

Anesthetic Management of a Patient with a Mediastinal Mass and Multiple Myeloma Undergoing Repair of Multiple Orthopedic Injuries

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Introduction

Our case describes a patient with multiple myeloma and a mediastinal mass who presented with multiple pathologic and impending fractures. She underwent extensive orthopedic procedures in one day in the operating room. Patients with mediastinal masses presenting for surgery can pose a challenge for the anesthesiologist. Depending on the size, these masses can cause significant compression of vital structures and cause airway and hemodynamic compromise. Further complicating the clinical picture, our patient had a diagnosis of multiple myeloma. Neuraxial techniques can certainly be performed in these patients, however, the benefits must be balanced with increased risks of epidural hematoma and other coagulation problems. Our case describes an extensive orthopedic surgery that was performed successfully in a patient with both multiple myeloma and resulting mediastinal mass performed with upper extremity block and spinal anesthesia.

Materials and Methods

- Patient informed consent was obtained for submission of a case report. IRB approval was waived.

Case Report

The patient was a 68-year-old female who presented with dyspnea, weakness, right arm pain, and an enlarging chest wall mass over two weeks. She was found to have multiple myeloma with multiple pathologic lytic lesions of the right radius and the left femur, requiring surgical repair; the chest wall mass was biopsied and shown to be a plasmacytoma. Her medical history was significant for coronary artery disease status post percutaneous coronary intervention; hypertension; anemia; acute kidney injury; and current smoker with 20 pack-years.

Preoperative workup included EKG, showing normal sinus rhythm; echocardiogram, notable for EF 65%, normal biventricular systolic function, mild pulmonary hypertension, and a variant left-sided superior vena cava; and chest CT, showing lytic lesions throughout the bones, some associated with soft tissue masses, the largest of which was an anterior chest wall mass (**Figure 2**) and compression on the left innominate vein, and degenerative changes to the spine with spinal stenosis; MRI of lumbar spine showed mild bulging disc at L3-L4 and a thickened ligamentum flavum, and facet hypertrophy resulting in moderate central canal stenosis.

The patient was taken to the operating room for repair of the right radius and ulna, and the left femur and tibia, and radical resection of tumors of the femur, tibia, and radius. Thoracic surgery was on standby in the setting of the mediastinal mass. She was first prepped for the right axillary nerve block, performed under ultrasound using 30 mL of 0.5% bupivacaine with 1:200,000 epinephrine (Figure 3). An intercostobrachial nerve block was performed by anatomic landmarks using 8 mL of 0.25% bupivacaine with 1:200,000 epinephrine. The spinal anesthetic was performed using 2.6 mL of 0.5% bupivacaine with epinephrine wash. Then, the patient was sedated using propofol at 50 µg/kg/min and dexmedetomidine at 0.3 µg/kg/h for the duration of the case. Both extremities were repaired simultaneously, though the repair of the lower extremity was completed before the upper extremity, and the surgery lasted for five hours. The patient was breathing spontaneously, and her oxygen saturation remained >95% on 6 L/minute of O2 by simple face mask. No vasopressor infusions were required. She received 3 units of packed red blood cells, 1 unit of fresh frozen plasma, 250 mL of 5% albumin, 1.5 L of crystalloid, and 1.5 g of calcium chloride. Estimated blood loss was 500 mL, and urine output was 200 mL.

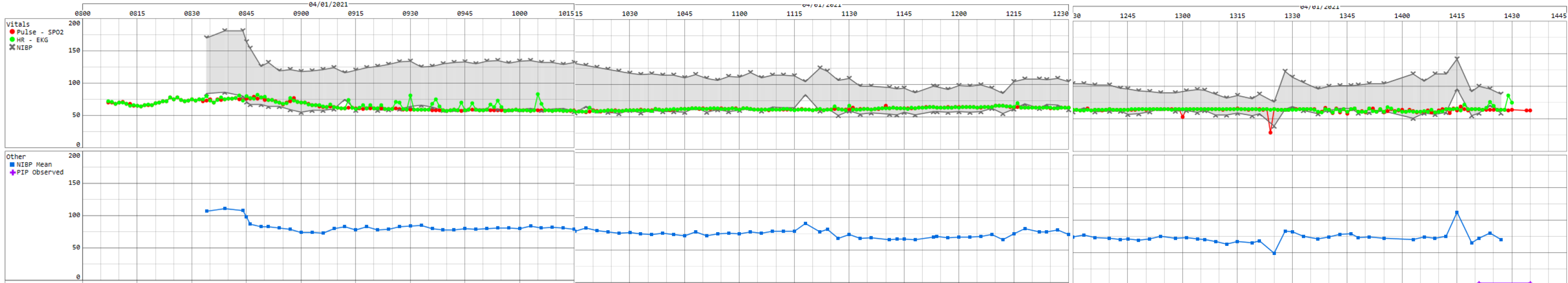


Figure 1. Intraoperative record showing patient hemodynamics during the anesthetic.



