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Case Report: Fibre Optic Bronchoscopic Airway Management In Longstanding Multinodular Goitre With Tracheomalacia: Is Tracheostomy Mandatory?

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Abstract: *Surgery is the common method for the treatment of benign nodular goiter. Even though optimal operative strategy for treating benign nodular goiter remains controversial.Long standing large goiters are extremely unusual and often result as a consequence of ignorance, neglect, lack of inadequate medical facility, fear of undergoing surgery. These patients pose a specific challenge and need to be managed by experienced surgeon and anesthetist.Tracheomalacia is a life threating complication which must be taken care before extubating. Thyroidectomy for such goiters is a surgical challenge due to the possible association of tracheomalacia, difficult intubation along with distorted and displaced anatomy.*
Key Words: *Hemithyroidectomy, Fiberoptic-Bronchoscopy, Tracheomalacia*

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I. Introduction:

Benign multi-nodular goitre a common problem affecting 5% of the general population in non-endemic and 15% in endemic area[1]. Benign nodular goitre is the most common endocrine disorder, especially in countries where iodine deficiency is endemic.Surgery is the common method of treatment for benign nodular goitre. Bilateral thyroidectomy has become the accepted surgical therapy for bilateral MNG. However, the favoured surgical treatment for unilateral goitre continues to be of debate [2,3,4]. A longstanding goitre can lead to deviation and narrowing of trachea. Pre- operative anaesthetic assessments often diagnose a difficult intubation. The incidence of tracheomalacia has been reported from 0.001% to as high as 1.5%. Many of these patients are associated with weakness in the tracheal wall (tracheomalacia) making tracheostomy mandatory in the postoperative period[7]. A Mathieu *et al*. reported that the overall incidence of difficult intubation in thyroid surgery was 11.1%. We present one such case of successful intubation with help of fibreoptic bronchoscope (FOB) using loco-sedative technique[8.]

II. Case Report:

A 32 years old lady with 37 kg weight presented with complaints of gradually increasing swelling in front of neck over 20 years. Patient had history of chronic dyspnea and weakness. She had no history of change in voice and no respiratory symptoms. On examination, patient was conscious, cooperative. Pulse was 80/min and blood pressure 140/90 mmHg. ECG showed sinus rhythm. She had no stridor and no respiratory difficulty, even on lying down. The neck swelling was 12*10 cm in size, nodular, extending from lower jaw to sternal notch [Figure 1]. The lower limit of the swelling was visualized & palpable. There were no distended veins on chest. The swelling moves with deglutition. On palpation, it was firm, mobile, and the skin above it was free. Airway examination showed less than 2 fingers mouth opening due to a large thyroid mass obstructing mouth opening, protruding incisors; Mallampati score couldn't be determined due to restricted mouth opening, limited neck flexion and extension. Indirect laryngoscopy revealed normal vocal cord mobility. Complete blood test revealed Hb- 7.3, WBC -8400, platelet -3,09,000. In view of chronic anemia 4 PCV transfused. Radiological examination revealed lateral displacement of the trachea to the right on antero- posterior view and compression of trachea in lateral view [Figure 2 A]. Thyroid sonography showed large cysto-nodular mass in with increased vascularity on color Doppler f/s/o benign mass. FNAC suggestive of colloid goiter . CT scan showed large space occupying lesion measuring 9.3*5.7*8.6 cm from inferior portion of right lobe and isthmus of thyroid extending from inferior margin of hyoid bone up to suprasternal notch appearing heterogeneously hypodense. Lesion causing significant compression of trachea with maximum compression at C7 vertebral body measuring about 1.2*0.5 cm . The diameter of trachea below the level of tracheal stenosis measures 1.7*1 cm. Right lobe of thyroid normal. [Figure 2 B]. Free T3, T4, and TSH levels were in normal limits. In view of CT findings,

