horner syndrome are less common features due to vessels and nerve compression in case of retrosternal goitres⁽⁹⁾. Clinical history,

clinical examination and imaging are important in the diagnosis of retrosternal goitres⁽⁹⁾.

The treatment of choice for retrosternal goitres is surgical removal even if the patient is asymptomatic⁽¹⁰⁾.

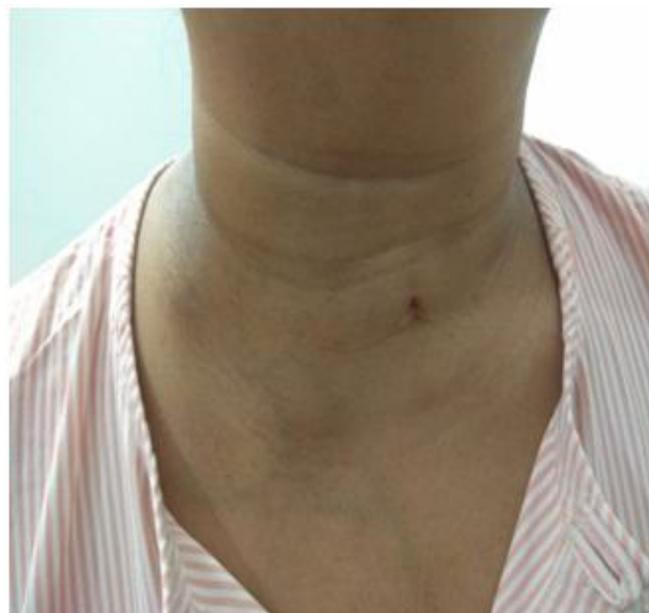
Materials and Methods

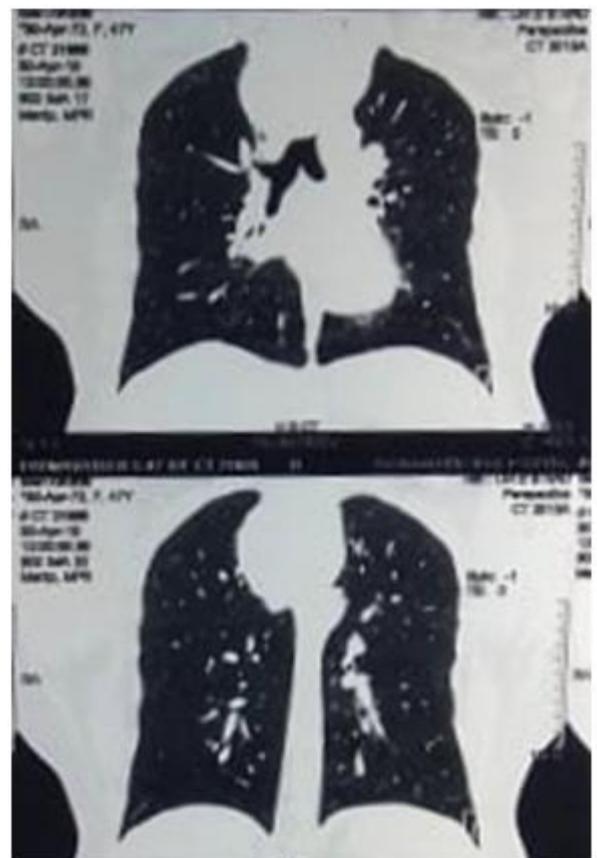
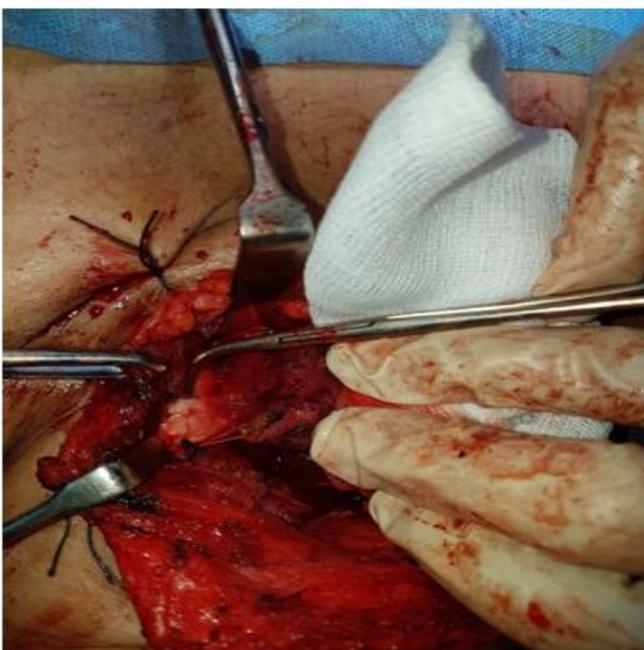
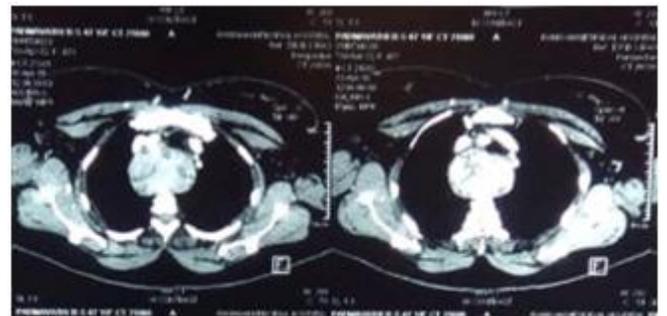
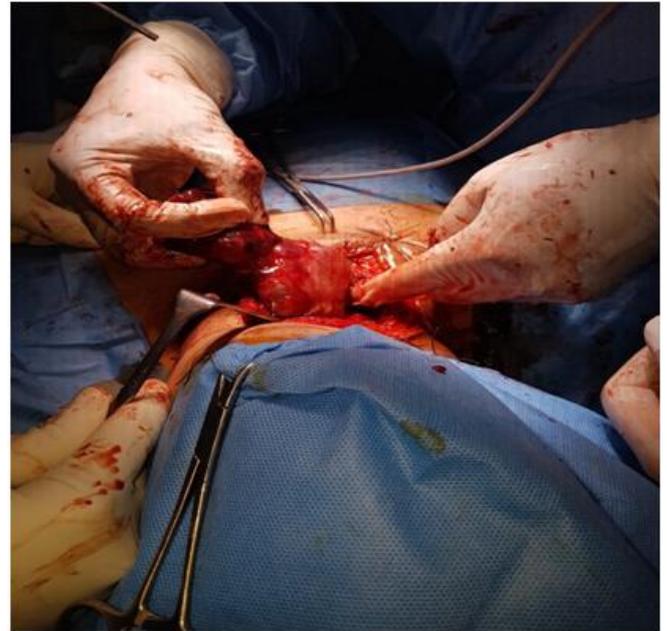
Over a period of 2 years (2017-2019), 20 patients with retrosternal Goitre underwent subcapsular thyroidectomy in KIMS hospital, department of oncology. In all the patients retrosternal extent was present with or without the signs of tracheal, oesophageal, nerve or vascular compression. A total of 20 patients were operated out of which 12 are females and 8 are males. Out of the 20 patients 17 patients were diagnosed to have benign tumor remaining 3 were malignant confirmed by fine-needle aspiration cytology. All patients were treated surgically. Patients are placed in supine position and head extended with elevated shoulders (makes the Goitre more prominent). Transverse Kocher's incision placed 2cm above the sternal notch. Platysma is separated, subplatysmal flap raised till the thyroid cartilage. Strap muscles separated in the mid line, anterior surface of both thyroid lobes dissected. The superior pole of the thyroid is then exposed to isolate (gently dissecting the external branch of the superior laryngeal nerve away from the vessels), clamp, divide and ligate the superior thyroid vessels. Following ligation and mobilization of superior pole, remaining gland is mobilized. A finger is insinuated under the strap muscles and immediately against the thyroid, "hooking" around the inferior aspect of the substernal component, separating its loose attachments in the mediastinum, and delivering it into the neck. Recurrent laryngeal nerve is identified and carefully separated. Inferior thyroid artery pedicle is identified and ligated and inferior part of the gland is mobilized. contralateral side is removed in an identical fashion. A drain is placed and the separated strap muscles are sutured using Vicryl 3-0. Platysma re approximated using vicryl