Figure 2. CT image of anterior chest wall mass with destruction of the manubrium and anterior first ribs (measurements of the mass: 12.4 cm x 5.9 cm x 7.1 cm).



Figure 3. Ultrasound image of right axillary block performed preoperatively.

Discussion

Mediastinal masses present a host of challenges in the operating room, particularly in airway and hemodynamic control, to avoid complete cardiovascular or tracheobronchial collapse. Our patient presented with dyspnea and an enlarging chest wall mass, which imaging showed to compress the large vessels, but it did not obstruct the airway. In preoperative discussion with the surgeon, the surgical plan was to address both operative limbs simultaneously, to shorten the total surgical time. Our anesthetic plan thus comprised maintaining spontaneous ventilation for the duration of the case, and to provide surgical anesthesia with a spinal anesthetic and an axillary nerve block. Maintaining spontaneous ventilation is a cornerstone of safe anesthetic management of the patient with a mediastinal mass to prevent airway or great vessel compression.

The diagnosis of multiple myeloma adds another layer of complexity to the anesthetic management of this patient. Disease-specific factors must be considered when formulating the anesthetic plan, including the increased risk for hematoma with neuraxial (particularly with epidural placement), due to thrombocytopenia secondary to pathologic plasma cell proliferation. This patient also had spinal stenosis on imaging, which has a higher risk for neurologic complications after neuraxial anesthesia. Anticipating a relatively short surgery with simultaneous repair of the affected limbs, we opted for spinal anesthesia with a peripheral nerve block for the upper extremity. Communication with the surgeon was paramount in the perioperative period.

References

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Anesthetic Considerations for Mediastinal Mass
Adequate (central) vascular access
Invasive preinduction blood pressure monitoring
Patient positioning to alleviate mass compression of vital structures
Maintenance of spontaneous ventilation, avoidance of neuromuscular blockade to prevent airway or cardiovascular collapse
Awake intubation
Rigid bronchoscopy expert and equipment immediately available
Elective/preinduction institution of ECMO
Intraoperative use of TEE

Table 1. Anesthetic considerations for patients presenting with a mediastinal mass.

Considerations for Regional Anesthesia in Multiple Myeloma
Preoperative testing to assess renal, cardiac, hematologic functions
Thrombocytopenia (caution with deep plexus/neuraxial blocks)
Increased risk of epidural hematoma
Increased risk of venous thromboembolism
Anemia (anticipate blood product transfusion)
Patient positioning (caution for pathologic fractures)
Chemotherapy side effects (i.e., bortezomib causing neuropathy)
Avoid nephrotoxins in renal failure

Table 2. Regional anesthetic considerations for patients with multiple myeloma.

	Spinal	Combined Spinal Epidural	General Anesthesia
Risks and Disadvantages	PDPH, back pain, nausea, vomiting, hypotension, hearing loss, total spinal, neurologic injury, spinal hematoma, transient neurologic symptoms, failure	PDPH, back pain, nausea, vomiting, hypotension, hearing loss, total spinal, neurologic injury, spinal hematoma (higher risk with epidural than with spinal), transient neurologic symptoms, failure, inability to test epidural catheter	Nausea, vomiting, urinary retention, throat pain, shivering, myocardial infarction, thromboembolism, cardiovascular accident, death, loss of spontaneous ventilation, mass effect with vascular and airway compression
Benefits and Advantages	Short duration, can keep patient awake, maintain spontaneous ventilation, rapid onset, decreased respiratory effects	Rapid onset, increased duration, titratable, modality for postoperative analgesia	Control airway, quick onset, quick reversal

Table 3. Risks and benefits of neuraxial and general anesthesia for this patient with multiple myeloma and a mediastinal mass.