fiberoptic bronchoscopy planned in which airway inlet were directly visualized during spontaneous respiration. Patient was kept fasting for 6 hours for before OT. Ranitidine 150 mg was given with a small sip of water on night before and morning of surgery. No preoperative sedation was prescribed. The patient shifted to the OT. Difficult airway management cart with rigid bronchoscope and jet ventilation and tracheostomy tray was kept ready. The procedure was explained to the patient, and written consent was taken. Standard monitors (ECG, pulse oximeter, and NIBP) were attached, and the baseline vitals were recorded. Inj. glycopyrrolate 0.2 mg i.v. was administered. Xylometazoline was instilled in both the nostrils for vasoconstriction of nasal passage to facilitate passage of fiberoptic bronchoscope (FOB) without mucosal injury. The patient's airway was anesthetized by application of lignocaine 2% jelly in the nostrils and lignocaine spray (10%). Oxygen was administered via oxymask at a rate of 2 L/min. Patient was administered 2 mg midazolam and 60 mcg fentanyl i.v. to allay anxiety and for mild sedation. After explaining to the patient, the bronchoscope was inserted through one of the nostrils and advanced towards laryngeal inlet. Laryngeal and esophageal openings were visualized side‐ by‐ side with the laryngeal inlet on the right side. Patient was instructed to take deep breaths to facilitate identification of the airway. The scope was negotiated through the vocal cord, the insertion of the FOB was difficult beyond the cord due to deviation and significant narrowing of trachea (Figure 3). The finding consists of loss of normal semicircular shape of tracheal lumen, forward ballooning of posterior membranous wall and anterior-posterior narrowing of tracheal lumen there was constriction of nearly 1.5cm length of trachea. Then FOB was loaded with a 6.0 mm armored endotracheal tube. The fiberscope was advanced and positioned above the carina. Lignocaine 2.0% was administered via the drug port of the FOB, as and when required, to facilitate passage of FOB. Endotracheal (ET) tube was then threaded over the FOB, and the FOB removed. Eighty mg Propofol was administered prior to railroading the ET tube through the vocal cord to attenuate the laryngeal and tracheal reflex. The breathing circuit was attached, and the tube placement was confirmed by movement of reservoir bag and capnography. Sevoflurane inhalation was started. 150 mcg of fentanyl and 5 mg vecuronium were administered intravenously. The ET was firmly secured, and anesthesia was maintained with O2 in N2O and sevoflurane, vecuronium, and fentanyl. Total 400 mg lignocaine was given to the patient. Right hemithyroidectomy was performed. Intraoperatively there was soft floppy trachea on palpation after withdrawing endotracheal tube for a short distance and obstruction of spontaneous respiration at time of gradual withdrawal of ET tube. The patient remained hemodynamically stable throughout the procedure. Post‐ procedure, patient was not extubated in view of tracheomalacia and localised oedema due to surgery. Intravenous steroids administered to control localized edema due to surgery. On postoperative day 2, after patient was maintaining blood gases on "T – piece trial," tracheal tube cuff was deflated and leak test was performed. Leak was demonstrated around tracheal tube after deflation, so it was considered safe to extubate the patient. The patient was planned to extubate in ICU under direct vision using FOB, so that during extubating if any problem occurred, airway obstruction could be avoided by placing the ET-tube to its original position. After connecting oxygen to the side port of FOB, the FOB was passed through the ET-tube till the carina and then slowly withdraw to visualize the end of ET-tube. During extubating it was evident from the FOB view that there was no tracheal indrawing nor collapse of trachea. The distorted anatomy of trachea was seen, there was indentation on the right side but the airway patency was maintained. The ET-tube was slowly withdrawn so-that the trachea was seen along the course as extubating was done. After extubating the patient was observed for stridor and respiratory distress for 24 hours in ICU before being shifted to ward. Postoperatively patient managed with propped up position with slow and careful feeding to prevent aspiration, for prevention of cough patient nebulized with humidified normal saline, solution. To prevent GERD patient was on PPI.

