

Figure 2. RCC high magnification²

Using Open Partial Nephrectomy as an Effective Nephron-sparing Surgical Treatment in Renal Cell Carcinoma

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According to the American Cancer Society, renal cell carcinoma (RCC), an adenocarcinoma affecting the renal tubules, is the highest source of kidney cancers, affecting roughly one in 63 of the population. It is found most often in men aged 50 to 70.

Risk factors may include: gender (found to be twice as common in men as it is possible that more men are likely to be smokers and possible greater chance of being exposed in the workplace to cancer-causing chemicals), race (African Americans and American Indians/Alaskan Natives are at higher risk than Caucasians), smoking (both passive and active), obesity, overuse of NSAIDS, exposure to workplace chemicals (metals such as cadmium, herbicides and organic solvents, especially trichloroethylene), horseshoe kidney (kidney joined by fibrous band), hereditary especially in siblings with familial history of kidney cancer, hypertension, certain medications such as diuretics and Phenacetin (not used in the US for more than 20 years), having advanced kidney disease or polycystic kidney disease that may compromise function and certain genetic factors such as having Von Hippel-Lindau disease (changes on VHL gene). Hereditary papillary RCC (changes on MET gene), hereditary leiomyoma RCC (changes on FH gene), Birt-Hogg-Dube (BHD) syndrome (changes on FLCN gene), Familial RCC (defects on SDHB and SDHD genes), and hereditary renal oncocyoma are other risk factors.^{4, 17}

SIGNS AND SYMPTOMS

In early stages, there may be no appearance of symptoms. As the tumor progresses, the possible symptoms may include hematuria, back or flank pain, palpable abdominal mass, unexplained weight loss and/or anemia.¹³

LEARNING OBJECTIVES

- ▲ List the anatomy associated with an open partial nephrectomy
- ▲ Learn about the treatment options for patients diagnosed with renal cell carcinoma
- ▲ Examine the role the surgical technologist plays during this procedure
- ▲ Recall the stats associated with RCC
- ▲ Review the procedural steps associated with this surgery

