Case Report | Journal of Anaesthesia and Critical Care Case Reports | 2022 January-April; 8(1): 06-08

Anaesthetic Management of Carinal Tumour Using Cross-table Ventilation

Kavya Goel[1], Atul Bansal[1], Alok Basu Roy[1], Anurag Chaturvedi[1], Naveen Gupta[1]

Abstract

This case report describes a rarely used and described technique of cross-table ventilation which was successfully used in a case of carinal reconstruction surgery for a patient diagnosed with a breast tumour and carinal adenocarcinoma. She was planned for left modified radical mastectomy and carinal and right main bronchus sleeve resection with carinal reconstruction. After resection of left bronchus, a sterile flexometallic endobronchial tube was inserted into the left main bronchus and a sterile circuit attached. Surgery was uneventful and patient extubated successfully on third postoperative day. The choice to not insert a double lumen tube and ensure best possible access to surgeon for a thorough removal of the tumour ended up providing the best outcome for the patient.

Keywords: Carinal tumour, Cross-table ventilation, One lung ventilation

Introduction

Anaesthetic management of carinal tumours are challenging due to the shared airway and use of one lung ventilation. Intratracheal tumours further increase difficulty in establishment of a patent airway before commencement of surgery. The primary concerns are maintaining oxygenation and ventilation in the face of an open airway [1]. This case report describes a rarely used and described technique of cross-table ventilation which was successfully used in a case of carinal reconstruction surgery.

Case Presentation

A 55 year-old-female of average height and weighing 58 kgs, presented with a lump in left breast and complaint of cough with expectoration for 2 years with orthopnoea and no history of haemoptysis. She had a history of pulmonary tuberculosis with cervical lymphadenitis 5 years before presentation for which she took anti tubercular therapy for 9 months with no other co-morbidities. Her general physical examination revealed a lump in left breast and normal respiratory functions. Chest X-ray was normal and all other preoperative investigations were within normal limit. Computed tomography was inconclusive hence a fibre-optic bronchoscopy(FOB) was done which revealed a carinal growth measuring approximately 4-5 mm in diameter with no obstruction to passage of either bronchus.

The breast lump was diagnosed as a ductal carcinoma in situ (DCIS) and the carinal tumour as adenocarcinoma on biopsies. The patient was thus scheduled for a left sided modified radical mastectomy (MRM) and a carinal resection with a right main bronchus sleeve resection following anastomosis of lower end of trachea with right main bronchus through a right thoracotomy approach. Preoperative preparation was initiated for surgery under general anaesthesia in the form of incentive spirometry, deep breathing exercises and thorough counselling regarding need for post-operative mechanical ventilation in an intensive care unit. A thorough preoperative workup was performed including blood gases, pulmonary function testing and stress echo to determine functional capacity which was found to be satisfactory.

After receiving 3 cycles of neoadjuvant chemotherapy consisting of carboplatin and paclitaxel, a comprehensive plan was made involving the onco-surgical and anaesthesia & intensive care teams and surgery was planned under general anaesthesia. Both surgeries were performed in a single sitting to decrease recovery time for the patient. Patient was nebulised with bronchodilators preoperatively as routinely practiced in our institute for airway surgeries. She was then taken up for the first part of the surgery which was the MRM. General anaesthesia was induced using standard agents and a supraglottic airway device (SAD) was inserted in order to prevent accidental stimulation or bleeding from the tracheal tumour during the initial surgical approach of MRM. A central venous catheter and an arterial cannula were inserted for invasive blood pressure and central venous pressure measurement. After completion of the MRM, the airway was intubated using a 6.5 mm internal diameter (I.D.) reinforced flexometallic tube advanced into the left main bronchus, confirmed by FOB. The patient was made left lateral for the right thoracotomy and one lung ventilation was initiated using low tidal volumes (250-280 ml) and high respiratory rate (20-25 breaths/minute) to avoid barotrauma and maintain a normal oxygen saturation(SpO_2). Right before resection of the lower trachea, the endotracheal tube was withdrawn till above the tumour and the left main bronchus was intubated through the operative field (cross-table ventilation) with a sterile, cuffed flexometallic endotracheal tube (6.0 mm ID) with a sterile connector/catheter mount/circuit and ventilation maintained with low tidal volume (250-280 ml), respiratory rate (20-25 breaths/min) maintaining an end tidal CO_2 ($EtCO_2$) 35-40 mmHg and minimum possible FiO_2 to maintain SpO_2 between 90-92%). During the anastomosis the endobronchial tube was

[1]Department of Anaesthesia, Max Super Speciality Hospital, Vaishali, Uttar Pradesh, India.

