Case Report

DOI: https://dx.doi.org/10.18203/2349-2902.isj20211845

Pre-operative use of Lugol's iodine in a case with toxic adenomatous goiter

Sharang Kulkarni^{1*}, Sheetal Murchite¹, Saurabh Parab¹, Vikash Tiwari¹, Archa Rajagopal²

¹Department of General Surgery, ²Department of Pathology, Dr. D. Y. Patil Hospital and Research Institute, Kolhapur, Maharashtra, India

Received: 06 March 2021 Accepted: 06 April 2021

*Correspondence: Dr. Sharang Kulkarni,

E-mail: 001sharang@gmail.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Euthyroid state is considered a requisite before planning a thyroid surgery. Before such a surgery, pharmacotherapy can be used for managing a hyperthyroid state. It warrants a long-term treatment with pharmacotherapy agents like imidazole class (carbimazole, methimazole) or propylthiouracil. In cases with large goiters, with pressure symptoms like dyspnoea, dysphagia, dysphonia; a surgeon would prefer a pharmacotherapy with a quicker action than the established agents. Lugol's iodine was used pre-operatively before the advent of newer agents. In rural areas, where patients present with large goiters, hyperthyroid states due to lack of awareness and availability of the modern pharmacotherapy, Lugol's iodine can be a rescue pre-operative therapy to make such a patient euthyroid and to decrease the vascularity of the goiter, which facilitates a safer thyroid surgery.

Keywords: Thyroid surgery, Euthyroid, Lugol's iodine

INTRODUCTION

A patient with goiter and a hyperthyroid state can be treated with pharmacotherapy, surgical management or radioiodine.1 A goiter in hyperthyroid state often has increased vascularity.2 Intra-operative and immediate postoperative bleeding and a thyrotoxic storm are the most dreaded complications of thyroid surgery. A reduction in bleeding also facilitates a clean dissection and better visualization of important structures like recurrent laryngeal nerves as well as the parathyroid glands. In the early 20th century, it was postulated and later proven that preoperative use of inorganic iodine leads to decreased morbidity and mortality.3 The histology of adenomatous goiter varies from solid to gelatinous or colloid-rich type. The etiology includes iodine deficiency, dietary goitrogens or inherent dyshormonogenesis.4 The use of inorganic iodine in pharmacological doses inhibits iodine transport in the thyroid and iodide organification (Wolff-Chaikoff effect) and rapidly inhibits thyroid hormone synthesis and release and thereby negating the thyrotoxicosis. However, after a few weeks, the effect weans off and the thyrotoxicosis recurs. Therefore, short-term use of inorganic iodide is useful in preparing patients with hyperthyroidism for thyroid surgery. Usually, it is given in dosage of three to five drops thrice daily for 10 days.⁵

The use of inorganic iodine as a pre-operative preparation before thyroid surgery was first postulated by Plummer in 1923. Lugol's iodine is a solution of elemental iodine, potassium iodide and distilled water. It was previously used as a disinfectant, starch detector, histological preparation and Schiller's test. Its use in thyroid surgery started in the 1920s.

CASE REPORT

A 45 year old male presented to the outpatient department with a large thyroid swelling for 8 years. The swelling was localized on the left of the midline initially and gradually progressed in size to involve both lobes and isthmus over 8 years to the current size (18×10×5 cm). He also complained of hoarseness of voice and difficulty in breathing for the last 6 years. There was no medication history for the same. On examination, the surface of the swelling was bosselated, had a firm consistency and the lower border of the swelling was palpable just above the jugular notch. The patient had mild tachycardia, fine tremors and hoarseness of voice. There was mild engorgement of the neck veins.

The ultrasonography of the swelling demonstrated multiple ill-defined nodular lesions of heterogenous echotexture involving the whole thyroid gland along with a few cystic areas and calcifications. There was hypervascularity throughout the gland. The trachea was compressed and distorted along with lateral displacement of the common carotid artery and internal jugular vein bilaterally. The cytology report on FNAC showed scattered clusters of follicular epithelial cells with cyst macrophages and suggested a nodular goiter as the diagnosis. A CT scan of the neck confirmed these findings with a demonstration of a retrosternal extension

of the left lobe. Both X-ray soft tissue neck and indirect laryngoscopy suggested a slight tracheal shift towards the left. The patient presented with a hyperthyroid state with a thyroid panel showing serum T3 as 2.21 ng/mL, serum T4 as 10.74 μ g/dL and TSH as 0.02 mIU/L. A repeated thyroid profile after one month showed a persistent hyperthyroid state with T4 as 15.43 μ g/dL, free T4 as 3.7943 μ g/dL and TSH as 0.046 mIU/L.

