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Research Article

Laryngotracheoplasty for Laryngotracheal Stenosis Post Intubation and Post Tracheostomy: A Case of Stenting with Airway Exchange Catheter

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Abstract

Objective: To report a case of Laryngotracheoplasty with costal cartilage augmentation and stenting with airway exchange catheter.

Case report: We received a 27 year-old man with past medical history of asthma and cerebral malaria managed by intubation and tracheostomy for assisted ventilation. The lung specialist for suspicion of laryngotracheal stenosis referred him. At presentation, he was complaining of noisy breathing with respiratory difficulty mistaken for asthma. Computed tomography found laryngotracheal stenosis of 19 mm long and 6 mm thick with a distored cricoid cartilage with partial erosion Flexible laryngoscopy showed normal mobility of vocal folds and a grade III subglottic stenosis. Emergency tracheostomy was performed for moderate to severe dyspnea. Posterior cricoid split with costal cartilage augmentation and stenting was performed. Because Montgomery T-tubes were not available, we used a fashioned airway exchange catheter as a stent. Post recoveries were marked by infection and mucus plugging in tracheal cannula. Stent removal was done 2 months later with decannulation the same day. Follow-up was achieved for 18 months without re-stenosis.

Discussion: Prolonged intubation and high tracheostomy may cause laryngotracheal stenosis. In this case, both mechanisms were involved. Symptoms like stridor and wheezing can led to misdiagnose laryngotracheal stenosis as asthma. Abnormal pulmonary function tests and absence of improvement through asthma treatment raised suspicion of obstruction. Laryngoscopies (indirect and direct) give the diagnosis and assess the grading of stenosis. Only CT scan can show other stenosis. This case associated subglottic and tracheal stenosis. Laryngotracheal reconstruction with free costal cartilage graft was our surgical option with using of airway exchange catheter as a stent. Decannulation was successfully achieved.

Conclusion: Laryngotracheal stenosis is a complex issue with difficulty in management. Various surgical options are available. Proper selection of surgical technique in each clinical setting is the key for successful outcome.

Keywords: Laryngotracheal stenosis; Laryngotracheoplasty; Cricoid cartilage; Prolonged intubation; Tracheostomy; Stent; Airway exchange catheter

Introduction

Laryngotracheal stenosis is defined as a partial or complete cicatricial narrowing of the endolarynx or trachea [1]. The complexity of the region which contains delicate structures such as vocal cords, recurrent laryngeal nerve which coordinate the functions of respiration, deglutition and phonation make of the laryngotracheal stenosis, a difficult entity to manage [2]. Laryngotracheal stenosis is most frequently secondary to prolonged intubation/tracheostomy with assisted ventilation [3].

This case-report dealt with laryngotracheal stenosis post prolonged intubation and post tracheostomy management by Rethi's technique and stenting with airway exchange catheter. Rethi's technique was introduced in Senegal by Professor Gilbert Chantrain (Belgium) in 2013 for bilateral vocal cord paralysis post thyroidectomy with use of airway exchange catheter as a stent because Montgomerry T-tube was not available.

Case Report

Presentation and investigation

A 27 year-old patient was admitted to our ENT Department in April 2014 with history of asthma and cerebral malaria managed in 2012 in another hospital. During his previous admission, he stayed in the intensive care unit for 2 months. Where he underwent prolonged oral endotracheal intubation for 30 days followed by tracheal intubation through tracheostomy for 30 days before decannulation and discharge. A year later (2013), he complained of noisy breathing and recurrent respiratory difficulty mistaken for asthma attack. Chest X-ray revealed hyper inflated lungs (Figure 1). Pulmonary function tests revealed severe restriction and he was given salbutamol 4 mg and cetirizine 10 mg daily. Because there was no improvement under treatment, the lung specialist asked for a neck and chest CT scan. Computed tomography found subglottic and tracheal stenosis measuring 19 mm long and 6 mm thick and distored cricoid cartilage with partial erosion (Figures 2a, 2b, 2c, 2d). When he came to our clinic in 2014, he was complaining of noisy breathing, dyspnea and use of accessory muscle of respiration with retraction at suprasternal notch. Flexible nasopharyngolaryngoscopy at office showed normal mobility of vocal cords and no supraglottic stenosis and grade III subglottic stenosis. Then, laryngotracheal stenosis due to prolonged intubation or tracheostomy was suspected.

