

Case Study:

Partial Nephrectomy for Renal Cell Carcinoma

BEST PRACTICES IN HEALTHCARE



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Patient Presentation

A 60-year-old female patient presented to the operating room with renal cell carcinoma. The proposed surgery was a left open partial nephrectomy. The medical history noted allergies to penicillin and prochlorperazine. The anesthesia care team (ACT) quantified the patient as an ASA III. Her height was 67in. and she weighed 94.8kg. She was positioned in right lateral decubitus for the surgery. During the respiratory review, the ACT noted the patient was a smoker with COPD and concomitant allergic rhinitis. Her cardiovascular review noted a history of hypertension. Her central nervous system revealed anxiety and headaches. During the hepatic, renal, and gastrointestinal review, the ACT noted several pathological conditions, including urinary incontinence, liver metastases, and chronic nausea. The final pathophysiology analysis noted the patient was obese and did not have teeth. The patient's prior anesthetic history was extensive, an embolization of a basilar artery aneurysm, hysterectomy, cholecystectomy, and a D&C procedure. Basilar artery aneurysms The patient had not taken any medication the day of surgery.

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Surgical Background

Renal cell carcinoma is a common etiology for a patient requiring a partial nephrectomy. According to Jaffe's *The Anesiologists Manual of Surgical Procedures*, partial nephrectomies are ideal for small cell carcinomas.

"Partial nephrectomy is the surgical excision of the segment of the kidney harboring the pathology. It is performed for small renal cell carcinomas and benign tumors of the kidney, such as angiomyolipomas, and for duplicated collecting systems with a diseased moiety (Jaffe, 2014, p. 892-893)."

Given the patient's history, there were surgical implications the anesthesia technologist should be aware of in order to best assist the anesthesia provider in caring for the patient. One special consideration was needed to for the patient's COPD. Patients with COPD will have increased compliance due to the destruction of elastic recoil in the in alveoli. Pardo and Miller in the *Basics of Anesthesia* 7th edition recommend preoperative bronchodilator therapy to counteract the obstructive disorder.

"All patients with COPD should receive bronchodilator therapy as guided by their symptoms. If sympathomimetic and anticholinergic bronchodilators provide inadequate therapy, a trial of corticosteroid therapy should be instituted (Pardo and Miller, 2018, p. 466)."



Concerning the alveoli, the pre-surgical breathing treatment can help open the alveolar walls and decrease secretions. A drug that is typically used to reduce secretions from COPD is glycopyrrolate. In addition to the anticholinergic agents

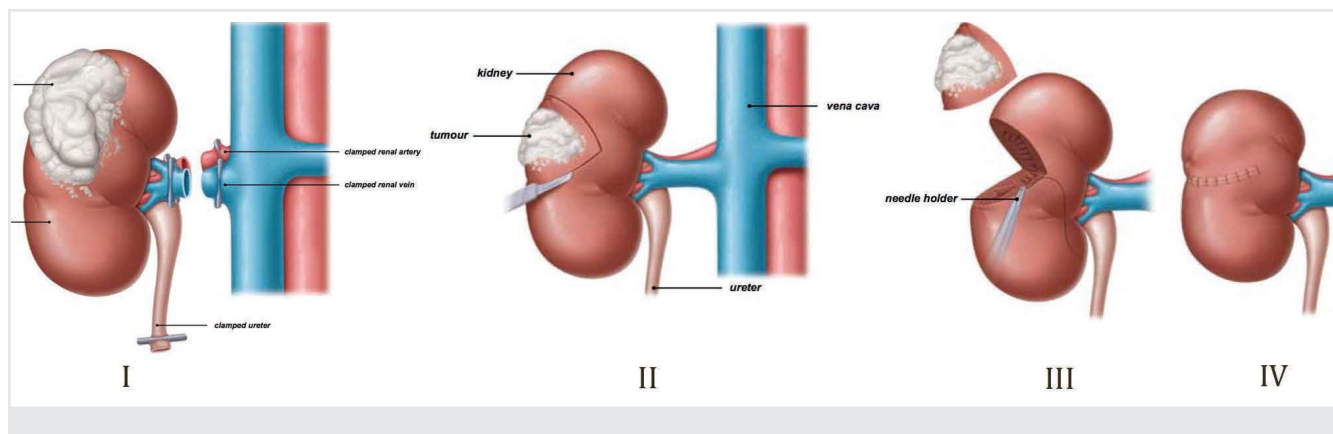


and bronchodilator breathing treatments, Pardo and Miller indicate that preoperative chest physiotherapy is noted to reduce pulmonary complications post-surgical intervention. (Prado and Miller, 2018, p. 466). Chest physiotherapy is a manual process of clearing mucous from the respiratory system. It relies on percussive measures being applied to different areas of the chest wall. The goal is to move the secretions to the patient's midline. The process also includes getting the patient to produce solid coughs to remove the repositioned secretions.

