

Challenging Cases of Renal Cell Cancers With or Without Tumor Thrombus During the Covid-19 Pandemic

GAETANO CIANCIO^{1,2,3,4}, AHMED FARAG^{1,3,5} and JEFFREY J. GAYNOR^{1,3}

Departments of ¹Surgery and ²Urology, ³Miami Transplant Institute, University of Miami Miller School of Medicine, Miami, FL, U.S.A.;

⁴Jackson Memorial Hospital, Miami, FL, U.S.A.;

⁵Department of Surgery, Zagazig University School of Medicine, Zagazig, Egypt

Abstract. *Background/Aim: Large or bilateral multiple renal cell carcinoma (RCC) without/with tumor thrombus (TT) in the renal vein (RV) or inferior vena cava (IVC) poses a challenge to the surgeon due to the potential for massive hemorrhage, tumor thromboemboli and dialysis, and the situation is more critical due to Covid-19 pandemic. We report our experience and measures in dealing with challenging cases of large or multiple RCCs without/with TT during the ongoing Covid-19 pandemic. Patients and Methods: Between 4/2020-10/2020, five patients underwent RCC resection with/without TT. Patients 1 and 2 had RCCs/TT in RV; Patient 3 had RCC/TT supradiaphragmatic below right atrium; Patient-4 had a 26 cm RCC; Patient-5 had multiple RCCs as part of Birt-Hogg-Dube syndrome. Results: Patients were preoperatively tested negative for Covid-19. Operation times were 105, 85, 255, 200 and 247 minutes for Patients 1-5. Estimated blood loss was: 100, 50, 3,900, 100 and 50 ml, respectively. Patient 3 underwent RCC resection en bloc with IVC/TT. Patients 1 and 2 underwent resections of RCC/TT in RV. Patient 4 underwent a 26 cm RCC resection. Patient 5 underwent laparoscopic bilateral radical nephrectomies. No immediate postoperative complications were reported. Conclusion: We successfully managed 5 challenging cases of RCCs despite the recommendations imposed by hospitals due to Covid-19 pandemic, with favorable outcomes.*

Renal cell carcinoma (RCC) infrequently extends into the renal vein (RV) and inferior vena cava (IVC) (1, 2). Surgery

Correspondence to: Gaetano Ciancio, MD, Department of Surgery and Urology, University of Miami Miller School of Medicine, Jackson Memorial Hospital, Miami Transplant Institute, 1801 NW 9th Ave, 7th Floor, Miami, FL 33136, U.S.A. Tel: +1 3053555803, Fax: +1 3053555797, e-mail: gciancio@med.miami.edu

Key Words: Renal cell carcinoma, tumor thrombus, Covid-19, Birt-Hogg-Dube syndrome.

offers the only potential cure for those patients (3, 4). As Jackson Memorial Hospital (JMH) started preparing for the Covid-19 pandemic patients in Miami, Florida, USA (5), it was decided to cancel elective surgeries, and re-evaluate any necessary surgeries in order to make as many of the hospitals beds, intensive care units' beds, and nursing staff available for the possibility of a dramatically increased need to treat Covid-19 patients admitted to JMH. The American College of Surgeons also made a recommendation of cancelling the elective surgeries (6).

From April 2020 to October 2020, 5 patients presented to JMH with large RCCs with or without tumor thrombus (TT) extending into the RV or IVC, or with multiple bilateral renal tumors. Two patients, who presented in March 2020, were initially informed to wait because JMH's immediate priorities were to treat Covid-19 Patients. Both Patients and their families became anxious knowing the loved ones had advanced forms of cancer, and the surgery was the only therapeutic option. The patients returned upon JMH's resumption of the elective surgeries. Recent articles, in the urology literature (7, 8), have shown that more advanced RCCs, particularly those with tumor thrombus, may progress rapidly, and therefore require immediate attention. Thus, a decision to proceed with the surgery, without further delay, was made in each case. Their surgeries were performed in April 2020. The Covid-19 situation started to normalize in June 2020; therefore, we scheduled the other 3 patients.