Figure: 1

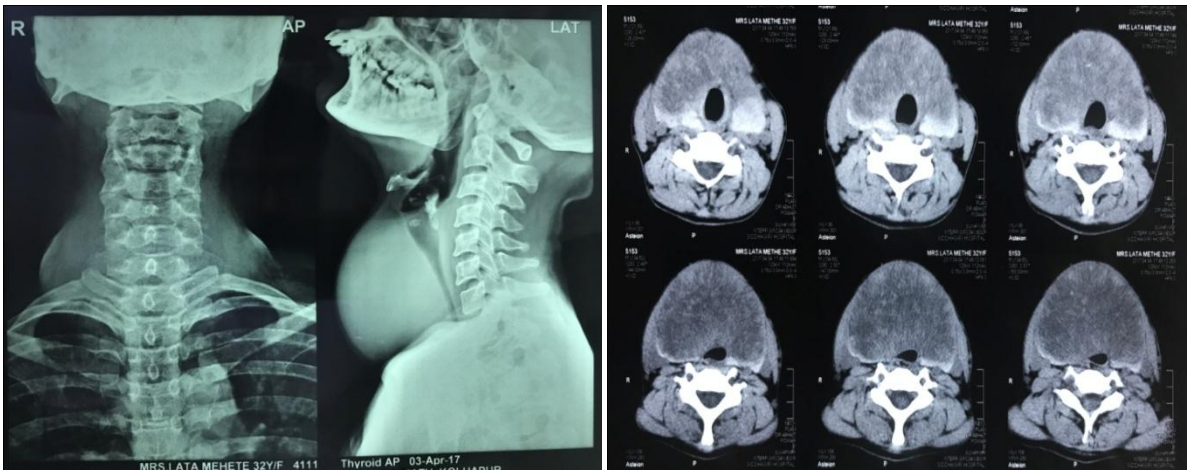

Figure: 2a,2b

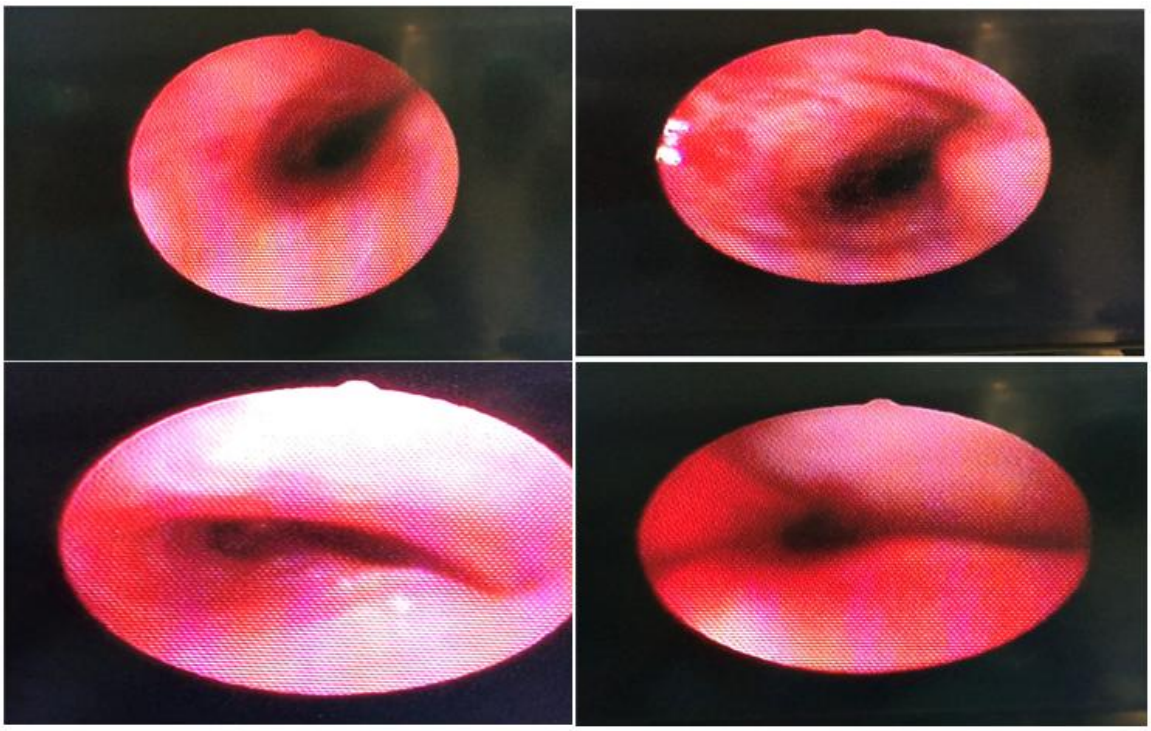

Figure 3.