Address of Correspondence
Dr. Kavya Goel,
Department of Anaesthesia, Max Super Speciality Hospital, Vaishali, Uttar Pradesh, India.
E-mail: goel.kavya@gmail.com

Submitted: 21/03/2021; Reviewed: 18/04/2021; Accepted: 22/09/2021; Published: 10/01/2022

DOI: 10.13107/jaccr.2022.v08i01.193

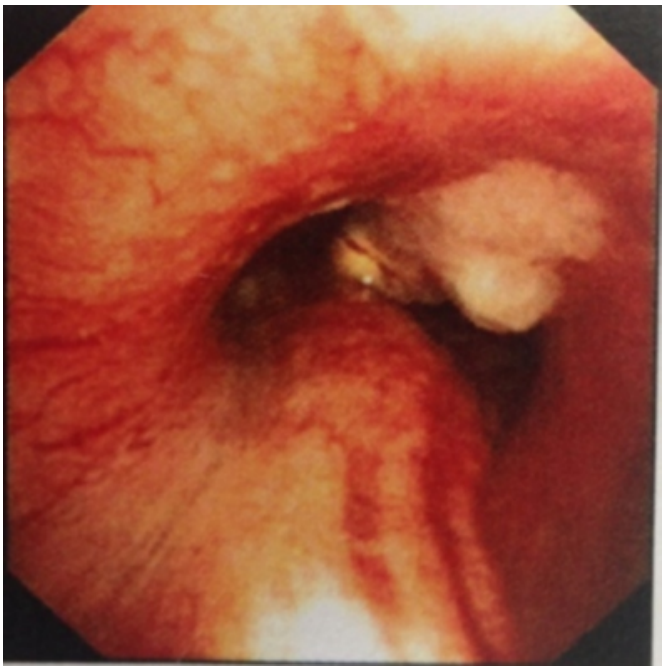

Figure 1: Bronchoscopic view

withdrawn and the patient was on apnoeic ventilation via continuous oxygen insufflation through the endotracheal tube for 90 seconds measured using a timer on the anaesthesia monitor. After the anastomosis, both lungs were ventilated using the endotracheal flexometallic tube with low pressures.

During the procedure a close co-operation existed between the anaesthesiologist and the surgeon. Serial Arterial blood gas analyses were done during the surgery which were normal. While on one lung ventilation we allowed a permissive hypercapnia with $PaCO_2$ of 48mmHg being the highest recorded while pH values ranged between 7.33-7.42. PO_2 was maintained above 100 mmHg using minimum possible FiO_2. During surgery a single episode of bradycardia and hypotension was noticed which was found to be due to pressure on IVC which was relieved by intermittent release of lung retractor.

Upon completion of the surgery, the patient was electively ventilated in the surgical ICU. She was started on NSAIDS and fentanyl intravenous infusion for pain relief which was tapered gradually and was successfully extubated on the third post operative day uneventfully. The delayed extubation was a result of difficulty in weaning attributed to inadequate analgesia probably due to non usage of regional nerve block/ neuraxial techniques which were avoided due to patient apprehensions. Aggressive physiotherapy was done for early recovery and patient was discharged on 21st post operative day.

Discussion

Primary tumours of trachea are relatively uncommon and account for less than 0.1% of all tumours which can be benign or malignant, presenting as a therapeutic challenge to the clinician [2]. There are chances of misdiagnosis of benign tumours with chronic lung disease or asthma. Malignant tumours however are usually diagnosed earlier due to more worrisome symptoms like haemoptysis [3]. Most of the primary tracheal tumours are malignant, generally squamous cell or

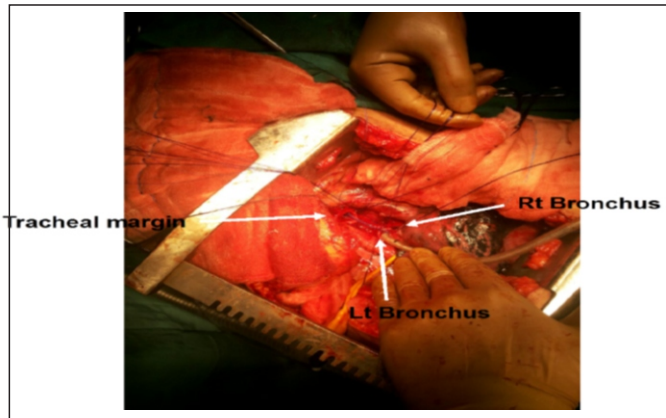

Figure 2: Cross table ventilation

adenoid cystic carcinomas and comprise 75% of all the tumours of trachea [4]. Tracheal resection and reconstruction with primary anastomosis is the definitive treatment for managing tumours of trachea [5].

The challenges faced by the anaesthetist include a narrowed airway diameter, shared airway with the surgeon, difficulty in maintaining of oxygenation and ventilation during tracheal resection and a need for early post operative extubation to prevent anastomotic leak, bronchopleural fistula, barotrauma etc. [6]. The options available for airway management and oxygenation and ventilation for these surgeries are: (i) intubation with a double-lumen tube, (ii) fiberoptic endobronchial intubation using a single-lumen tube, (iii) using a jet ventilator, (iv) Cross-field or cross-table ventilation (v) cardiopulmonary bypass (CPB) particularly during left thoracotomy approach [7, 8] and (iv) extracorporeal membrane oxygenation (ECMO).

