

Scenario Overview

Name of Scenario: Anterior mediastinal mass

Authored By: Dr. Lana Volz Reviewed By: Dr. Tristan Levey

Cite As: Volz, L. Anterior Mediastinal Mass. Pedi Crisis Checklists Simulation Scenario. Society for Pediatric Anesthesia. Available at: <https://www.pedsanesthesia.org/critical-events-checklist/> Accessed on: (Month, Year).

Learning Objectives of Scenario:

Cognitive:

- 1) Discuss risk factors for airway and cardiovascular collapse when presented with a patient with an anterior mediastinal mass.**
- 2) Design an anesthetic that keeps the patient with an anterior mediastinal mass spontaneously ventilating.**

Technical (for medium and high fidelity sims):

- 1) Demonstrate the proper management of a patient with complete airway and cardiovascular collapse from an anterior mediastinal mass.**
- 2) Position the patient in a lateral position.**

Behavioral:

- 1) Recognize the need to communicate with surgical colleagues prior to starting a high-risk case and ensure rapid availability of rigid bronchoscopy and/or ECMO for a patient with an anterior mediastinal mass.**
- 2) Effective communication with the surgeon intraoperatively.**

Patient Description: A 15 year old girl with newly diagnosed Hodgkin lymphoma presents for urgent port placement for chemotherapy. She arrives to the OR in a hospital gown without IV access. She is very anxious.

History: She weighs 60 kg and was previously healthy until three weeks ago when she developed unexplained fevers, night sweats, and difficulty sleeping. She had an uneventful laparoscopic appendectomy at age 12. Last week she had a lymph node excision under local that was extremely painful, and now fears medical procedures.

Allergies: NKDA

Meds: medroxyprogesterone

Baseline Vital Signs: T 38.5 HR 95 BP 138/90 SaO₂ 97% on RA
Physical exam: diaphoretic, face is flushed, distant heart sounds
Baseline Lab Values: Hgb 9g/dL, Plt 100,000, otherwise normal
Imaging: Chest CT reveals anterior mediastinal mass with 50% tracheal narrowing.

Target Trainees (Learners): Anesthesia residents and fellows

Anticipated Duration: 45 minutes

Scenario Time: 15 minutes

Debriefing Time (typically 2-3x scenario length) 30 minutes

Scenario Set-UP (high or medium fidelity)

Room Configuration (set up): Set up as operating room with sterile table for surgical instruments, anesthesia workstation, and drug cart.

Equipment Needed:

Standard OR monitors in place

IV bag and IV start kit in room

Anesthesia machine

Airway management tools (6.5 ETT, mask, laryngoscope, oral airway)

Suction tubing with Yankauer

Anesthesia/Emergency Medications (drawn up on tabletop) – Standard

Fentanyl 3cc, 50ug/ml

Epinephrine 1cc, 100ug/ml

Midazolam 1cc, 5mg/ml

Epinephrine 10cc, 100ug/ml

Propofol 10cc, 10mg/ml

Atropine 1cc, 0.4mg/ml

Succinylcholine 1cc, 20 mg/ml

Atropine 3cc, 0.4mg/ml

Succinylcholine 10cc, 20 mg/ml

NS flush 10 cc

Albuterol inhalation aerosol

Mannequins/ Task trainers/ Standardized Patients Needed: Need Sim Junior or adult mannequin for high fidelity OR ‘doll’ or volunteer for medium fidelity. Need staff to play surgeon, OR nurse, and 1-2 anesthesia colleagues who arrive when help is requested.

Patient Medical Chart Information: Previously healthy. Easy airway per anesthetic record 3 years ago (easy mask, mac 3, grade 1 view).

Demonstration Items needed for Scenario and Debriefing:

Society for Pediatric Anesthesia PediCrisis Manual <http://www.pedsanesthesia.org/wp-content/uploads/2018/03/SPACriticalEventsChecklists.pdf>

Adler (reference #1) to look at imaging

Scenario Logistics

Expected Scenario Flow: The anesthesiologist is paged for the time out and arrives to find an anxious adolescent girl lying on the OR table. Monitors are in place. OR nurse and surgeon are already in the room. All perform time out.

Expected Interventions of the Participants:

First event: Participant should place an IV, place a nasal cannula, and position the patient in Trendelenburg. Mannequin or standardized patient will complain that she does not tolerate lying flat and is feeling short of breath. If participant sedates her at this point while surgeon tries to prep, complete airway and cardiovascular collapse will occur (skip to fourth event).

Expected participant action: Discuss with surgeon that patient cannot tolerate lying flat. Port placement may not be possible, but surgeon could place a PICC line with patient in lateral position. Explain extremely high anesthetic risk of the case to the surgeon, stressing need for rigid bronchoscopy or ECMO in case of emergency.