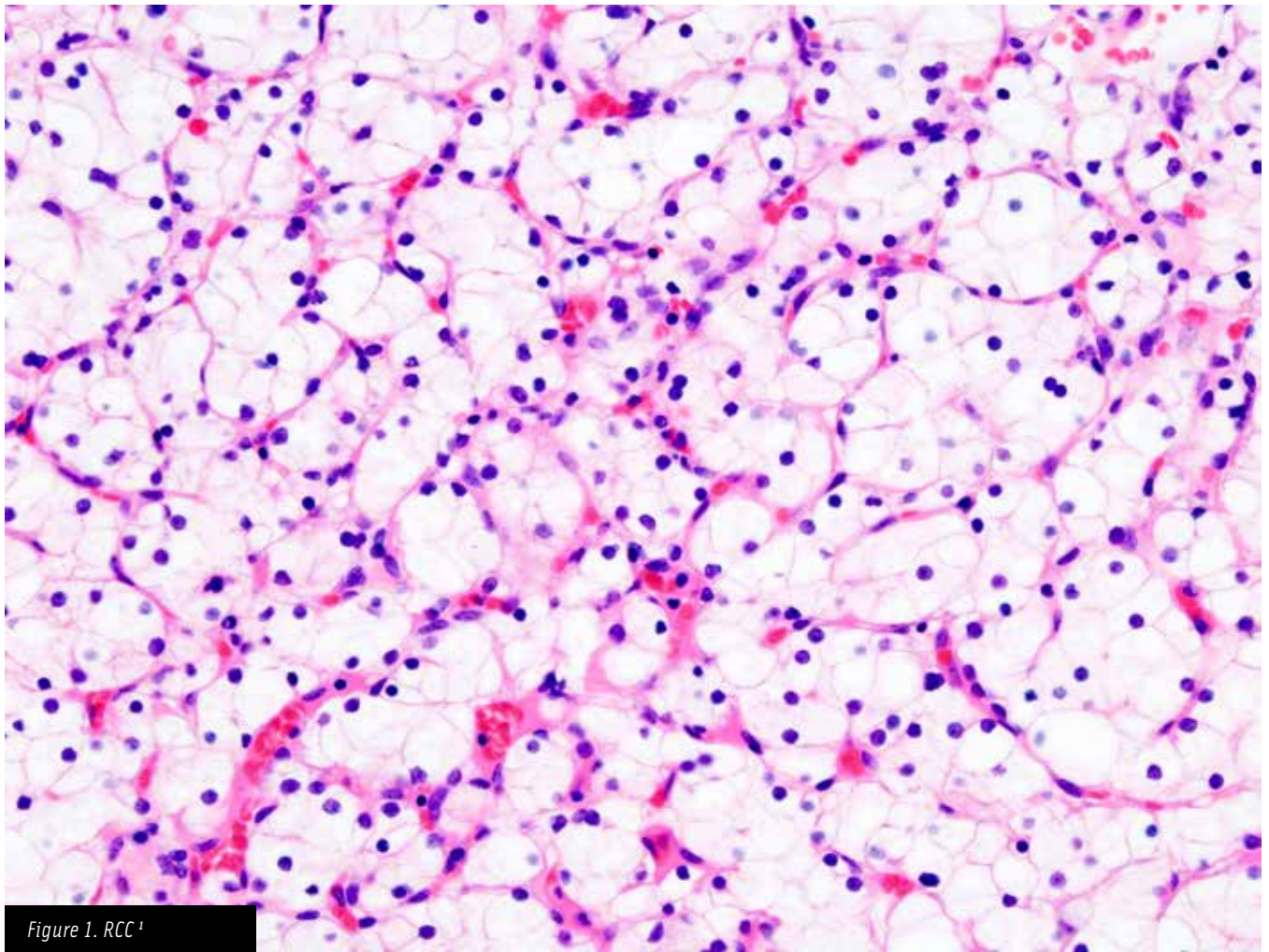


Figure 1. RCC ¹

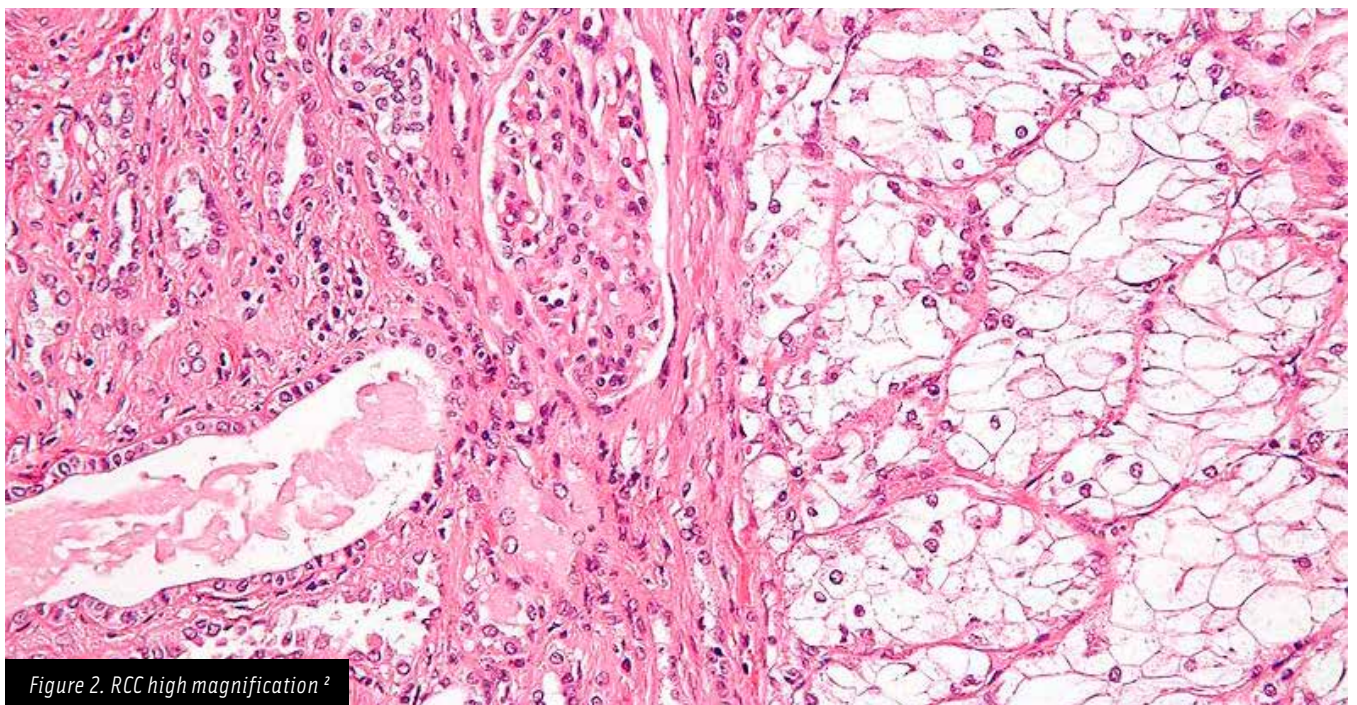


Figure 2. RCC high magnification ²

DIAGNOSIS AND STAGING

Possible ways to definitively diagnose RCC can be by the use of imaging tests such as CT, ultrasound (u/s), MRI and XR. A biopsy is not usual as seeding may occur or a high false negative rate. A full history and physical will be performed as well as running blood and urine chemistries.^{5, 13}

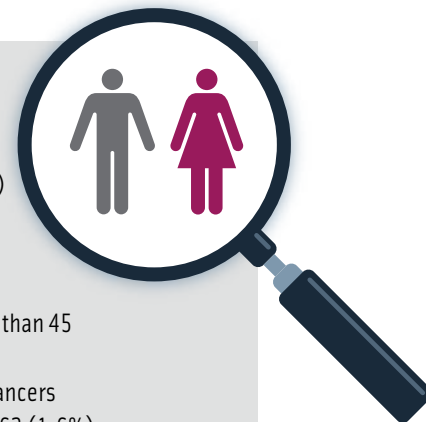
Of those affected, there is a general statistical chance of recovery/cure/remission dependent upon the individual's staging and tumor. The American Joint Committee on Cancer (AJCC) uses stages I-IV, which describes the level of invasiveness for the cancer. The tumor is described by the TNM Classification of Malignant Tumors staging system (tumor/nodes/metastases). In a Stage I or Stage II cancer with a T1N0M0, a patient would qualify for a partial nephrectomy or nephron-sparing surgery. While robotic and laparoscopic assisted surgeries have become a routine way to excise this cancer, the continued standard of treatment is the open partial nephrectomy. The open partial nephrectomy can be used to preserve kidney function and avoid dialysis, especially if there has been damage or removal of the opposing kidney. The OPN is considered nephron-sparing surgery.⁴

There are two separate staging systems used for classifying RCC. The AJCC TNM staging system uses an observed five-year survival rate. This classification comes from patients who were first diagnosed in 2001 and 2002. These observed statistics include patients who may have died