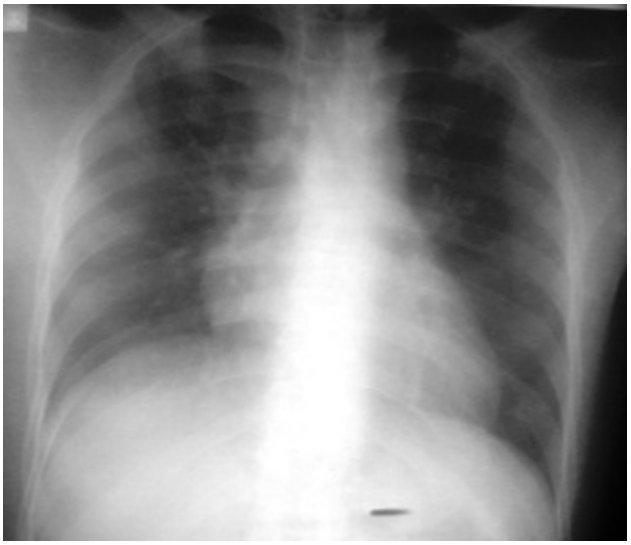

Figure 1: Chest X-ray postero-anterior view showed hyper inflated lungs (before tracheostomy).

Figure 2a: Axial view of subglottic stenosis (grade III Myer-Cotton) Narrowing of the airway by fibrosis and edema with a distored cricoid cartilage with erosion (arrow).

Surgical approach

Emergency tracheostomy was performed under local anesthesia. Since laryngotracheal stenosis was diagnosed, we decided to perform direct laryngoscopy and Laryngotracheoplasty according to Rethi's technique, under general anesthesia. In our condition of practice marked by unavailability of conservative treatments (dilatations, laser) only laryngotracheal reconstruction or Resection-Anastomosis were possible. Subglottic stenosis precluded end-to-end anastomosis. The sole option remaining was Laryngotracheoplasty with free costal graft and stenting. Moreover, Montgomery –tube was not available and then an airway exchange catheter was used as a stent. Pre-operative assessment including routine blood investigations (hemogram, coagulogram and renal function tests), radiological investigations (Chest X-Ray postero-anterior view) were performed. Blood tests were normal and Chest X-ray after tracheostomy was normal (Figure 3).

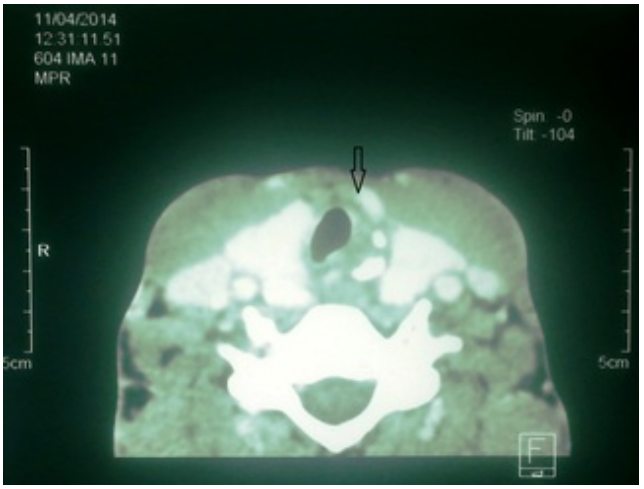

Figure 2b: Axial view of tracheal stenosis. Narrowing of tracheal lumen with edema and fibrosis on the left and posterior wall at the level of first tracheal ring (arrow).