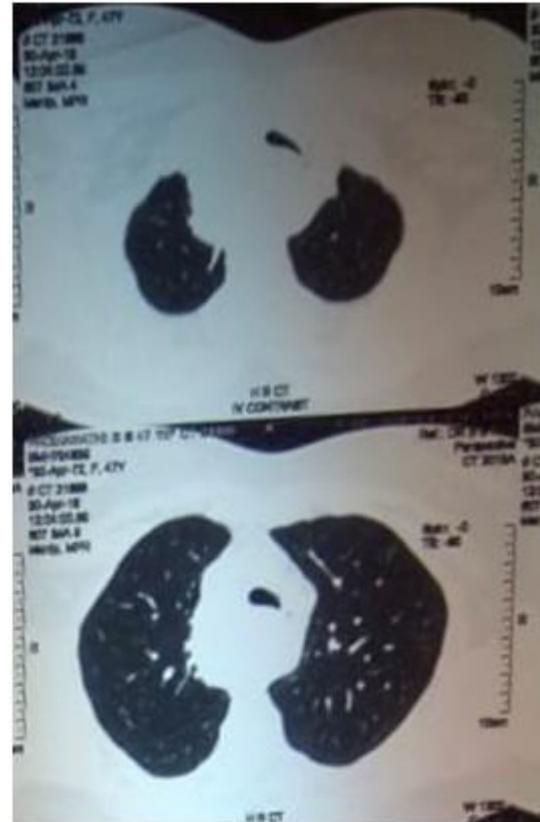
3-0. Skin is closed using 4-0vicrylsubcuticular sutures.

Results

Out of the 20 patients operated, 17 patients had benign tumour and the rest 3 had a malignant tumour. 2 patients were symptomatic for symptoms of retrosternal goitre and the rest showed no signs of retrosternal extension (symptoms are Dyspnoea, dysphagia, cough, choking sensation). One patient had no symptoms and was diagnosed incidentally on CT thorax. The thyroid gland removed showed a mean weight of 170gms. The average time for performing subcapsular approach is 175mins. 85% of the patients operated had benign lesions like follicular adenoma where as the other 15% had papillary and medullary carcinoma of thyroid. Post operatively, 1 patient had transient hypoparathyroidism, no patient had postoperative bleeding, recurrent laryngeal nerve injury. No patient died post operatively. All patients were followed up at regular intervals.







Discussion

deSouza and Smith defined retrosternal goitre as $>50\%$ of its mass in the mediastinum⁽⁶⁾. As this definition lacks anatomical precision, it is defined as a goitre lying two fingerbreadths below the thoracic inlet with the patient in a supine position 11, a goitre reaching the aortic arch 19, or the carina tracheae 4, a goitre with its inferior pole passing through the cervico-thoracic isthmus below the subclavian vessels 12. Depending upon the percent of goitre mass present in the mediastinum, Cohen and Cho divide goitres into four grades⁽¹³⁾. Huins et al. proposed a classification of RG based on the relationship of goitre with anatomical structures of the mediastinum: they defined three grades of goitre depending upon mediastinal extension, namely, to the level of the aortic arch, to the level of the pericardium or below the level of the right atrium⁽¹⁴⁾. Classically, patients present during the fourth and fifth decades of life with symptomatic goiters caused by one or a combination of the “3 Ds”: dyspnea, dysphagia, and dysphonia. Of these 3, the most common complaint is dyspnea on

exertion, which is present in 30% to 60% of patients.⁽²⁶⁾ The anatomy of RLN gets distorted due to abnormally large size of the gland. complete or partial transection, traction, or handling of the nerve, contusion, crush, burn, clamping, misplaced ligature, and compromised blood supply are the mechanisms responsible for recurrent laryngeal nerve injury.^[15] The incidence of RLN palsy in thyroid surgery varies from 5% to 11%. Bilateral RLN palsy is a rare life-threatening complication following surgery and requires emergency management. The reported incidence is 0.1%.^[16] complications of thyroid surgery can be decreased by using microsurgical techniques.⁽¹⁷⁾ The tubercle of Zuckerkandl and fascial layers are the most common locations of RLN injuries.⁽¹⁸⁾ The permanent injury to RLN manifests as irreversible dysfunction of phonation with irreversible respiratory difficulties. Hypoglycemia is a complication of thyroidectomy, which is defined as deficiency of calcium in bloodstream (normal = 8.5–10.5 mg/dl). It can be temporary or permanent. Symptoms often manifest about 24–48 h after

surgery, and there is no direct correlation between their timing and the severity of hypocalcemia.^(20,21,22) In patients undergoing thyroidectomy, temporary hypocalcemia is seen in 1.6%–50%, and only about 1.5%–4% end up with permanent hypocalcemia. (23,24).Vascular manipulation compromises parathyroid function until blood flow is re-established through collateral vessels.^[25] Transient hypocalcemia was treated with calcium supplementation 500 mg qid and 1.25 deoxy cholecalciferol (Vitamin D3).