from alternate causes. At Stage I, there is an 81% chance of surviving five years; Stage II is 74%; Stage III is 53%; and Stage IV is 8%. The second staging system is the UCLA Integrated Staging System, which has gathered data from 1989-2005. This staging system describes whether the cancer has remained localized (meaning no lymph node involvement) or has metastasized (meaning the cancer has

Treatments are designed to follow the staging systems and will be implemented in accordance with the appropriately diagnosed stage, and are designed to escalate with elevated stages.

2017 Stats

- 63,990 new cases a year (40,610 in men; 23,380 in women)
- Of those, 14,400 will die (9,470 men; 4,930 women)
- The average age of diagnosis: 64
- Uncommon in individuals younger than 45
- The risk is higher in men
- It is among the 10 most common cancers
- An individual's lifetime risk is 1 in 63 (1.6%)
- Kidney cancer diagnosis has increased since the 1990s. Although the cause is unclear, it could be because of incidental finds in CT imaging
- Death rates, though, have decreased due to early discovery^{4, 14}



moved into the lymph nodes or out to distant organs). This system assesses the risk level and assigns a percentage to the five-year survival rate in that manner. For localized tumors, there is a low risk, which has a 97% five-year survival rate; an intermediate risk at 81%; and a high risk at 62%. For metastasized tumors, the risk level remains the same, but the percentages of survival are significantly less. For low-risk metastases, the five-year survival rate is 41%; 18% for intermediate risk; and 8% for high risk.^{4, 14}