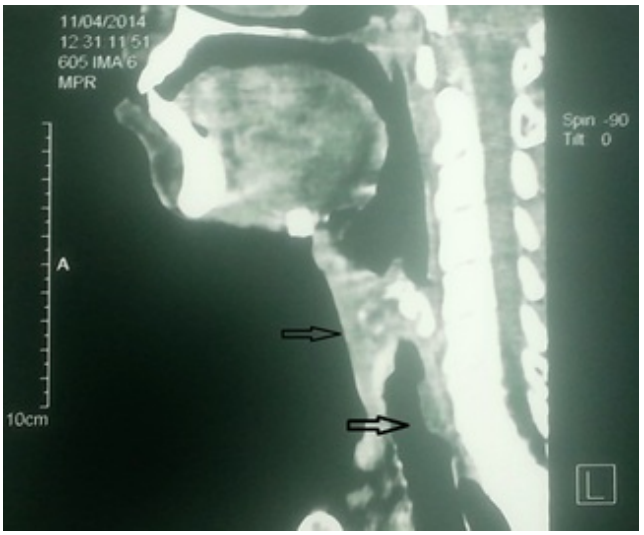

Figure 2c: Parasagittal view of laryngotracheal stenosis (grade III Myer-Cotton) Arrow above: Laryngeal stenosis with laryngeal fibrosis and edema with a distored cricoid cartilage Arrow below (in bold): Tracheal stenosis with mucosal granuloma of posterior wall.

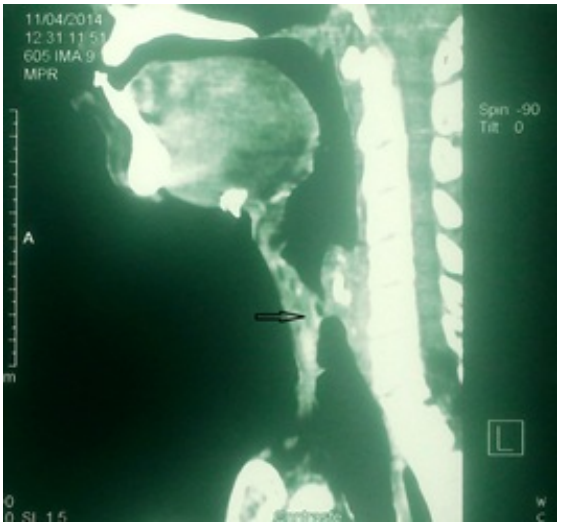

Figure 2d: Parasagittal view of laryngotracheal stenosis (sub glottis stenosis: arrow)