Conclusion

Subcapsular dissection for intra thoracic goitres is safe and efficient for total thyroidectomy. An experienced surgeon can identify the important structures even when the anatomy is distorted. The operative time and risk of injury to the vital structures can be reduced by using bipolar and harmonic scalpel. The most common feature following surgery is transient hypocalcemia, hence post operative calcium monitoring is necessary. However with subcapsular approach, the incidence of hypocalcemia (hypoparathyroidism) is 1%-2% and injury to laryngeal nerve is <1%.⁽²⁷⁾

References

- Haller A. Disputatones Anatomica Selectae. Gottingen: Vendenhoceck; 1749. p. 96.
- Huins CT, Georgalas C, Mehrzad H, Tolley NS. A new classification system for retrosternal goitre based on a systematic review of its complications and management. *Int J Surg.* 2008;6:71–6.
- Cougard P, Matet P, Goudet P, et al. Les goitre plongeants: 218 cas operas. *Ann Endocrinol (Paris).* 1992;53:230–5.
- Vadasz P, Kotsis L. Surgical aspects of 175 mediastinal goiters. *Eur J Cardiothorac Surg.* 1998; 14:393–7.
- Chow TL, Chan TT, Suen DT, Chu DW, Lam SH. Surgical management of substernal goitre: local experience. *Hong Kong Med J.* 2005;11:360–5.
- deSouza FM, Smith PE. Retrosternal goiter. *J Otolaryngol.* 1983;12:393–6
- Huins CT, Georgalas C, Mehrzad H, Tolley NS. A new classification system for retrosternal goitre based on a systematic review of its complications and management. *Int J Surg.* 2008;6:71–6.
- Cougard P, Matet P, Goudet P, et al. Les goitre plongeants: 218 cas operas. *Ann Endocrinol (Paris).* 1992;53:230–5.
- Vadasz P, Kotsis L. Surgical aspects of 175 mediastinal goiters. *Eur J Cardiothorac Surg.* 1998; 14:393–7.
- Chow TL, Chan TT, Suen DT, Chu DW, Lam SH. Surgical management of substernal goitre: local experience. *Hong Kong Med J.* 2005;11:360–5.
- deSouza FM, Smith PE. Retrosternal goiter. *J Otolaryngol.* 1983;12:393–6.
- Huins CT, Georgalas C, Mehrzad H, Tolley NS. A new classification system for retrosternal goitre based on a systematic review of its complications and management. *Int J Surg.* 2008;6:71–6.
- Huins CT, Georgalas C, Mehrzad H, Tolley NS. A new classification system for retrosternal goitre based on a systematic review of its complications and management. *Int J Surg.* 2008;6:71–6.
- Huins CT, Georgalas C, Mehrzad H, Tolley NS. A new classification system for retrosternal goitre based on a systematic review of its complications and management. *Int J Surg.* 2008;6:71–6.
- Huins CT, Georgalas C, Mehrzad H, Tolley NS. A new classification system for retrosternal goitre based on a systematic review of its complications and management. *Int J Surg.* 2008;6:71–6.
- Huins CT, Georgalas C, Mehrzad H, Tolley NS. A new classification system for retrosternal goitre based on a systematic review of its complications and management. *Int J Surg.* 2008;6:71–6.