III. Discussion:

The choice of surgical procedure for symptomatic benign nodular goitre is still controversial. Some surgeons prefer a hemithyroidectomy or subtotal thyroidectomy. However, after these procedures the need to re-operate may arise due to the recurrence of symptomatic benign nodular goitre. Preoperative hyperthyroidism, toxic nodular goitre and a definitive pathological diagnosis of nodular hyperplasia were found to be associated with progression of remnant nodules after hemithyroidectomy[9]. Unilateral resection is often chosen to limit post-operative complications and to avoid lifelong hormone replacement therapy, while bilateral resection may be preferred to limit the risk of recurrence. In a study found that there was no significant difference in the rate of MNG recurrence between the two operations. Transient post-operative complications occurred more frequently following bilateral resection, however, there was no difference in the rate of permanent complications between the two operations. In addition, far fewer patients required thyroid hormone replacement after unilateral resection. Levothyroxine was necessary post-operatively in 14–30% who underwent unilateral resection. Conversely, all patients undergoing bilateral resection require thyroid hormone replacementpost-operatively to prevent hypothyroidism. Levothyroxine requires regular check-ups and occasional medication adjustments, and overdosing may cause patients to experience side effects such as atrial fibrillation, osteoporosis, and osteopenia. Given the possible negative effect on patientsquality of lifeas well as the increased cost of treating postoperative

