Anaesthetic considerations for tracheal resection in oncological thyroid surgeries

INTRODUCTION

Thyroid cancers infiltrating the trachea are uncommon, and management of these cases is challenging, requiring skilful anaesthesia and surgery.[1] Most patients with thyroid cancers have well-differentiated histology, and they carry an excellent prognosis. However, a small subset of patients has extra-thyroid spread. Involvement of trachea occurs in about 1/3rd of locally advanced thyroid cancers. In well-selected patients, complete excision of the disease with good pre-operative, intra-operative and post-operative care can provide long survival and good palliation.

METHODS

This is a retrospective report of 10 cases of thyroid cancers infiltrating trachea and subjected to thyroidectomy. Routine investigations including lateral neck X-ray, indirect laryngoscopy, two-dimensional echocardiogram and thyroid function test were done. Indirect laryngoscopy and fine-needle aspiration cytology (FNAC) were done in all the patients.

Premedication with anxiolytics was deferred until the patients were in supervised surroundings of the operating room. Patients were monitored with electrocardiogram, SpO_2, end-tidal carbon dioxide monitoring, non-invasive blood pressure, temperature, neuromuscular monitoring and urine output. Difficult airway cart and tracheostomy set were kept ready. In seven patients, planned awake fibreoptic intubation was done as tracheal involvement was diagnosed pre-operatively. All lesions were either high or mid tracheal lesions. Injection midazolam 0.05 mg/kg intravenous (i.v.), oral local anaesthetic gargling, nebulisation with 5 ml of 4% lignocaine were given. The fibreoptic scope was passed through the nasopharynx and larynx lesion assessed and then the patient was intubated. In every case the fibre optic bronchoscope was navigated past the involved tracheal segment to reach the distal normal trachea. The endotracheal tube was advanced over bronchoscope into the distal trachea.

Remaining three patients were induced with injection fentanyl 1.5 μg/kg, injection propofol 2 mg/kg and suxamethonium 2 mg/kg i.v. and were naso-tracheally intubated as tracheal resection was decided intra-operatively. After intubation, deep level of anaesthesia was maintained with fentanyl, oxygen, nitrous oxide, isoflurane and vecuronium with neuromuscular monitoring and intermittent positive pressure ventilation (IPPV).

After resection of tumour distal tracheal intubation and IPPV technique was followed and to facilitate anastomosis intermittent apnoeic technique was instituted. After completion of surgery neuromuscular blockade was reversed, and the endotracheal tube with a cuff deflated was kept *in situ* for 24 h. in anticipation of intra/extra tracheal oedema secondary to resection. The neck was kept flexed with the help of a chin stitch and maintained with special care. After 24 h. patients were extubated with tube exchanger *in situ* in the operation theatre.

RESULTS

There were 7 males and 3 females. The mean age was 54 years (range 45–65 years). All patients presented with swelling in the neck. Five had breathlessness, 4 had hoarseness of voice and 1 patient had dysphagia. In one patient chest X-ray revealed solitary pulmonary metastasis. FNAC revealed papillary carcinoma in 8 patients and poorly differentiated in the other two. All patients underwent total thyroidectomy with a central compartment clearance. Unilateral functional neck dissection was done in two patients and bilateral functional neck dissection in one patient. Tracheal segmental resection (3–5 rings) and end to end anastomosis was done in all patients.

On indirect laryngoscopic examination the vocal cords were fixed in 1 patient, showed restricted movements in 4 patients and were normal in 5 patients. Seven patients in planned tracheal resection group underwent additional specific investigations namely contrast-enhanced computed tomography (CT) scan of neck and thorax, bronchoscopic evaluation and pulmonary function test (PFT).

We did not encounter any major intra-operative complications. None of the patients required a tracheostomy. In one patient, accidental extubation of proximal endotracheal tube had occurred. A sterile bougie was passed, and the tube was railroaded

on it. Another patient developed chyle leak in the post-operative period, which resulted in septicaemia and death after 3 weeks. One patient who had vocal cord palsy transiently had symptoms of aspiration. She underwent percutaneous endoscopic gastrostomy to tide over aspiration/aspiration risk.

DISCUSSION

The overall goal for anaesthesia for tracheal resection and reconstruction is continuous management of compromised airway and an awake co-operative patient at the conclusion of the procedure.[2] Difficult airway has to be anticipated and managed.[3,4]

Pre-operative evaluation should be comprehensive; history and progression of exertional dyspnoea suggest narrowing of tracheal diameter to 50% or 8 mm. Inspiratory stridor at rest indicates a further reduction of tracheal diameter to 5–6 mm.[5]

A few specific investigations contribute significantly to pre-operative assessment in patients for tracheal resection. Bronchoscopy defines nature of lesion, length, location and degree of obstruction. CT scan provides detailed information about minimal tracheal diameter and involvement of adjacent structures. It is a useful adjunct to assess extra tracheal or extra-bronchial involvement by the tumour as well as oesophageal and mediastinal invasion. PFT predicts the likelihood of post-operative ventilation in the setting of pulmonary dysfunction.[5] Flow volume loops in particular assess and define the obstruction – intra-thoracic, extra-thoracic or variable.

