

## Surgery and Anesthesiological Approach for Giant Thyroid Goiter: An Unusual Case of Didactic Management

Razafimanjato Narindra Njarasoa Mihaja<sup>1\*</sup>, Ravelomihary Tsiry Dama-Ntsoa<sup>1</sup>, Tsiambanizafy Guillaume Odilon<sup>1</sup>, Rakotovo Hanitra Jean Louis<sup>1</sup>, Rajaonera Andriambelo Tovohery<sup>2</sup>

<sup>1</sup>Department of Surgery & Division of Thoracic Surgery, Faculty of Medicine, University of Antananarivo, Madagascar; <sup>2</sup>Department of Fundamental Science & Division of Anesthesia, Faculty of Medicine, University of Antananarivo, Madagascar

### ABSTRACT

Although giants goitres are frequently asymptomatic for a long time, its natural development always progresses eventually to compression of the trachea or oesophagus and result in clinical symptoms such as dyspnea or dysphagia. Surgical treatment can prevent: on the one hand, the inevitable evolution to compressive symptoms and the malignant transformation, and on the other hand, correct the aesthetic prejudice and functional discomfort of patients.

**Keywords:** Airway obstruction; Difficult airway; Dyspnea; Fiberoptic intubation; Goiter; Thyroid; Thyroidectomy

### INTRODUCTION

The term 'goiter' is derived from the Latin phrase *tumidum gutter* (swollen throat) and refers to an abnormal enlargement of the thyroid gland [1]. Giant goiter is defined by an enlargement of the thyroid gland of at least 10 g/kg body weight or a thyroid tumor larger than 10 cm in diameter [2]. The WHO has categorized goiter according to its size, where class 0 corresponds to a palpable thyroid mass and class I to a visible and palpable cervical tumor and modified the curves and line of the neck. Class II is a very large goiter with retrosternal extension that makes the tracheal deviation, compression of the trachea and esophagus [3,4]. These problems pose a significant difficult anaesthesiology and surgical management problem in low-income countries. Because of its location, a massive goiter, in addition to being aesthetically disfiguring, can seriously compromise the permeability of the trachea and esophagus [4,5]. In the literature, more reports are detailing the approach management of giant goiter but frequently limited to isolated case reports and small retrospective descriptive case series. Giant goiter is a rare problem encountered rarely by clinician. No specific guidelines from the Difficult Airway Society (United Kingdom) or the American Society of Anesthesiologists [6] have been established for the management of the obstruction airway

secondary to them. Despite this standard surgical procedure, thyroidectomy itself presents several risks of complications, sequelae, and constraints for patients, including post-operative hematoma, surgical site infection, syndromes of parathyroid failure (tetany and hypocalcemia) after total thyroidectomy, thyroid hormonal substitution requiring and airway obstruction or altered voice, due to permanent bilateral paralysis of the recurrent laryngeal nerve [7]. This study aims to highlight through literature anaesthesiology and surgical management and to draw attention to the main problems in a similar case presentation.

### CASE DESCRIPTION

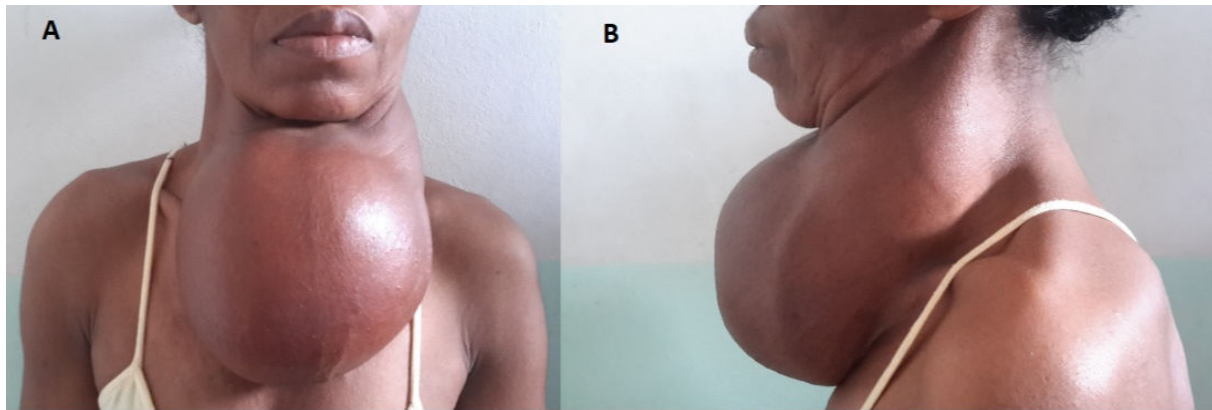
A 51-year-old woman presented at the consultation for a large anterior cervical swelling, which has increased slowly during 33 years duration. She complains of aesthetic and functional discomfort because of the weight of the thyroid gland without compression symptomatology of the cervical region. However, it presents some dry cough erratically. She has no particular antecedent. At the physical examination found this voluminous goiter measured 17 × 14 × 15 cm occupying all the cervical anterior region (Figure 1), without lymphadenopathy satellite.