TREATMENT

Treatments are designed to follow the staging systems and will be implemented in accordance with the appropriately diagnosed stage, and are designed to escalate with elevated stages. Active surveillance may be used as an alternative in early stages, especially in frail or elderly patients. Surgical intervention with partial nephrectomy in Stages I and II (tumors less than 7 cm) and radical nephrectomy in Stages III and IV are the best options. Ablation and other local therapies also can be used. Radiation therapy is not as widely used as this generally does not have an effect on RCC. Targeted and immunotherapies (biologic or hormone therapy) also may be employed. Later stages of treatment may include interferon, chemotherapy (this also generally does not have an effect on RCC), palliative surgery and surgical removal of metastases.^{17, 12, 10}

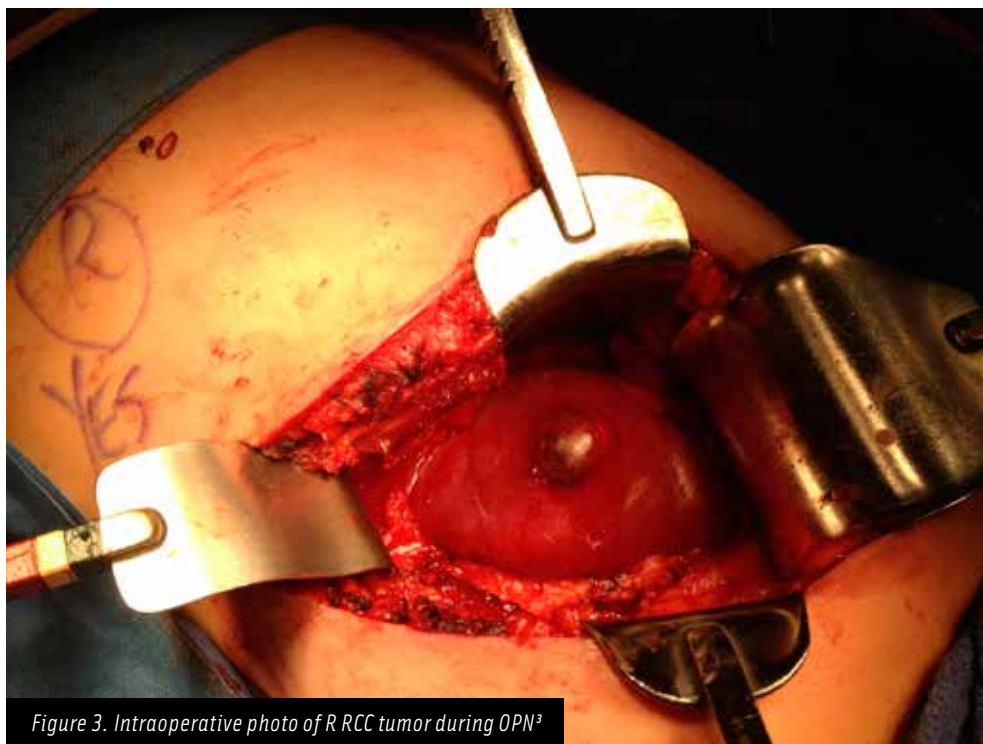


Figure 3. Intraoperative photo of R RCC tumor during OPN³



Figure 4. Resected tumor site with porcine gelatin absorbent

SURGICAL INTERVENTION AND THE SURGICAL TECHNOLOGIST'S ROLE IN THE SURGERY

Prep/draping

General anesthesia will be used with access for a central venous line and/or arterial line. The patient will be placed in the kidney/lateral decubitus positioning with the affected side superior. IV fluids may include one of following and

A time out in universal precaution fashion with verification of patient will occur and preoperative antibiotics will be given. After general anesthesia induction, the patient will be placed in the supine position for placement of the indwelling catheter. The patient will then be positioned with their arms to padded double armboards, one superior to other, palms facing in. Soft restraints will be placed on the lower

While robotic and laparoscopic assisted surgeries have become a routine way to excise this cancer, the continued standard of treatment is the open partial nephrectomy. The open partial nephrectomy can be used to preserve kidney function and avoid dialysis, especially if there has been damage or removal of the opposing kidney.

will be dependent upon the surgeon's preference: NS 0.9% NaCl, D5 ½ normal 0.45% NaCl, D5 1/3 normal 0.33% NaCl, D5 1/5 normal 0.18% NaCl, Ringers Lactate.^{8,9}

The correct patient site will be verified and marked clearly by the surgeon or surgical assistant and an informed consent will be obtained while patient is awake and aware. The patient will then be transferred to the operative suite.