Before the start of the case, the anesthesia technologist should make sure suction is on the anesthesia machine, working effectively, and generating 40.6kPa (Dorsch, 2012). In addition to the standard yankaur used for oropharyngeal suctioning during induction, the technologist should ensure the anesthesia deck has appropriately sized tracheal suction catheters. A patient with COPD is likely to have more secretions upon emergence, and the anesthesia provider will need the suction ready to go to ease the emergence process.

Another anesthetic consideration specific to this patient dealt with her medication history. The patient was on chronic lisinopril, which could affect her drug metabolism due to her liver metastases. Lisinopril is a class of ACE inhibitor used as a vasodilator. In combination with the patients Liver metastases, the anesthesia care team should reduce hepatic and renal metabolized medications. For this reason, the patient was given Cisatracurium besilate for Neuromuscular blockade since this NMBA relies on Hoffmann elimination as opposed to hepatic and renal metabolism commonly associated with Rocuronium Bromide.

The technologist needs to have a fluid warmer setup and ready to use to compensate for evaporative heat loss due to the patient having open abdominal surgery. Due



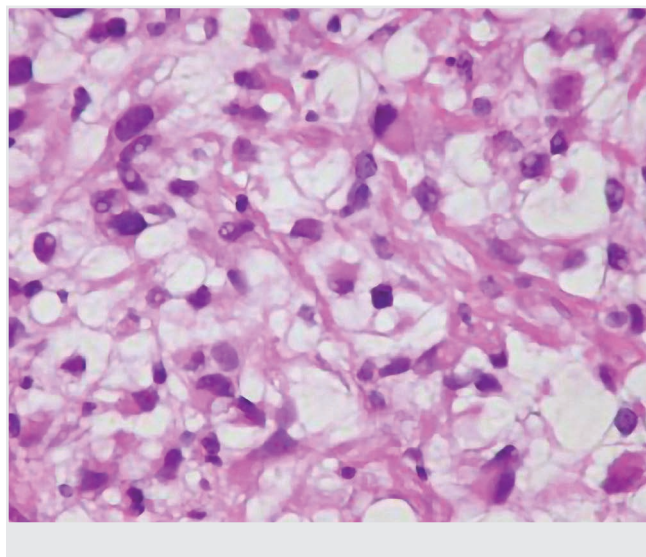
to the patients' comorbidities, the provider requested an ultrasound in the room to assist with the arterial line placement.

Patient Positioning

Proper positioning is imperative for patient safety. A partial nephrectomy is a 3-4-hour procedure, so appropriate positioning precautions were taken to prevent injury and nerve neuropathy. As stated earlier, the patient was in the lateral decubitus position for the surgery. A prone pillow was used to keep the spine in a neutral position. Another consideration taken during the positioning was making sure the patient's dependent ear was not compressed and the eyes were taped and free from pressure. It is important to note that the dependent ear and eye, or the eye and ear in closest contact to the OR table, should be routinely checked. The ear should be free from bending as this can potentiate localized ischemia. Additionally, the dependent eye is more prone to increased intraocular pressure (IOP). According to the American Academy of Ophthalmology, signs of increased IOP are forward displacement of the lens, corneal edema, irregular pupils, and mid-dilated pupils, among other clinical signs. Pharmacologically, the Seventh Edition of *Miller's Anesthesia* recommends avoiding ketamine and nitrous oxide when IOP increases are predicted. The text does recommend using volatile anesthetics and opioids as these are shown to reduce IOP (Miller, RD et al., 2009).

The positioning of the extremities is important when in the lateral decubitus position. Injuries to the Brachial Plexus and Common Peroneal nerve are the most common unless preventive measures are taken. According to Miller and Pardo's *Basics of Anesthesia*, injury to the brachial plexus is avoided when the arms are not abducted more than 90 degrees, and proper padding is used to prevent compression injuries to the Brachial Plexus induced by the humeral

head (Pardo and Miller, 2018, p. 325). During positioning, specific attention was given to the patient's extremities to prevent nerve damage. The dependent arm (in this case, the right arm) was placed in an arm board cushioned with foam padding. The non-dependent arm was folded over the dependent arm and placed in an attachable armrest with additional padding.