**Correspondence to:** Razafimanjato Narindra Njarasoa Mihaja, Department of Surgery & Division of Thoracic Surgery, Faculty of Medicine, University of Antananarivo, Madagascar, Tel: +261-349368720; E-mail: razafesteban@yahoo.fr

**Received:** August 07, 2020; **Accepted:** August 21, 2020; **Published:** August 28, 2020

**Citation:** Razafimanjato NNM, Ravelomihary TDN, Tsiambanizafy GO, Rakotovo HJL, Rajaonera AT (2020) Surgery and Anesthesiological Approach for Giant Thyroid Goiter: An Unusual Case of Didactic Management. *Thyroid Disorders Ther.*9:237.

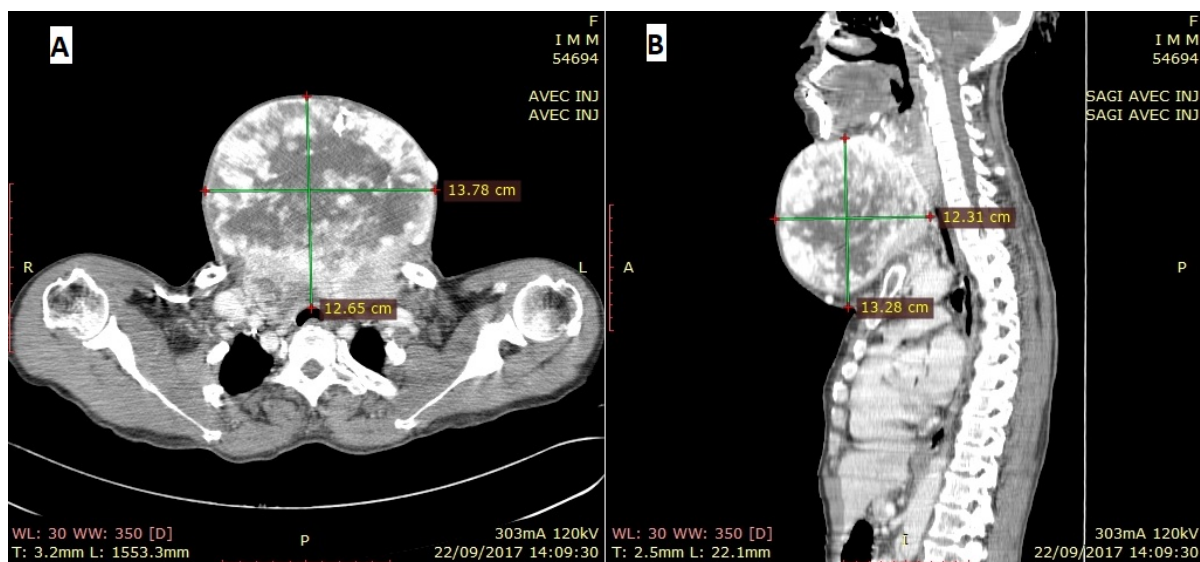
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**Figure 1:** Showing preoperative giant goiter at physical examination occupying the entire cervical anterior region.

No signs of tracheal compression, Pemberton's manoeuvre was negative and showing no vascular compression. The preoperative checkups were normal and the patient was euthyroid. The patient had an American Society of Anesthesiologists grade 1 and Mallampatti score was II.

Contrast-enhanced computerized tomography cervicothoracic showed heterogeneous tissue formation of the thyroid gland with necrotic fluid components, with tracheal compression (Figure 2).



**Figure 2:** Preoperative Computerized tomography showing (A: axial, B: sagittal) cervical mass with compression of trachea.