The patient was posted for a total thyroidectomy and necessary preoperative preparation was started. The patient was started on 5% Lugol's iodine 10 drops (60 mg) thrice daily along with tablet methimazole 10 mg, tablet propranolol 20 mg and tab hydrocortisone 10 mg thrice daily. The Lugol's iodine was administered for 7 days and the thyroid profile was repeated, which showed euthyroid state, serum T3 as 1.49 ng/mL, serum T4 as $10.73 \mu g/dL$ and serum TSH as 0.2 mIU/L. After attaining fitness from an anesthetist and endocrinologist, the patient underwent a total thyroidectomy. The procedure went uneventful. The specimen retrieved was subjected to histopathological examination, which reported it to be an adenomatous goiter. The patient recovered well, with no postoperative complications, but the hoarseness of voice persisted congruent with the preoperative state. The patient was started on antibiotics, calcium supplements and discharged with hormone replacement.

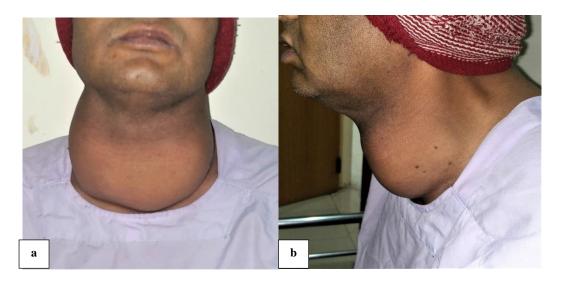


Figure 1 (a and b): Thyroid swelling.

Table 1: Timeline of events.

1st thyroid profile: hyperthyroid state	Day 2
Admission	Day 0
Lugol's iodine administration	Day 1
2nd thyroid profile: euthyroid state	Day 10
Total thyroidectomy	Day 12
Discharge	Day 21

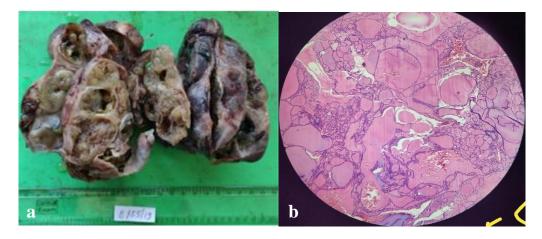


Figure 2: Histological specimen of the lesion (a and b).

DISCUSSION

As already discussed, a euthyroid state is of paramount importance during thyroid surgery. A hyperthyroid state can be managed with pharmacotherapy with carbimazole or propylthiouracil, which warrants a long-term treatment. In cases, as seen here, when patients present from rural areas, where awareness, as well as availability of modern pharmacotherapy is scarce, they usually have advanced disease and pressure symptoms. In such patients, preoperative preparation with Lugol's iodine which potentially can acquire euthyroid state promptly and decreases the vascularity in the lesion is a breakthrough. The use of Lugol's iodine for this purpose started in the early 1920s but took a backseat with the advent of modern pharmacotherapy and its widespread availability.

According to American thyroid association, a patient must be brought to a euthyroid state using methimazole and inorganic iodide. They also state that in cases where a patient cannot be euthyroid preoperatively, e.g. allergy to antithyroid drugs or emergency thyroidectomy, inorganic iodide and beta-blockers must be administered. This aims at rendering a patient euthyroid as well as decreasing the vascularity by decreasing angiogenic stimuli (lowering CD34 expression) and thereby decreasing the blood loss and improving visibility for the preservation of vital structure during the surgery. It also decreases the possibility of intra or postoperative thyroid storm by inhibiting the release of the hormones as well as inhibiting the organification of iodide moieties.

Calissendorff et al in a study in twenty seven patients in 2017 administered Lugol's iodine preoperatively for different factors like agranulocytosis, hepatotoxicity and other side effects of antithyroid drugs. They demonstrated a significant decrease in the levels of free T3 and free T4, but no change in the TSH levels. Minor complications like rash, nausea and vomiting were noted in 15% of the

patients. There also was a significant improvement in tachycardia.¹

Yilmaz et al in their study conducted in 2016 enrolled 40 patients who were stratified into three groups, receiving preoperative treatment with Lugol's iodine (group 1), no preoperative treatment with Lugol's iodine (group 2) and healthy euthyroid adults (group 3). Doppler study was used to measure blood flow through the vasculature and thyroid profiling along with thyroid volume and the resistance index of main thyroid arteries were measured. They found out that Lugol's iodine was the only significant independent factor that decreased the blood loss during thyroidectomy by 7.40-fold.²