arm and around both for stability and security. Padding will be applied to the ankle, foot, knees and an axillary roll with a pillow or gel donut will be applied to the head. Two safety restraints will be placed two inches proximal to the knee and one below the axillary level. Padded kidney rests or rolls will be placed for anterior and posterior placement around the torso. The patient will be prepped with chlorhexidine



sorbable sponges for hemostasis³

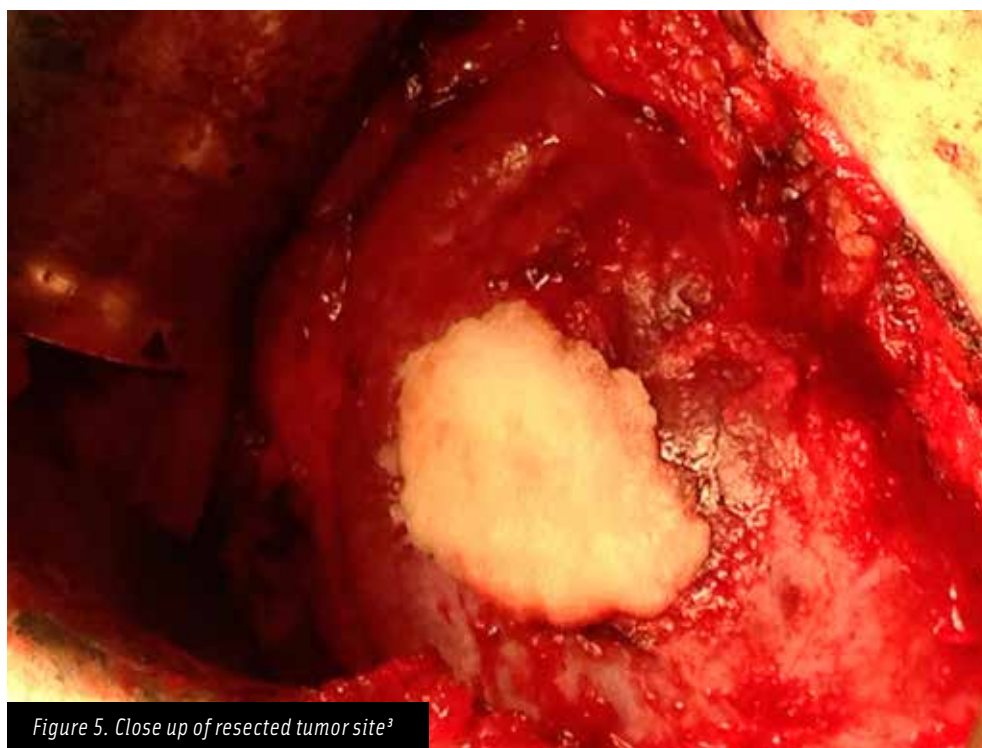


Figure 5. Close up of resected tumor site³

or an iodine solution according to the hospital or surgeon's preference beginning at the 12th rib and extending superiorly to the axilla and down to several inches below the iliac crest/thigh and to the table anteriorly and posteriorly. Four folded surgical towels around the incision site and a transverse sheet will be draped. The surgical technologist will need to have the drapes ready and be prepared for the intraoperative u/s, collection of perirenal fat, placement of chest tubes and drains. The back table and Mayo stand will need to be set up in the most sensible arrangement for each section of the surgery.^{7,8}

Incision

The surgical technologist will perform an initial sponge, needle and instrument count with the circulator as per protocol. The incision will follow with an infra or supracostal cut made above or below 11th or 12th rib, dependent upon the tumor site and anatomy. A roughly 25-cm incision will be made on superior aspect of 12th rib from lateral aspect of right rectus muscle to the back toward the costovertebral ligament with a #10 blade. The incision will be developed with electrocautery. The subcutaneous layer will be divided, the external oblique and latissimus dorsi will be opened and the internal oblique will be divided with the Bovie. The transversus abdominis initially will be scored by the Bovie and the muscle will be split digitally/bluntly. The field will