The needle aspiration was not performed. A total thyroidectomy was indicated given the aesthetic prejudice and the mid-term risk of tracheal compression. In the procedure, oro-tracheal intubation was performed without any particular difficulty despite the deviation of the trachea on the preoperative CT scan. The surgery consisted of large anterior cervicotomy; the difficulty lay in the identification of the different vessels, the recurrent laryngeal nerve and the parathyroid glands. The thyroid gland was polylobed about 15 × 20 × 25 cm mostly cystic. The histological examination found a piece of total thyroidectomy, polylobed, brown, firm, well-encapsulated of 1309 gram, right lobe 10 × 5, 5 × 4 cm and left lobe 18 × 14 × 9 cm and diagnosed as a benign tumour-like adenomatous multinodular goiter. Corticosteroid therapy was instituted immediately postoperatively. Awake fiber optic intubation was the

preferred choice of airway management in this patient. Placement of an endotracheal tube, such as a flexible, reinforced tube, induction of anaesthesia was done with fentanyl and propofol. Patient was maintained on tracrrium, fentanyl infusion and sevoflurane/oxygen-air mixture. After thyroid gland removal, digital assessment of tracheal wall strength confirmed that there was no evidence of clinically relevant tracheomalacia. After the operation, the patient doesn't have a post-extubation stridor. The postoperative period was uneventful. Patient was discharged on four postoperative days with transitory dysphonia. The results noted after 3 years post-operatively, on criteria of aesthetic benefit, analgesia and mobility, were satisfying (Figure 3).



**Figure 3:** Our patient after 3 years post-operatively.

## DISCUSSION

Thyroidectomy for goitre was first described in 1170 by Robert Frugardi, but historically it was considered a dangerous undertaking such that the French Academy of Medicine banned it in 1850 and in London, in 1877 the mortality rate was 44.4% [1]. Improved surgical and anaesthetic practices decrease the morbimortality rate of thyroid surgery at 0.16% [1]. A similar case with compressive symptom was reported by Alper F. and al in Turkey [8]. Cervicothoracic goiters are mainly diagnosed in patients in their fifties, with a clear predominance of women [9].

### Anaesthesiological approach

There are multiple modalities to manage the difficult airway in the patient with thyroid enlargement. However, this requires the anaesthesiologist's expertise and experience. The management of giant thyroid goiter presents a challenge particularly in airway management. There are no specific guidelines from the Difficult Airway Society (United Kingdom) or the American Society of Anaesthesiologists for the management of the obstructed airway secondary with this pathology [1]. Anaesthetic difficulty management of a patient with goiter depends on the size of the goiter, vascularity, compression on the surrounding organs and sub-sternal extension [3]. The clinical assessment of the patient by the anaesthetists is an important element in the therapeutic approach of a giant goiter. Wong P and al., in a general review, report that predictors of difficult face mask ventilation (FMV) and difficult intubation (mouth opening, Mallampati score, mandible luxation score, thyromental distance, neck movement) have only weak to moderate predictive values [1]. Clinically, the predictors of difficult airway of giant thyroid goiter include dyspnoea, dysphagia, superior vena cava syndrome and nerves compressions (Horner's syndrome, and recurrent laryngeal and phrenic nerves) [1]. On examination, it is essential to search the Pemberton's sign, which evokes an obstruction of the superior vena cava due to a retrosternally large thyroid goiter compression. The Pemberton maneuver is achieved by having the patient elevate both arms until they touch the sides of the head. A positive Pemberton's sign results a facial congestion and

cyanosis, as well as respiratory distress after approximately one minute [10]. This phenomenon is also known as "thyroid cork" [1]. Flexible naso-endoscope can detect anatomical distortion (by large goitres), confirm accessibility to the glottis (should intubation using direct laryngoscopy be attempted) and determine vocal cord function [1].

Laboratory investigations should include preoperative hormone assays to assess thyroid function and serum calcium to establish a reference value in the management of postoperative hypocalcemia. Imaging such as radiography, CT scan (in the supine position and during apnoea, static picture) and magnetic resonance imaging (MRI) are useful for confirmation of thyroid location and extension (topography) of a goiter, and for detecting signs of compression or invasion of adjacent structures [1-3]. In advanced countries, virtual bronchoscopy using CT reconstruction is still important for preoperative evaluation and for planning the intubation approach and surgical strategy for the management of a potential stenosis or tracheal deviation [1].

In conjunction with the systematic use in preoperative of a flexible, reinforced tube (to avoid twisting) for endotracheal intubation, the National Institute for Health and Care Excellence also recommends the use of an electromyogram tracheal tube to detect and prevent recurrent laryngeal nerve damage [11]. Review of airway secure management of cases of massive retrosternal goiter reveals a variety of techniques including awake fiberoptic intubation, awake direct laryngoscopy, awake emergency tracheostomy and awake rigid bronchoscopy, and jet ventilation, some of which would not usually be regarded as first-line procedures [3]. Many studies have suggested that fibroscopy should be considered as a gold standard option in the case of breathing difficulty to secure the airway [12]. Another "awake technique" is to perform cardiopulmonary bypass (CPB) or extracorporeal membrane oxygenation (ECMO) by cannulation of the femoral vessels under local anaesthesia, although this is only available in specialized hospitals in developing country [1]. Other specific concerns include questions related to intravenous induction technique, mechanical ventilation, but opinion on appropriate anaesthesia management is controversial and depends on anaesthesiologist expertise. However, in postoperative period, each practitioner needs to assess predisposing risk for occurrence of post thyroidectomy tracheomalacia include large goiters of long duration older than five years and large size as in our case, malignancy goiters or re-do thyroidectomy, preoperative recurrent laryngeal nerve paralysis, significant narrowing and/or deviation of the trachea, retrosternal or retrotracheal extension and difficult tracheal intubation [1,4]. The preventive use of corticosteroids has been proposed and considered to be a very acceptable attitude in order to prevent the occurrence of airway complication post-extubation [13]. More specifically, non-invasive positive airway pressure ventilation has been demonstrated to be an effective and safe way to manage stridor and airway compromise after extubation in patients with post-thyroidectomy tracheomalacia [12]. In a low-income country where the technical equipment is often in lack, detailed patient interview is the most important step in the management of giant goiter and should be focused on the patient's health and medical history and assessment of the patient's general



