Chapter 48
CT I

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Fig. 48.1 CT showing mediastinal mass causing deviation and crescentic compression of the trachea

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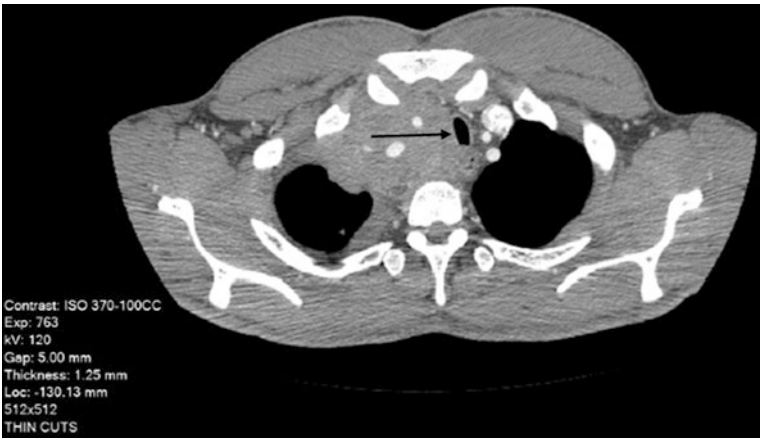

Fig. 48.2 CT showing mediastinal mass posttreatment with less deviation and loss of crescentic compression

A 58-year-old man with a diagnosis of Hodgkin's disease presents to the anesthesia preoperative clinic prior to placement of a port. He complains of mild difficulty in sleeping totally supine and clinically shows fullness of the veins of the neck. CT scan (Fig. 48.1) shows that he has a mediastinal mass with both tracheal deviation and crescentic compression.

1. What are the symptoms of a mediastinal mass?
2. What are the physical ramifications of a significant mediastinal mass on the airway?
3. What are the anesthesia considerations for a significant mediastinal mass?
4. What are techniques for the safe administration of an anesthetic for a significant mediastinal mass?

Answers

1. Symptoms of a mediastinal mass:
   (a) A mediastinal mass may be asymptomatic even when it reaches a significant size. It may be discovered during routine radiological testing for the disease causing the mass or just incidentally [1].
   (b) When the mass reaches a critical size within the restricted mediastinal space, it can cause signs and symptoms related primarily to the cardiac or pulmonary system. This can include diminished venous return via the superior vena cava (SVC) leading to fullness of the neck veins and in extreme cases cardiac dysfunction from direct compression. Respiratory symptoms could range from dyspnea, progressive orthopnea, voice changes (nerve palsy), and in late stages stridor.

2. Physical ramifications of the mediastinal mass on the intrathoracic airway:
   (a) Deviation of the trachea. This could include:
      - "C"-shaped bowing of the trachea
      - "S"-shaped trachea
   (b) Narrowing and invasion of the lumen of the trachea and/or major bronchus:
      - The trachea when externally compressed becomes crescentic as the membranous posterior wall is the first to collapse.
      - Narrowing can be a short segment or a long segment of the trachea.
      - Encroachment can be around the entire carinal trifurcation of the trachea.

3. Anesthesia considerations for a significant mediastinal mass:
   (a) Lack of symptoms should not be considered as reassuring. This is especially true with superior or anterior mediastinal masses. With spontaneous ventilation, the mechanics of thoracic cage cause a distracting force on the larger airways by maintaining the intrapleural pressure gradient, helping to maintain the patency of the lumen. The loss of bronchial tone due to general anesthesia can also decrease lumen size. Thirdly, the distension of the major airways will be diminished with smaller ventilatory volumes [2]. The loss of normal spontaneous ventilation during general anesthesia can thus precipitate intrathoracic airway obstruction in such cases with catastrophic results [3].
   (b) Once the airway has been secured, the anesthetic plan is determined by the surgery and patient's other comorbidities.
   (c) Placement of a regular endotracheal tube (ETT) in a trachea with "S"-shaped deviation can lead to the distal bevel end pushing up against the wall of the trachea leading to obstruction.
   (d) A smaller ETT size must be chosen against the measured diameter of the lumen by CT scan.
   (e) Securing the "lost" airway can possibly be done only by rigid bronchoscopy (RB).

(f) Long-segment tracheal narrowing is a cause for concern for ETT placement or for the performance of rescue rigid bronchoscopy.
(g) Extracorporeal oxygenation (ECO) which takes time with significant prior organization and access placement is the only rescue for loss of the intrathoracic airway with failed rigid bronchoscopy [4, 5].
(h) Significant and chronic tracheal compression can lead to tracheomalacia [6]. This weakness of tracheal wall and airway swelling due to the ETT in a narrowed lumen must be considered before extubation.
(i) Occlusion beyond the carina in one of the major bronchi is significant but less concerning than total tracheal obstruction.
(j) Intravenous lines should be placed in the lower extremities if the SVC is compromised.

4. Techniques for safe administration of anesthesia in a patient with a significant mediastinal mass:
   (a) Ascertain the significance of the mass and its encroachment of the airway preoperatively—this consultation should include the surgeon (and CVT surgeon), radiologist, and anesthesiologist [7]. The factors in risk assessment include symptoms, type of tumor, and airway compromise.
   (b) Many tumor masses will show amazing resolution with chemotherapy or radiation prior to surgery. The CT scan in the above patient was repeated after short definitive therapy and showed near-total resolution of tracheal deviation and compression (Fig. 48.2). This should be done if appropriate.
   (c) When feasible, consider avoidance of general anesthesia. In the case presented, if venous access for treatment was critically needed, this should be done under monitored anesthesia care (MAC). If SVC drainage is compromised, venous access should be secured in the lower extremity.
   (d) Even if MAC or regional anesthesia is considered, every precaution to prevent loss of spontaneous ventilation must be employed. Rigid bronchoscopy must be available in the OR.
   (e) If MAC or regional anesthesia is not feasible, the choices are maintenance of spontaneous ventilation with either an inhalational induction or perform awake fiber-optic intubation followed by general anesthesia with appropriate ETT placement. This should include proper selection of the appropriate ETT for size and made with reinforced material.
   (f) In cases of significant compromise or long-segment stenosis, awake fiber-optic intubation after placement of access catheters for extracorporeal oxygenation in the groin is warranted [5, 8]. In extreme cases of carinal encroachment, the patient can be placed on ECO and rigid bronchoscopy performed under TIVA for airway securement (personal experience).

   After the anesthetic, due caution must be given to the airway, as described above (3H), before removing the ETT which must preferably be done in the fully awake and recovered patient.

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