be kept clear by the surgical assistant or surgical technologist with suction ad lib for visualization. A Richardson or some hand-held retractor will be used for exposure. The lumbodorsal fascia will be entered at the end of the 12th rib. The intercostal muscles will be split close to the superior aspect of 12th rib. Pleural and peritoneal entry then will be gained. The retroperitoneal fat will be dissected away from abdominal surface of diaphragm; the diaphragm should be left intact. The Bookwalter, or another self-retaining retractor, will be placed at this point for visualization, which the surgical technologist should be prepared to pass. The peritoneum will then be mobilized medially. The perirenal fat that has been excised will be placed on the back table in a basin of normal saline by surgical technologist for possible use as a bolster for hemostasis. The Gerota's fascia will be identified and mobilized down to the psoas fascia. The Gerota's fascia will then be opened on the longitudinal aspect toward the posterior aspect of the kidney. Then the kidney will be mobilized within the perirenal fat. Dependent upon the tumor site and size, identification and assessment of the tumor removal will commence.

In the case of the intraoperative photos presented in this article, there was a well-formed tumor clearly visible on the anterior aspect, upper pole of the right kidney within the field. Much of the perirenal fat was left intact as the tumor presented immediately in the anterior portion.



Figure 6. Resected tumor on back table³



Figure 7. Resected tumor on back table with instruments³

The surface will be cleared, and the surgical technologist should prepare for an intraoperative u/s to be performed, which will confirm and assess previous findings as in the CT scan or MRI. After the u/s, the tumor will be dissected. The Bovie tip will be switched out by the surgical technologist to use a needle tip for circumscribing the tumor and clearing negative margins. The surgical technologist will then pass a Penfield dissector and tenotomy scissors for dissec-

The surgical technologist must prepare to send out any tissue to pathology. The tumor will be then sent to pathology for an intraoperative reading. A frozen section will confirm or deny the negative margins and the procedure will then proceed as dictated.

tion of the tumor away from the healthy parenchyma. For hemostasis, Gerald forceps and Bovie will be used when encountering blood vessels. For larger vessels encountered, mosquito forceps will be used. A large right angle will be placed at the base of the tumor once it has been mostly dissected and the tenotomy scissors are used for final excision. The surgical technologist must prepare to send out any tissue to pathology. The tumor will be then sent to pathology for an intraoperative reading. A frozen section will confirm

or deny the negative margins and the procedure will then proceed as dictated. Any bleeding of the vessels at the tumor site will be controlled using 3-0 polyglactin 910 figure of eight sutures or for larger vessels, 2-0 polyglactin 910 ties will be used after the vessels are clamped with a mosquito. Any vessels found being clamped by the right angle will be suture ligated with 2-0 polyglactin 910 suture. A porcine gelatin absorbable sponge will be placed for further hemostasis along with pressure at the site of resection. Once hemostasis has been reached, anesthesia will administer indigo carmine or methylene blue for evaluation of entry into the collecting system. Urine in the urimeter will turn blue as well as any compromised portions of the resection site in the field. A 4-0 poliglecaprone 25 in a running stitch will then be used to suture closed any compromised areas of the collecting system. Reevaluation of the site then occurs and confirmation of absence of dye or bleeding will ensue. If further hemostasis is needed, an additional porcine gelatin absorbable sponge and pressure will be used. Adrenal glands and visible lymph nodes will be assessed for involvement.

Closure

The kidney will then be repaired using renorrhaphy sutures, which may include 2-0 polyglactin 910 with pledgets, Weck clips and Lapper ties. The edges of the defect in the parenchyma will be reapproximated with 2-0 polyglactin 910 sutures. Placement of a Penrose drain will be in the lower quadrant on the side of the affected kidney from Gerota's fascia to skin. Gerota's fascia will then be closed around the drain and the kidney using a 2-0 polyglactin 910 running



Figure 8. s/p OPN week one³



Figure 9. s/p OPN week two³



Figure 10. s/p OPN week three³



Figure 11. s/p OPN month three³

Skin
Subcutaneous layer
Fascia [lumbodorsal]
Muscle [internal and external oblique, transversus abdominis, latissimus dorsi]
Peritoneum
Pleura
Subcostal neurovascular bundle
Retroperitoneal space
Perinephric fat
Gerota's fascia
Adrenal gland
Kidney [upper and lower pole, hilum]
Ureter
Renal pedicle
Vascular pedicle
Renal artery and vein
Inferior vena cava