Other options also include high frequency jet ventilation (HFJV) through the stenotic area, low frequency jet ventilation for stent insertion and high frequency positive pressure ventilation (HFPPV) [9, 10]. Since airway narrowing was not significant as evidenced by preoperative FOB, jet ventilation was not our primary mode of ventilation although it was kept on standby during the procedure in the event of a prolonged apnoea time. Use of ECMO despite showing good results [11] was rare in our institute hence was not preferred and CPB was avoided in view of increased morbidity related to the procedure [12]. Our decision to use a flexometallic tube instead of a double lumen tube (DLT) stems from an increased risk of trauma, possibility of obstruction of passage by the tumour and higher chances of injury to tumour and resultant bleeding. Use of cross-table ventilation was preferred by the surgeon as well as the anaesthesia team due to the presence of a good cooperation and communication between anaesthesia and surgical team, better ventilation as compared to HFJV or HFPPV and lesser morbidity as compared to a cardiopulmonary bypass. Our decision to electively ventilate the patient as opposed to extubation on table catered to the concern over extensive nature of surgery (including MRM), increased risk of airway reactivity and increased morbidity and mortality associated with reintubation if required. Apart from tumours, this method of airway management can be used for various tracheobronchial injuries and surgeries for tracheal stenosis [8, 13]. The authors recognised post-operative analgesia to be a major hurdle without the use of neuraxial or regional techniques such as use of thoracic epidural

analgesia, paravertebral block using single shot or continuous catheter technique or an intraoperative intercostal nerve block which has shown improvement in preserving effort dependent pulmonary function compared to narcotic analgesia [14].

Conclusion

The purpose of this case report is to share the implications involved in anaesthesia during the management of this particular case, which are not very common in day-to-day anaesthesia practice. Cross-table ventilation appears to be a valid, effective and moreover preferred mode of airway management in cases involving tracheobronchial and particularly carinal resections. It leads to improved patient outcome, minimal post operative complications and faster recovery.

Declaration of patient consent: The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given his consent for his images and other clinical information to be reported in the Journal. The patient understands that his name and initials will not be published, and due efforts will be made to conceal his identity, but anonymity cannot be guaranteed.

Conflict of interest: Nil **Source of support:** None

References

1. Wagh HD. Successful Anaesthetic Management of an Intra-tracheal Tumour. 2015;8(1):3.
2. Grillo HC, Mathisen DJ. Primary tracheal tumors: Treatment and results. The Annals of Thoracic Surgery. 1990 Jan;49(1):69–77.
3. Sammartino F, Macchiarini P. Primary tracheal tumors. Lung cancer New Jersey: Wiley. Wiley Online Library; 2014;267–77.
4. Azar T, Abdul-Karim FW, Tucker HM. Adenoid cystic carcinoma of the trachea. Laryngoscope. 1998 Sep;108(9):1297–1300.
5. Macchiarini P, Altmayer M, Go T, Walles T, Schulze K, Wildfang I, Haverich A, Hardin M, Force HIITT. Technical innovations of carinal resection for nonsmall-cell lung cancer. The Annals of Thoracic Surgery. Elsevier; 2006;82(6):1989–1997.
6. Grillo HC. Development of tracheal surgery: a historical review. Part 1: techniques of tracheal surgery. The Annals of Thoracic Surgery. 2003 Feb;75(2):610–619.
7. Hoetzenecker K, Klepetko W, Keshavjee S, Cypel M. Extracorporeal support in airway surgery. J Thorac Dis. 2017 Jul;9(7):2108–2117.
8. Sehgal S, Chance JC, Steliga MA. Thoracic Anesthesia and Cross Field Ventilation for Tracheobronchial Injuries: A Challenge for Anesthesiologists. Case Reports in Anesthesiology. 2014;2014:1–5.
9. Murthy T. Anaesthetic management of carinal resection and reconstruction–A case report. Indian Journal of Anaesthesia. Wolters Kluwer–Medknow Publications; 2009;53(3):340.
10. El-Baz N, El-Ganzouri A, Gottschalk W, Jensik R. One-lung high frequency positive pressure ventilation for sleeve pneumonectomy: an alternative technique. Anesthesia & Analgesia. LWW; 1981;60(9):683–686.
11. Petrella F, Salvi L, Venturino M, Alamanni F, Spaggiari L. Veno-venous extracorporeal membrane oxygenation tracheal sleeve pneumonectomy. Shanghai Chest. 2020;4:7–7.
12. Sarkar M, Prabhu V. Basics of cardiopulmonary bypass. Indian journal of anaesthesia. Wolters Kluwer--Medknow Publications; 2017;61(9):760.
13. Auchincloss HG, Mathisen DJ. Tracheal stenosis—resection and reconstruction. Ann Cardiothorac Surg. 2018 Mar;7(2):306–308.
14. Faust RJ, Nauss LA. Post-thoracotomy intercostal block: comparison of its effects on pulmonary function with those of intramuscular meperidine. Anesthesia and analgesia. 1976;55(4):542–546.

How to Cite this Article

Goel K, Bansal A, Roy AB, Chaturvedi A, Gupta N | Anaesthetic Management of Carinal Tumour Using Cross-table Ventilation | Journal of Anaesthesia and Critical Care Case Reports | January-April 2022; 8(1): 06-08.