An axillary roll was placed just below the axilla to prevent damage to the Axillary nerve. The axillary roll was placed below the axilla rather than directly in the axilla to avoid compression against the axillary nerve, which would potentiate damage to the brachial plexus. Additionally, it should be noted that the axillary roll's placement below the axilla helps reduce suprascapular nerve damage (Pardo and Miller, 2018, p. 325). A pillow was placed underneath the patient's hips to protect the bony prominences and avoid damage to the sciatic nerve. According to Prado and Miller (2018), special considerations should be taken when positioning the lower extremities as well.

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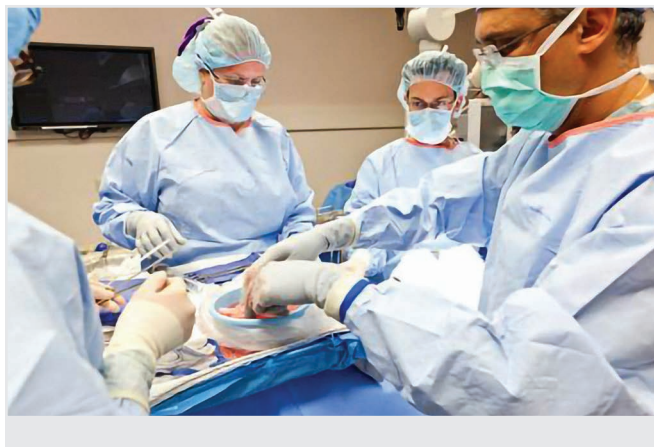
"The dependent leg should be somewhat flexed. A pillow or other padding is generally placed between the knees with the dependent leg flexed to minimize excessive pressure on bony prominences and stretch of lower extremity nerves (Prado and Miller, 2018, p. 325)."

To protect the patient's lower extremities, the dependent leg (right leg) was slightly flexed with padding underneath to protect the Common Peroneal nerve. A pillow was placed between the patient's knees to protect the popliteal nerve from injury. The non-dependent leg (left leg) was slightly extended and placed over the pillow on the dependent leg. Padding was placed under the dependent foot's heel and between the patient's ankles for further neuropathy prevention.

Induction Sequence

It is essential to be prepared and have the correct equipment for induction. If the anesthesia technologist is familiar with the anesthesia provider's preferred setup, the anesthesia technologist should have the induction equipment set up before starting the case. For this case, the resident used a MAC 3 laryngoscope blade, 7.0 endotracheal tube, and a 9cm Berman oropharyngeal airway. According to Jaffe (2014), this procedure can be associated with higher fluid requirements (8-10 mL/kg/h). Normal saline or lactated ringers should be given at 6-8 mL/kg/h, and all fluids should be warmed. Mild-to-moderate blood loss can be expected (Jaffe, 2014, p. 898). For this procedure, the patient had a 20-gauge macro drip IV in her left arm and an 18-gauge hotline with normal saline in her right arm.

An arterial line was placed in the patient's right radial artery for invasive blood pressure monitoring. The requirement of the arterial line was two-fold. The severity of the surgery and risk of acute hypotension and the intraoperative monitoring and management of the patient's hypertension. The arterial




line was free of kinks and zeroed at the phlebostatic axis. If the patient still had the basilar artery aneurysm, the arterial line would need to be zeroed at her ear to give a more accurate reading of the pressure in the head. However, since her basilar artery aneurysm was managed in a previous surgery, the arterial line was zeroed at the phlebostatic axis. Prior to the start of the case, the anesthesia technologist provided an ISTAT to have on hand for intraoperative blood testing. Blood administration was not necessary during this case. However, depending on the amount of blood loss, a partial nephrectomy could require blood administration. ASA monitors are required with every surgery. This patient was connected to a pulse oximeter, non-invasive blood pressure cuff, EKG leads, and a temperature probe, all of which had no artifacts or intraoperative anomalies. A foley catheter was placed to monitor urine output and assess fluid needs. According to Jaffe (2014), regional techniques such as a spinal or epidural may be combined with general anesthesia to minimize postoperative pain (Jaffe, 2014, p. 898). The patient, in this case, had an epidural placed preoperatively to aid in pain management. Upon successful extubation, the patient was taken to the PACU in a simple face mask with auxillary oxygen at 8L/min. Once the patient was moved to the floor, a PCA was administered to help with postoperative pain management.