condition as well as the state of the patient's thyroid gland in our opinion.

### Surgery management

The surgical approach to the management of giant goiters is the same as for routine thyroid goiters. Cervico-thoracic computed tomography with the injection of contrast products is contraindicated in hyperthyroidism [12]. Nevertheless, the authors emphasize in the literature that it is a diagnostic instrument for surgeons to apprehend and predict the difficulties associated with surgical procedures [14,15]. Here, the patient was euthyroid, which made the exam possible. Operative indications to giant goiter include bilateral nodular goiter compresses the trachea, causing shortness of breath at a supine position; multiple nodular goiter with secondary hyperthyroidism is non-responsive to long-term pharmacotherapy; recently, the tumor grows rapidly and has a high risk for malignancy transformation and the giant thyroid tumor affects the appearance [16]. In our case, it was the aesthetic prejudice damage and the discomfort of this voluminous goiter that motivated the patient to be operated. In literature, the authors are unanimous in recommending a large exposure by cervicotomy to perform a thyroidectomy for a giant goiter [15-18]. Multiple hemodynamic modifications occurred during thyroidectomy for a giant goiter. Usually these occur in surgery of retrosternal extension goiter with compression and obstruction of the upper cervico-medastinal vessels and manifest as upper vena cava syndrome. Congestion of the collateral venous vessels results in "Downhill varices" of the upper oesophagus, which can lead to hematemesis. Such collateral must be recognized intraoperatively and correctly ligated to prevent post-operative bleeding. Many cases of stroke have even been reported in goiters, either by direct compression of the carotid arteries or by "thyrocervical steal" caused by increased blood flow from the thyroid gland. In some reported cases, thyroidectomy was a treatment for ischemic occurrences [12].

Concerning the postoperative tracheomalacia, there is no consensus about the systematic indication for a conventional tracheotomy after resection of a huge goiter except for the following cases [12]:

- (a) Extended compression time of the trachea and deterioration of more than two tracheal rings on the preoperative CT scan.
- (b) Difficulties in tracheal intubation
- (c) Recurrent preoperative laryngeal nerve paralysis (preoperative dysphonia)
- (d) Softened trachea on intraoperative palpation by surgeon after thyroidectomy

Incidences of intra-operative complications are higher in patients with large goiter when compared to patients with smaller thyroid glands [19,20]. In spite of the evidence in the literature to demonstrate increased post-operative morbidity and mortality associated with giant goiter surgery, none of these complications were detected in our patient's case. These complications include higher rates of transient and permanent vocal cords paralysis as well as temporary and permanent

hypocalcemia from parathyroid gland injury. Permanent recurrent laryngeal nerve palsy occurs in 0.3-3% of cases with transient palsies in 5-8% [21,22]. Some surgeons consider that these complications can be reduced by intraoperative verification of the anatomical and functional integrity with nerve monitors of the recurrent laryngeal nerve is important to avoid possible nerve damage and paralysis of the vocal cords [7,14]. Surgeons managing giant goiters must be attentive to all these difficulties and potential risks. In our context, special surgical training and expertise are absolutely essential, especially in our practice where the lack of a technical platform must be considered as an exacerbating factor of postoperative complications.

### CONCLUSION

Lack of medical infrastructure in low-income countries limits access to care to avoid diagnostic delays. Thyroidectomy for such goiters is always a surgical challenge due to distorted and displaced anatomy. Based on knowledge of the cervical anatomy, thyroid pathophysiology, general principles of surgery (asepsis, hemostasis, careful dissection) and standard procedure anaesthesia, the management of giant goiters is relatively straight forward and can be managed with few or any postoperative morbidity and mortality as in our observation. A multidisciplinary team approach between endocrinologists, anaesthetists and surgeons is recommended for safe management.

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