Second event: Patient tolerates lateral position with arm out for PICC, but is very anxious. Cries. Requests sedation.

Expected participant action: Play music, hold her hand, talk to patient, attempt distraction.

Third event: Patient still anxious and crying. Will not hold still for line placement.

Action: Administer midazolam, ketamine, dexmedetomidine or other drug that will maintain spontaneous ventilation.

Fourth event: Suddenly patient becomes unresponsive, SaO₂ drops rapidly, BP crashes to 60/30, HR drops to 40s.

Action: Call for help! Intubate and administer 100% Fio₂ with PEEP. Administer fluid bolus and epinephrine. Consider placing patient prone and ventilate via rigid bronchoscope or ask surgeon to cannulate to start ECMO.

Fifth event: Patient stabilizes.

Action: Discuss with surgeon where to go from here—wait for patient to awaken in OR? Take to ICU intubated and on ECMO?

Expected Endpoint of the Scenario: Participant and surgeon formulate plan of how to take patient out of the OR safely.

Distracters within Scenario: When help arrives they can try to start chest compressions for HR <40, but this will unlikely be helpful until an airway is re-established.

Optional Challenges for Higher Level Learners: The surgeon refuses to place patient in lateral position or perform PICC line. Participant must decide between cancelling case or calling

someone else to perform the procedure, even though patient is already in the room and she needs central access urgently for chemo.

Videotaping Guidelines (for medium or high fidelity sims): Per institution policy.

Roles of Participants/Trainees: Participant will be anesthesiologist. 1-2 other trainees can act as helpers once emergency occurs.

Roles of Confederates (if applicable, for medium or high fidelity sims): Need 2 staff members to be surgeon and OR nurse.

Debriefing Points:

Cognitive: Children with anterior mediastinal masses are at high risk for anesthetic complications, and can have intraoperative cardiovascular as well as airway collapse. Risk factors include orthopnea, upper body edema, SVC syndrome, left atrial compression, pericardial effusion, tracheal compression >50%, and T-cell leukemia.

Technical (for medium or high fidelity sims): Keep the patient breathing spontaneously. Administer as little sedation as possible and rely on distraction techniques. Position patient lateral or prone if necessary. Place an IV in the lower extremity if patient has SVC compression.

Behavioral: Interdisciplinary communication is imperative when caring for these patients. It is important to discuss perioperative care with not only the surgeon in case of possible ECMO, but also ENT if he/she needs to be on standby for rigid bronchoscopy, as well as nursing so they understand the gravity of the case, risks involved, and whom to call in the event of an emergency.

Scenario Support Materials, Pre and Post Tests, Evaluations:

Reference List:

Adler AC, Schwartz ER, Waters JM, Stricker PA. Anesthetizing a child for a large compressive mediastinal mass with distraction techniques and music therapies as the sole agents. *Journal Clinical Anesthesia* 2016; 35: 392–7.

Vanneman MW, Fikry K, Quraishi SA, Schoenfeld W. A Young Man with a Mediastinal Mass and Sudden Cardiac Arrest. *Annals of the American Thoracic Society* 2015;12(8): 1235–1239.

Pre-test:

1. True/False: General endotracheal anesthesia is the preferred technique when anesthetizing a child with an anterior mediastinal mass.

2. Where should you place intravenous access when caring for a child with an anterior mediastinal mass?
 - a. Lower extremity
 - b. Upper extremity
 - c. IJ central line

3. Which of the following are risk factors for anesthetic complications when caring for a patient with an anterior mediastinal mass?
 - a. SVC syndrome
 - b. Orthopnea
 - c. Tracheal compression >50%
 - d. T-cell leukemia
 - e. All of these are risks

4. True/False: A child with an anterior mediastinal mass presents to an ambulatory surgery center for mole excision. It is appropriate to sedate this patient in the ASC, as it is a quick procedure.

5. Which of the following would be the LEAST appropriate anesthetic for a patient with a large anterior mediastinal mass?
 - a. midazolam sedation
 - b. propofol + succinylcholine general endotracheal anesthetic
 - c. child life distraction
 - d. local anesthetic
 - e. prone LMA with sevoflurane

Post-test: same questions

Evaluations:

Participant: Grade each question with strongly agree, agree, neutral, disagree, strongly disagree, or not applicable:

This simulation experience highlighted the risks factors in caring for patients with an anterior mediastinal mass in the OR.

Because of this simulation I feel empowered to discuss perioperative management of anterior mediastinal mass patients with surgical colleagues prior to starting the case.

This simulation allowed me to improve my interdisciplinary communication skills.

I am confident I can use the knowledge and skills from this simulation and apply them to patient care.