Examination of neck mobility pre-operatively is very significant. Trachea can become mediastinal or cervical with flexion and extension respectively. The use of neck extension and flexion facilitates surgical exposure and post-operative healing.[2]

Tracheal resection and reconstruction is contraindicated in patients with pulmonary dysfunction severe enough to likely require post-operative ventilator support. This is because prolonged positive pressure ventilation and cuff in the area of anastomosis can result in dehiscence. Steroid dependence and history of radiation therapy to the neck is a relative contraindication to tracheal resection.

In our institute, we follow distal tracheal intubation and IPPV. The course of anaesthesia was divided into five phases.[5] (1) Induction and intubation-a critical period, (2) dissection a period of relative calm during which lesion is defined, (3) open airway, a critical period in which anastomosis is being constructed and airway is intubated across the field, (4) closure and emergence and (5) extubation-a critical period during which the reconstructed, potentially oedematous airway is extubated.

Once the trachea was transected by the surgeon, the proximal endotracheal tube was pulled back slightly but still kept in trachea [Figure 1].[6] Before pulling the tube surgeon was asked to pass surgical tape through Murphy's eye[7] and the endotracheal tube was secured to avoid accidental extubation. Then, a new and sterile armoured endotracheal tube was inserted by the surgeon through the open end of the trachea. IPPV was resumed through the armoured tube. Once the diseased tracheal segment was excised, end to end anastomosis was carried out. For this stage of surgery short intermittent apnoeic technique was used during which the armoured tube was removed intermittently to facilitate anastomosis. Pinsonneault states that there is no defined optimal apnoeic time. Patient should be receiving 100% oxygen to ensure an oxygen rich functional residual capacity, and vital signs should be observed closely.

In our case series, the maximum apnoeic time allowed was 3 min for anastomosis. In between apnoeic periods, patient was manually ventilated with 100% oxygen for 1–2 min to ensure pCO_2 within normal range. The neck was kept flexed during this part of surgery. Once all the sutures were in place, and the posterior membrane was securely anastomosed, the armoured tube was removed, and the proximal endotracheal tube was advanced into the trachea beyond the anastomosis.

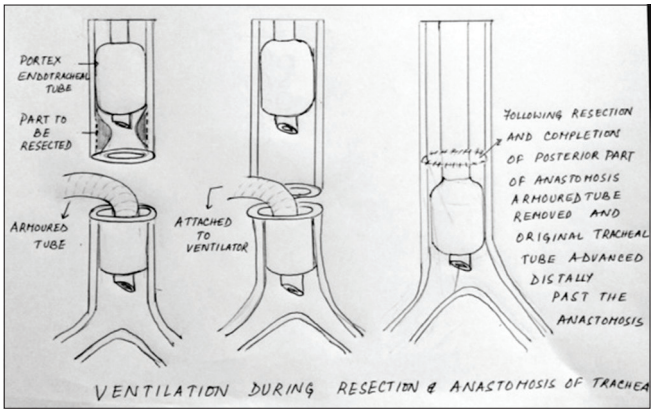

Figure 1: Ventilation during resection and anastomosis of trachea

IPPV through naso-tracheal tube was resumed. The surgeon then tied the remaining sutures anteriorly.

Emergence and extubation was potentially the most critical period of management. After neuromuscular blockade was completely reversed, endotracheal tube was maintained in position with cuff deflated for 24 h. As extra tracheal soft tissue oedema is one of the anticipated sequelae of extensive oncological surgeries. The neck of the patient was kept flexed with the help of a chin stitch. Stich was left for 7–10 days to avoid traction to anastomosis. Neck flexion was maintained with special care when transferring the patient with pillows kept the head. Post-operatively, humidified oxygen was delivered.After 24 h, patients were extubated with the tube exchanger *in situ* in the operation theatre None of the patients required re-intubation or tracheostomy.

CONCLUSION

Tracheal resection and reconstruction is a challenging operation for anaesthesiologist largely because the airway itself is abnormal and precariously controlled during anaesthetic induction, during construction of the anastomosis and at emergence. Distal tracheal intubation and IPPV is a simple technique which provides a good control of airway, clear surgical field and adequate oxygenation with minimum complications.

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