- review of its complications and management. *Int J Surg*.2008;6:71–
17. Huins CT, Georgalas C, Mehrzad H, Tolley NS. A new classification system for retrosternal goitre based on a systematic review of its complications and management. *Int J Surg*. 2008;6:71–
18. Huins CT, Georgalas C, Mehrzad H, Tolley NS. A new classification system for retrosternal goitre based on a systematic review of its complications and management. *Int J Surg*.2008;6:71–6.
19. Cougard P, Matet P, Goudet P, et al. Les goitre plongeants: 218cas operas. *Ann Endocrinol (Paris)*. 1992;53:230–5.
20. Vadasz P, Kotsis L. Surgical aspects of 175 mediastinal goiters. *Eur J Cardiothorac Surg*. 1998; 14:393–7.
21. Chow TL, Chan TT, Suen DT, Chu DW, Lam SH. Surgical management of substernal goitre: local experience. *Hong Kong Med J*. 2005;11:360–5.
22. deSouza FM, Smith PE. Retrosternal goiter. *J Otolaryngol*.1983;12:393–6
23. Katlic MR, Wang C, Grillo HC. Substernal goiter. *J Otolaryngol*.1992; 21:165–70
24. Podgaetz E, Gharagozloo F, Najam F, et al. A novel robot-assisted technique for excision of a posterior mediastinal thyroid goiter: a combined cervico-mediastinal approach. *Innovations (Phila)* 2009;4:225-8. 10.1097/IMI.0b013e3181a69bf0
25. Mackle T, Meaney J, Timon C. Tracheoesophageal compression associated with substernal goitre. Correlation of symptoms with cross-sectional imaging findings. *J Laryngol Otol* 2007;121:358-61.
26. Grainger J, Saravanappa N, D'Souza A, Wilcock D, Wilson PS. The surgical approach to retrosternal goiters: the role of computerized tomography. *Otolaryngol Head Neck Surg* 2005;132:849-51.
27. Dahan M, Gaillard J, Eschapasse H. Surgical treatment of goiters with intrathoracic development. In: Delarue M, editor. *International trends in general thoracic surgery*. Vol 5. *Thoracic Surgery: frontiers and uncommon neoplasms*. St. Louis: Mosby; 1989. p. 240-6.
28. Sancho JJ, Kraimps JL, Sanchez-Blanco JM, Larrad A, Rodriguez JM, Gil P, et al. Increased mortality and morbidity associated with thyroidectomy for intrathoracic goiters reaching the carina tracheae. *Arch Surg* 2006;141:82-5.
29. Cohen JP, Cho HT. Surgery for substernal goiters. *Oper Techn Otolaryngol Head Neck Surg* 1994;5:118-25.
30. Huins CT, Georgalas C, Mehrzad H, Tolley NS. A new classification system for retrosternal goitre based on a systematic review of its complications and management. *Int J Surg* 2008;6:71-6.
31. Steurer M, Passler C, Denk DM, Schneider B, Niederle B, Bigenzahn W, et al. Advantages of recurrent laryngeal nerve identification in thyroidectomy and parathyroidectomy and the importance of preoperative and postoperative laryngoscopic examination in more than 1000 nerves at risk. *Laryngoscope* 2002; 112:124-33.
32. Kovács L, Góth MI, Vörös A, Hubina E, Szilágyi G, Szabolcs I, et al. Changes of serum calcium level following thyroid surgery – Reasons and clinical implications. *Exp Clin Endocrinol Diabetes* 2000;108:364- 8.
33. Lahey FH, Hoover WB. Injuries to the recurrent laryngeal nerve in thyroid operations: Their management and avoidance. *Ann Surg* 1938;108:545-62.
34. Hayward NJ, Grodski S, Yeung M, Johnson WR, Serpell J. Recurrent laryngeal nerve injury in thyroid surgery: A review. *ANZ J Surg* 2013;83:15-21.
35. Serpell JW. New operative surgical concept of two fascial layers enveloping

- the recurrent laryngeal nerve. *Ann Surg Oncol* 2010;17:1628-36.
36. Sousa Ade A, Salles JM, Soares JM, Moraes GM, Carvalho JR, Savassi-Rocha PR, et al. Predictors factors for post-thyroidectomy hypocalcaemia. *Rev Col Bras Cir* 2012;39:476-82.
37. Demeester-Mirkine N, Hooghe L, Van Geertruyden J, De Maertelaer V. Hypocalcemia after thyroidectomy. *Arch Surg* 1992;127:854-8.
38. Kovács L, Góth MI, Vörös A, Hubina E, Szilágyi G, Szabolcs I, et al. Changes of serum calcium level following thyroid surgery – Reasons and clinical implications. *Exp Clin Endocrinol Diabetes* 2000;108:364- 8.
39. Noureldine SI, Genter DJ, Lopez M, Agrawal N, Tufano RP. Early predictors of hypocalcemia after total thyroidectomy: An analysis of 304 patients using a short-stay monitoring protocol. *JAMA Otolaryngol Head Neck Surg* 2014;140:1006-13.
40. Pattou F, Combemale F, Fabre S, Carnaille B, Decoux M, Wemeau JL, et al. Hypocalcemia following thyroid surgery: Incidence and prediction of outcome. *World J Surg* 1998;22:718-24.
41. Coimbra C, Monteiro F, Oliveira P, Ribeiro L, de Almeida MG, Condé A, et al. Hypoparathyroidism following thyroidectomy: Predictive factors. *Acta Otorrinolaringol Esp* 2017;68:106-11.
42. Ross D.S. • Cooper D.S. • Martin K.A. Clinical manifestations and evaluation of obstructive or substernalgoiter. *UpToDate*. 2008; v16: 2
43. White M.L, Doherty G.M, Gauger P.G.Evidence-based surgical management of substernal goiter. *World J Surg*. 2008; 32: 1285-1300.