Complications

Complications with this procedure include pneumothorax and decreased blood pressure due to the lateral position (Jaffe, 2014, p.898). Because the patient had COPD, she was at a higher risk for complications such as pneumothorax, atelectasis, and pneumonia. To prevent a pneumothorax or further complications with the patient's COPD, the endotracheal tube was taped securely and was monitored periodically to ensure negative tube migration and negative right bronchial mainstem lung isolation. At the start of the case, the resident had difficulty placing the arterial line. She first attempted to place the arterial line in the left radial artery before the patient was moved to the lateral decubitus position. However, she was unable to locate the artery, and the surgeon wanted to begin the procedure. After the patient was placed in the right lateral decubitus, the resident attempted to place the arterial line in the right radial artery under the sterile drapes. She could not locate the right radial artery as well, so the anesthesia technologist brought in an ultrasound. The ultrasound enabled the resident to get a better view of the artery, and she was able to place the arterial line.

Conclusion

In conclusion, a 60-year-old female with renal cell carcinoma was scheduled for a left open partial nephrectomy. The patient was placed in the right lateral decubitus position, which requires special attention to extremity placement and nerve padding. Several implications and considerations were to be taken with the patient's prior conditions, such as hypertension and COPD. Due to the preoperative concerns associated with this type of procedure, an anesthesia technologist must be familiar with the case and anticipate the anesthesia provider's needs by attaining a base understanding of renal physiology and pathophysiology. The anesthesia technologist played an important role in providing the best possible care for the patient. The technologist assisted with the patient's preoperative respiratory bronchodilation treatment, anesthesia room preparation according to best practice found in literature and provider preference, safe induction, and emergence from anesthesia, and safe transport to the PACU. The patient's surgery was successful with an ideal margin removal of cancer and was completed in 210 minutes. The patient was extubated after exiting Guedel Stage-Two of anesthesia to limit the possibility of laryngospasm. Upon extubation, the patient was given supplemental oxygen at 8L/min. via simple facemask and transported to PACU for continued monitoring and evaluation. 

References

Jaffe, R. A., Schmiesing, C. A., & Golianu, B. (2014). *Anesthesiologists manual of surgical procedures* (5th ed.). Philadelphia, PA: Wolters Kluwer.

Pardo, M. C., & Miller, R. D. (2018). *Basics of anesthesia* (7th ed.). Philadelphia, PA: Elsevier.

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QUIZ
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Continuing Education Quiz

To test your knowledge on this issue's article, provide correct answers to the following questions on the form below. Follow the instructions carefully.

1. What is the common etiology for a patient requiring a partial nephrectomy?

- a. Angioedema
- b. Renal Cell Carcinoma
- c. Sickle-Cell Disease
- d. Pheochromocytoma

2. What can be given to a patient if sympathomimetic and anticholinergic bronchodilators are not adequate treatments for their COPD?

- a. Trial corticosteroid therapy
- b. Looped-diuretic treatment
- c. Inotropic infusion therapy
- d. Beta-blocking agonist treatment

3. What is lisinopril?

- a. Beta blocker
- b. Bronchodilator
- c. Vasopressor
- d. ACE inhibitor

4. Why type of metabolism does Cisatracurium rely on?

- a. Hepatic metabolism
- b. Renal elimination
- c. Hoffmann elimination
- d. Pancreatic metabolism

5. What should be checked routinely for patients in a lateral decubitus position?

- a. Dependent eye
- b. Non-dependent eye
- c. Jugular distention
- d. Intercostal neuropathy

6. All are signs of increased intraocular pressure except?

- a. Corneal crenation
- b. Forward displacement of the lens
- c. Mid-dilated pupils
- d. Irregular pupils

7. What is the most common nerve injury for a patient in a lateral decubitus position?

- a. Trigeminal nerve
- b. Glossopharyngeal nerve
- c. Common peroneal nerve
- d. Femoral nerve

8. What is a known complication associated with this procedure?

- a. Pneumothorax
- b. Pneumoplasty
- c. Cranial decompression
- d. Cardiac tamponade

9. Arterial lines should be zeroed to the phlebostatic axis on patients with untreated basilar artery aneurysms.

- a. True
- b. False

10. What is the name of the manual process for clearing mucous in the respiratory system common with COPD patients?

- a. Chest physiotherapy
- b. Spinal physiotherapy
- c. Peroneal physiotherapy
- d. Intercostal physiotherapy

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- 5: A B C D

- 6: A B C D
- 7: A B C D
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Quiz 2 of 2

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