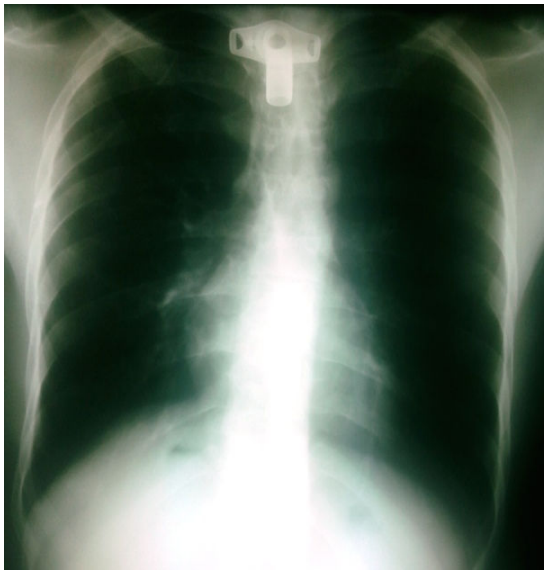

Figure 3: Normal Chest X-ray Postero-Anterior view after tracheostomy

On November 2014, the procedure was performed. After direct laryngoscopy showing subglottic stenosis and placement of nasogastric feeding tube, laryngofissure and anterior cricoid split was done. Ablation of granulation tissue above stoma was achieved by electro cautery before posterior cricoid split. Free costal cartilage graft was harvested from fifth anterior costal arch and fashioned with conservation of perichondrum. After fixing the rib cartilage graft with two transfixiant needles to the distracted ends of posterior cricoid lamina (Figure 4), an airway exchange catheter of suitable size previously fashioned and sterilized was use as a stent to stabilize graft. The cannula was placed through an anterior opening of the stent to maintain it. Second direct laryngoscopy was done to assess the position of the stent below the vocal folds. A course of broad spectrum antibiotics for 10 days was given with corticosteroids and analgesic. Post recoveries were marked by mucus plugging in the tracheal cannula and infections that led to change the antibiotics and to clean impacted secretions. No esophageal perforation occurred. Eight weeks later, the stent was removed and decannulation achieved the same day (Figure 5). Appointments were scheduled every month with regular fiberoptic examinations. Last consultation was done in January 2016 and showed mobility of vocal cords, sub glottis augmentation and normal nasal breathing (Follow-up duration = 18 months) (Figures 6a and 6b).

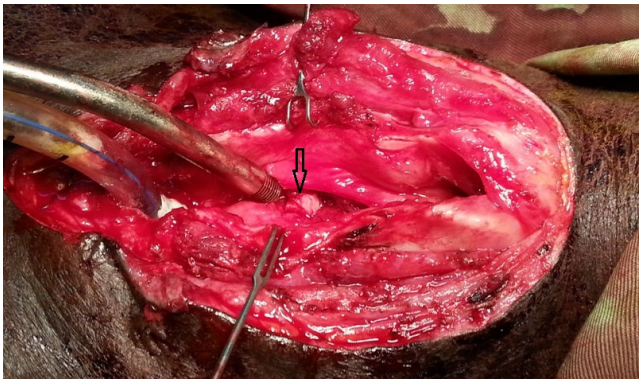

Figure 4: Laryngofissure, anterior and posterior cricoid split and augmentation with free costal cartilage graft inserted between the distracted ends of posterior cricoid lamina and maintained by two transfixiant needles (metallic suction tube and arrow showing the graft)

Figure 5: Tracheostomy cannula and stent (Fashioned airway exchange ventilation tube that was sectioned during ablation)

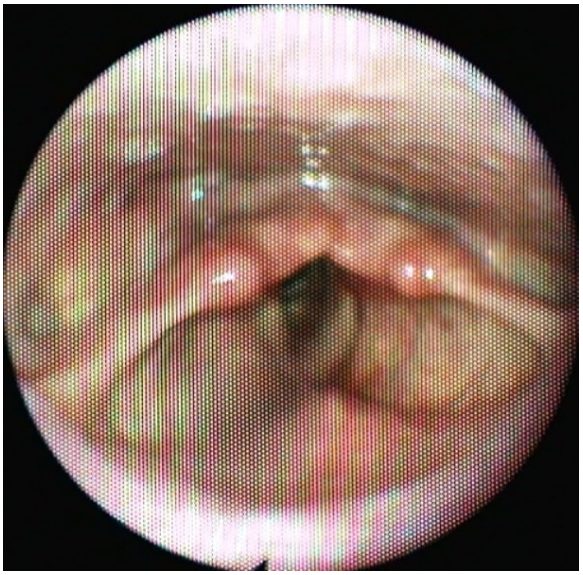

Figure 6a: Flexible laryngoscopy after laryngotracheal reconstruction (January 2016)

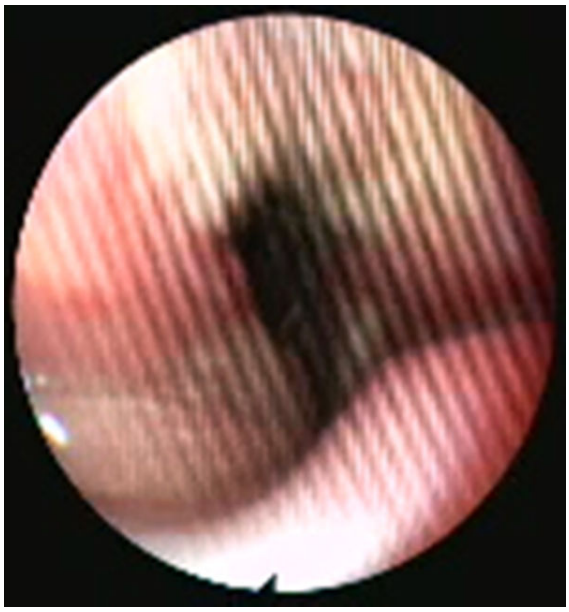

Figure 6b: Flexible laryngoscopy after laryngotracheal reconstruction (January 2016)