INSTRUMENT AND SUPPLY LIST ⁶

Basic major set/long instrument tray
Kidney/Urology tray
Vascular tray
Thoracotomy tray
Potts scissors
Pedicle clamps
Hemoclip appliers
Mixer/right angles
Bookwalter retractor/self-retaining retractor
General pack
Basin set
Weck bar
Peanuts/Kittner
Vessel loops
Umbilical tape
Chest tube
Chest drainage system
Surgicel/Surgifoam/Gelfoam/porcine gelatin absorbable sponges
Transverse laparotomy drape
ESU/grounding pad
Suction
SCDs
Bair-hugger
Penrose drain
Foley catheter/indwelling catheter
Various suture of MD preference

stitch. The drain will be anchored to the skin using a 2-0 nylon suture. Because of entry into the pleura, a chest tube must be placed and the ST will have the chest drainage system ready. The chest tube will be placed and anchored using a 2-0 silk suture. Once the drains have been placed, the retroperitoneal space and the pleura (anchoring this to the diaphragm) will be closed using 2-0 silk interrupted sutures. The ribs must be approximated using a 0 nylon suture with a rib punch. The peritoneum will be closed with 2-0 running polyglactin 910 suture. The closure to the skin level then will follow.

The internal oblique, external oblique and latissimus dorsi will be closed using a running #1 polypropylene stitch, the subcutaneous layer will be reapproximated with 2-0 polyglactin 910, the skin will be closed with either staples – with the surgical technologist passing two Adson forceps with the stapler – or a 4-0 poliglecaprone 25 running stitch. Steri-strips then will be placed. The surgical technologist and the circulator will perform a final count for all needle, sponges and instruments. A sterile compression/padded dressing will be applied in sterile fashion over the incision by the surgical technologist, a pouch will be placed over the Penrose drainage site and the chest tube will be placed into a chest drainage system system by the surgical technologist with assist from the circulator.

Post op

Steri-strips, skin suture, staples, Penrose drain/JP drain and the chest tube and wet suction control system will be used in the intraoperative stage. Postoperatively, the patient will be assisted in keeping the drains and original dressings while still an inpatient until discontinued by the doctor. The patient will likely be discharged with only steri-strips in place, with specific instructions as to removal after a set amount of time. Complications can include hemorrhage, pain, solitary kidney complications, infection and leakage from the drain site. Patients undergoing open partial nephrectomies generally recover fully with minimal complications, usually after a few months. There generally is a three-to-five day hospital stay, dependent upon the patient's needs and the facilities' norms. There is no organized physical therapy, but it is important for the patient to ambulate and be as active as possible for eventual recovery. Over time, success rates are high in Stages I and II with no metastasis and clean margins gained. This is considered a curative surgery in the instance of partial nephrectomy.^{18, 16, 15, 8, 7, 11, 6, 9, 10}



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1. According to the American Cancer Society, renal cell carcinoma affects roughly one in ____ of the population.
 - a. 53
 - b. 63
 - c. 73
 - d. 85
2. As the tumor progresses, a possible symptom a patient might experience is:
 - a. Nausea
 - b. Cramping
 - c. Weight loss
 - d. Blurred vision
3. Which test has a high false negative rate?
 - a. Ultrasound
 - b. MRI
 - c. XR
 - d. Biopsy
4. In the UCLA Integrated Staging System, the percentage of low-risk, localized tumors is:
 - a. 81%
 - b. 97%
 - c. 62%
 - d. 95%
5. When the patient is placed into the appropriate position, the affected side will be placed:
 - a. Superior
 - b. Inferior
 - c. Lateral
 - d. Prone
6. The incision site will be draped with a transverse sheet and ____ folded surgical towels.
 - a. 2
 - b. 3
 - c. 4
 - d. 5
7. To begin the procedure, a cut will be made above or below the ____ rib, dependent upon the tumor site and anatomy.
 - a. 11th
 - b. 12th
 - c. 11 or 12th
 - d. None of the above
8. The Gerota's fascia will be opened on the longitudinal aspect toward the ____ aspect of the kidney.
 - a. Anterior
 - b. Posterior
 - c. Medial
 - d. Lateral
9. The post-operative hospital stay is generally _____.
 - a. 1 day
 - b. 2-5 days
 - c. 3-5 days
 - d. 5-7 days
10. The average age of a patient diagnosed with kidney cancer is:
 - a. 45
 - b. 57
 - c. 64
 - d. 72

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