Herein, we describe our experience in the management of the challenging cases of five patients: three patients with RCC with TT extending into the RV and IVC; one patient with a large RCC who missed the follow-up, and consequently the mass increased in size from 13 cm (July 2013) to 26 cm (September 2020); one patient with Birt-Hogg Dube syndrome (BHDS) associated with bilateral multiple renal tumors. We demonstrated how these 5 patients were managed in an attempt to avoid their exposure to Covid-19, and achieve a good surgical outcome, as well.

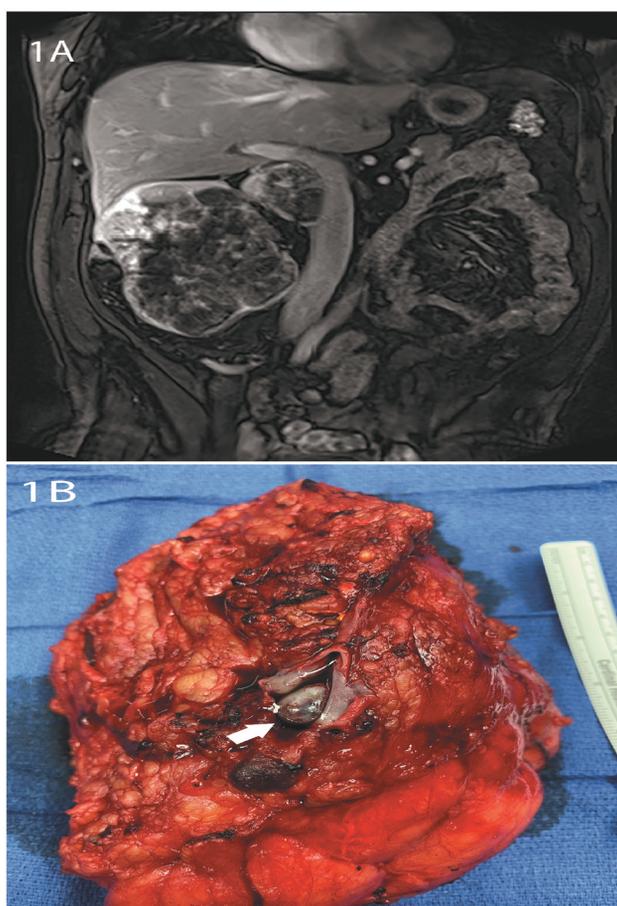


Figure 1. (A) Magnetic resonance imaging showing a large right mass with a mass pushing the Inferior Vena Cava medially. (B) Pathology specimen of large left renal mass with tumor thrombus into the left renal vein. The arrow is showing the tumor thrombus inside the renal vein.

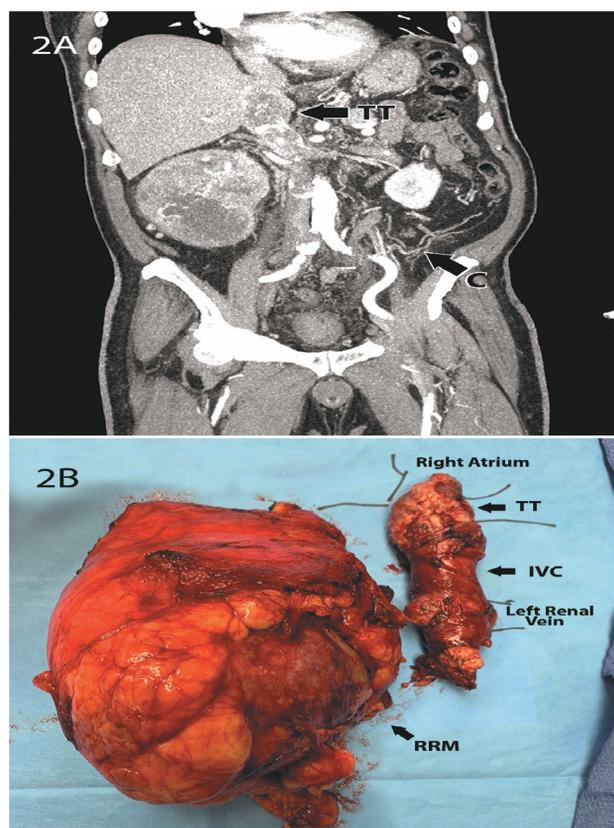


Figure 2. (A) Computerized tomography scan showing a right renal mass with tumor thrombus inside the Inferior Vena Cava (IVC). TT: Tumor thrombus inside the IVC, C: collateral circulation. The IVC was almost completely obstructed. (B) Large right renal mass with en-bloc removal with the IVC with TT inside. RRM: Right renal mass, TT: tumor thrombus extending above the diaphragm almost to the right atrium, IVC: inferior vena cava.