hypothyroidism, avoiding the need for thyroid hormone replacement may be ideal. The recurrence rate for patients with unilateral thyroidectomy has been reported to be between 1.5–34% in previous studies and recurrence rate for bilateral thyroidectomies is 0.5–3%. Post-operative complications after unilateral thyroidectomy previously reported between 2–3% and for bilateral resection is 5-33% [11,12]. The difference can be attributed to higher incidences of transient complications following bilateral resection, as the rates of permanent complications from each operation were not statistically different. Interestingly, there was no significant difference in the rates of recurrence between the two operations[13]. In a study in India, an area of endemic goiter, review of 900 thyroidectomies for goiter revealed a 1.9% incidence of airway collapse related to tracheomalacia[14].With regards to the degree of airway stenosis, a collapse of <50% is within normal limits, 50-75% is mild, 75-90% is moderate and 91-100% (close proximity of the posterior membrane to the anterior luminal surface) is considered to indicate severe malacia[15].Stridor becomes evident only when the tracheal diameter is reduced to less than 3.5 mm, and it signals critical functional obstruction[16]. The pathological findings described in children with TBM include hypoplasia and atrophy of longitudinal elastic fibers of the pars membranacea along with fragmentation of tracheal cartilage[17,18]. Whether similar histopathological findings may explain the pathogenesis of acquired TM (tracheomalacia) in adults remain unanswered [19].Although the techniques and criteria for the diagnosis of tracheomalacia are not standardized, thorax CT and bronchoscopy are the preferred methods in previously published studies [20-22].So surgical approach to such cases requires careful preoperative evaluation and planning. Each case is dealt with differently and the technical difficulties both surgical and anaesthetic must be anticipated in order to minimize perioperative morbidity and mortality. Usual preoperative criteria used for difficult intubation in general population e.g. mouth opening < 35mm, Mallampatti III or IV short neck, neck mobility <80 degrees, thyromental distance < 65 mm and a retrognathic mandible were significantly reliable in univariate analysis as risk factor for difficult intubation [23]. There is no single fool proof criterion for confirming a diagnosis of tracheomalacia. However, for the intraoperative diagnosis of tracheomalacia, criteria are: (1) Soft and floppy trachea on palpation by the surgeon at the end of thyroidectomy while gradually withdrawing the tube for a short distance and then feel the tracheawithout the tube in-situ to know an obvious collapse of the tracheal wall. (2) Obstruction to spontaneous respiration during gradual withdrawal of the ETT after thyroidectomy. (3) Difficulty in negotiating the suction catheter beyond the ETT after gradual withdrawal. (4) After closure of the wound, tracheomalacia can be suspected (a) if there is absence of peri tubal leak on deflation of ET cuff, (b) volume pressure loop on ventilator or (c) development of respiratory stridor along with a falling hemoglobin oxygen saturation (SpO2) on pulse oximetry despite the administration of increasing FiO2. Asymptomatic patients require close observation without treatment, and there is no uniform standard treatment for patients with the severe form of the disease. Generally, patients are treated on an individual basis. It has been suggested that leaving the endotracheal tube in place for 24–48 hr postoperatively to serve as a splint before extubating in a controlled setting can be successful in many cases [24].It is possible that repeated exposure of tracheal tissue to an acid milieu and digestive enzymes from GERD might alter the matrix protein structure, resulting in reduced tensile strength of tracheal tissue, leading to severe TM [19]. In this setting, alterations in mechanical forces induced signaling mechanisms in maintaining the plasticity and structural organization of airway smooth muscle of the trachea may be important [19].The efficacy of corticosteroids for the treatment of tracheomalacia has not been scientifically proven.Intravenous methylprednisolone can also be used to reduce laryngeal edema likely to develop after extensive neck clearance in malignancy. Surgical treatments, including stent implantation [25,14], tracheostomy tube insertion [27] and the external tracheal stabilization technique [26], are generally restricted to patients **with localized disease** and thus require careful consideration. Constant change in size and shape of the airway predisposes to stent migration and fracture. This makes appropriate selection of the type and size of airway-stent difficult [25]. Temporary tracheal stenting can be beneficial in select patients. Intratracheal stents are divided into two major types: silicone stents and shape-memory alloy stents. Silicone stents are easily implanted and removed, but have complications including infection, expectoration and the tendency to undergo migration (new onset cough) due to excessive laxity of tracheal supportive tissue [28]. The above-mentioned limitations of silicone stents are overcome by shape-memory alloy stents. Shape -memory alloy stents for patients with large airway compromise secondary to benign airway diseases for whom other medical comorbidities contraindicate surgery. Once deployed, they are difficult to remove, are associated with significant complications and require prospective bronchoscopy surveillance and often further therapeutic intervention [29]. However, use of these in benign airway stenosis is controversial since they are known to be associated with complications, including restenosis, the excessive growth of granulation tissue and stent migration. To the best of our knowledge, airway infection is one of the factors leading to the aggravation of adult tracheomalacia and is difficult to control in a short period of time. Chinese Li's metallic stents not only have the advantages of traditional memory-alloy stents but may also be adjusted and removed before the hyperplasia of granulation tissue occurs (usually at 3 weeks) due to the unique design of a double recycling line at both ends of the stent [28]. Artificial **tracheal transplant** may be a future consideration for Severe TM [19].Patients with **diffuse tracheobronchomalacia** when their collapse is complete

and extends over the entire trachea. Surgical therapy consists of restoring the convex cartilage horseshoe shape by reefing and supporting the membranous wall with polypropylene mesh [27].

IV. Conclusion:

In conclusion, patients that had unilateral resections endured less post-operative complications than those who had bilateral resections, even though their risk of permanent complications was similar. The risk of recurrent goiter was also similar after either operation. In addition, the large majority of patients with unilateral resection avoided lifelong thyroid replacement therapy, while this therapy was necessary in all patients after bilateral resection. Therefore, although bilateral resection should remain the standard surgical intervention for bilateral MNG, unilateral, benign MNG be treated with unilateral resection. The surgical approach to such cases requires careful deal and the technical difficulties both surgical and anaesthetic must be anticipated in order to minimize perioperative morbidity and mortality. FOB is considered a gold standard in these situation. In spite of the technical challenge, surgery continues to be the best option particularly in experienced hands due to its distinct advantage of immediate effect and complete resolution of compressive symptoms. There may be no need of elective tracheostomy after thyroid surgery, if patients are carefully monitored in the immediate postoperative period. Fibre-optic bronchoscopy and / or fibre-optic intubation is indicated in goitre when tracheal deviation and clinical symptom of tracheal compression and/or stenosis are present.

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