Discussion

Partial or complete narrowing of the subglottic area may be congenital or acquired. Laryngotracheal stenosis is most frequently secondary to prolonged intubation/tracheostomy with assisted ventilation [3]. Prolonged intubation can result in tracheal stenosis at various levels with the trachea [4]. The main risk factors associated with tracheal stenosis are the time spent intubated, tissue hypo perfusion and intubation related trauma [5,6]. The cause suggested by many authors is a tracheal localized ischemic necrosis and an excessive granulation tissue formation with process of scar contracture [7-10]. Tracheal stenosis following tracheostomy most commonly results from abnormal wound healing with excess granulation tissue formation around the tracheal stoma site; excess granulation tissue can also develop over a fractured cartilage, which can occur during the tracheostomy procedure [3,11-13]. In this case report the patient presented both conditions (prolonged intubation, tracheostomies). Without an appropriate index of clinical suspicious, symptoms of laryngotracheal stenosis are frequently mistaken for asthma [14]. Upper airway obstruction classically produces stridor; however wheezing is almost as commonly the presenting symptom [15]. With history of asthma, our patient was easily misdiagnosed, that was why pulmonary function tests were asked. Once suspected, laryngotracheal stenosis can be easily diagnosed with flow-volume loop testing [16]. With a past medical history of prolonged intubation and tracheotomy and pulmonary function testing showing severe restriction, the lung specialist highly suspected laryngotracheal stenosis with our patient and referred him to our clinic. Presurgical evaluation mainly included flexible fiberoptic office laryngoscopy to assess site, grade of stenosis, vocal cord mobility and X-ray soft tissue neck [17]. Computed tomography of the Neck with virtual bronchoscopy whenever required assess cartilaginous framework, length of stenosis [18]. Our patient underwent both fiber optic nasopharyngolaryngoscopy and direct laryngoscopy that found normal motility of vocal folds and sub glottis stenosis coted Grade III. According to the Myer-Cotton grading system, grade III lesions have 71% to 99% obstruction [19]. Only CT scan showed us the tracheal stenosis at the level of stoma site and assessed cartilaginous frame with erosion of cricoid lamina. Conservative treatments may be carried out for stenosis smaller than 1 cm in the length with no circumferential scarring and no loss of cartilaginous support [20]. Successful restoration of the subglottic airway by posterior cricoid split and costal cartilage augmentation has been well documented in the literature [21,22]. The other particularity of this procedure was the unavailability of Montgomery T-tube. Stenting with a fashioned and sterilized airway exchange ventilation tube was original. Stents have been proposed to protect laryngeal patency from the contracture of scar tissue, to promote the development of a new epithelial cover and to prevent mechanical disruption caused by the movements of swallowing and breathing during healing [23,24]. Duration of stenting is a very controversial issue; Evans [25] suggested removal of the silastic sheet in 6 weeks. Removal of stent was done after 8 weeks with decannulation of the patient. Decannulation and closure of a preliminary tracheotomy is another goal of modern therapy addressing airway stenosis [26]. No complication related to the procedure occurred such esophageal perforation. Major complications were due to infection and impacted secretions that were managed through antibiotic therapy and suction. Follow-up remained critical in order to early diagnose re-stenosis. In our case-report, follow-up was 18 months and was satisfactory with no re-stenosis.

Prevention post intubation stenosis is possible to a large extent by use of high volume, low pressure cuffs [27]. Beside High tracheotomy should be avoided as far as possible to prevent post tracheostomy stenosis [28].

Conclusion

Laryngotracheal stenosis is a challenging problem in the field of laryngology. Various surgical options are available. Proper selection of surgical technique in each clinical setting is the key for successful outcome. This case-report emphasized in all these features and was remarkable because of the use of airway exchange ventilation tube as a stent.

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