Hope and Kelly et al in their review article have stated that there are scant literature and evidence regarding the use of Lugol's iodine for preoperative preparation for thyroidectomies. After an extensive study of the literature regarding the same, they have concluded that large prospective randomized control studies need to be undertaken to establish whether Lugol's iodine is efficacious enough to be used as a routine preoperative preparation tool before thyroid surgeries. ¹¹

As in the case discussed here, the patient hailed from a rural area and despite having compressive symptoms due to the huge thyroid swelling, medical or surgical facilities were not sought for 8 years. The patient was clinically hyperthyroid (tachycardia, tremors) at presentation and had dysphonia, dyspnoea. The radiological investigations suggested significant displacement of neck structures (common carotid arteries, internal jugular veins and trachea) and increased vascularity of the swelling. This was a chronic, symptomatic and toxic swelling with increased risk of intraoperative complications and excess blood loss and thyrotoxic storm. Preoperative preparation with Lugol's iodine was done as mentioned above. The thyroidectomy done was uneventful with minimal blood loss, adequate visualization and preservation of important structures bilaterally and a controlled thyroid profile. This underlines that prompt action by Lugol's iodine rendered the patient clinically and biochemically euthyroid within 8 days and it is also likely that it also played a role in decreasing the vascularity of the thyroid gland. A decrease in the heart rate may also have played a part in reducing the rate of blood flow in the vasculature and thereby distension.

CONCLUSION

This case underlined the importance of Lugol's iodine as a routine preoperative preparation tool for thyroid surgeries. Management of hyperthyroid state and hypervascularity with Lugol's iodine was also emphasized.

We also wanted to propagate the notion that a larger, prospective, randomized study is warranted to establish whether Lugol's iodine was efficacious enough to be used as a routine preoperative preparation tool before thyroid surgeries.

Funding: No funding sources Conflict of interest: None declared Ethical approval: Not required

REFERENCES

- Calissendorff J, Falhammar H. Rescue pre-operative treatment with Lugol's solution in uncontrolled Graves' disease. Endocr Connect. 2017;6(4):200-5.
- Yilmaz Y, Kamer KE, Ureyen O, Sari E, Acar T, Karahalli O. The effect of preoperative Lugol's iodine on intraoperative bleeding in patients with hyperthyroidism. Ann Med Surg (Lond). 2016;9:53-7.
- 3. Santosh UP, Prashanth KB, Karanam L. Preoperative preparation with Lugol's Iodine in thyroidectomy of euthyroid patients-is it really mandatory?-an otorhinolaryngologist's view. J Clin Diagn Res. 2014;8(8):1.

- Yoshida SH, Takamatsu JU, Kuma KA, Murakami YA, Sakane SA, Katayama SH, et al. A variant of adenomatous goiter with characteristic histology and possible hereditary thyroglobulin abnormality. J Clinic Endocrinol Metabol. 1996;81(5):1961-6.
- 5. Farling PA. Thyroid disease. Br J Anaesth. 2000;85:15-28.
- 6. HS Plummer. Results of administering iodine to patients having exophthalmic goiter. JAMA. 1923;80:155-6.
- 7. Bahn RS, Burch HB, Cooper DS, Garber JR, Greenlee MC, Klein I, et al. Hyperthyroidism and other causes of thyrotoxicosis: management guidelines of the American thyroid association and american association of clinical endocrinologists. Endocr Pract. 2011;17(3):456-520.
- 8. Ansaldo GL, Pretolesi F, Varaldo E, Meola C, Minuto M, Borgonovo G, et al. Doppler evaluation of intrathyroid arterial resistances during preoperative treatment with Lugol's iodide solution in patients with diffuse toxic goiter. J Am Coll Surg. 2000;191(6):607-12.
- 9. Erbil Y, Ozluk Y, Giris M, Salmaslıoglu A, Issever H, et al. Effect of lugol solution on thyroid gland blood flow and microvessel density in the patients with Graves' disease. J Clin Endocrinol Metab. 2007;92(6):2182-9.
- 10. Carroll R, Matfin G. Endocrine and metabolic emergencies: thyroid storm. Ther Adv Endocrinol Metab. 2010;1(3):139-45.
- 11. Hope N, Kelly A. Pre-operative lugol's iodine treatment in the management of patients undergoing thyroidectomy for Graves' disease: a review of the literature. European Thyr J. 2017;6(1):20-5.

Cite this article as: Kulkarni S, Murchite S, Parab S, Tiwari V, Rajagopal A. Pre-operative use of Lugol's iodine in a case with toxic adenomatous goiter. Int Surg J 2021;8:1630-3.