Patients and Methods

This study was performed according to the ethical standards of the University of Miami Institutional Review Board and Declaration of Helsinki (as revised in 2013). Informed written consents were obtained from all participants in this study. From April 2020 to October 2020, 5 Patients were referred to JMH for treatment of RCCs with or without TT extending into the RV and IVC. The cranial extent of the tumor was defined per our own classification (9) and as per Neves and Zincke (10). Transesophageal echocardiography (TEE) was used to detect any pulmonary emboli before starting the surgery, during surgery, and at the end of surgery in order to carefully manage any pulmonary emboli that may have occurred during the procedure (11, 12).

Patient 1, a 61-year-old male had a right renal tumor extended into the right RV and a mass growing under the cava. The diagnosis of the right renal mass with TT was made after physical examination, laboratory investigations (Urine analysis showed microscopic hematuria of >25 RBC/HPF, reference: <2/HPF) and

imaging studies [ultrasound, computerized tomography (CT) scan and magnetic resonance imaging (MRI)] (Figure 1A).

Patient 2, a 57-year-old male, presented with gross hematuria (repeated urine tests few times), and finally underwent an ultrasound and CT scan that showed a left renal mass with level I TT (Figure 1B).

Patient 3, a 79-year-old male, referred to the JMH's emergency room (ER, an urgent care center), presenting with gross hematuria and right-sided abdominal pain. CT scan demonstrated a large right renal mass with level IIIId TT (9) (Figure 2A) and with bland thrombus below the TT.

Patient 4, 65-year-old male, with a history of hypertension and right renal mass diagnosed incidentally in 2013 (Figure 3A). He had an insurance problem and lost the follow-up. In July 2020, presented to the ER with nausea, vomiting, metabolic acidosis, abdominal pain, and acute kidney injury. After controlling his medical problems and normalization of the renal function (serum creatinine became 1 mg/dl), MRI was performed showing the same right renal mass, but this time its size was 26 cm (Figure 3B).

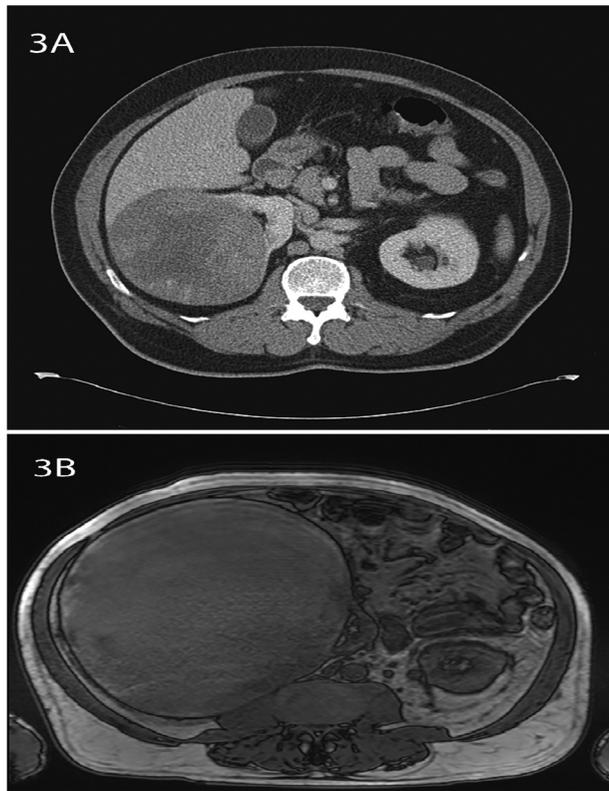


Figure 3. (A) Computerized Tomography Scan performed in July 2013, the mass was 13 cm. (B) Magnetic Resonance Imaging performed in September 2020, this time the mass was 26 cm.

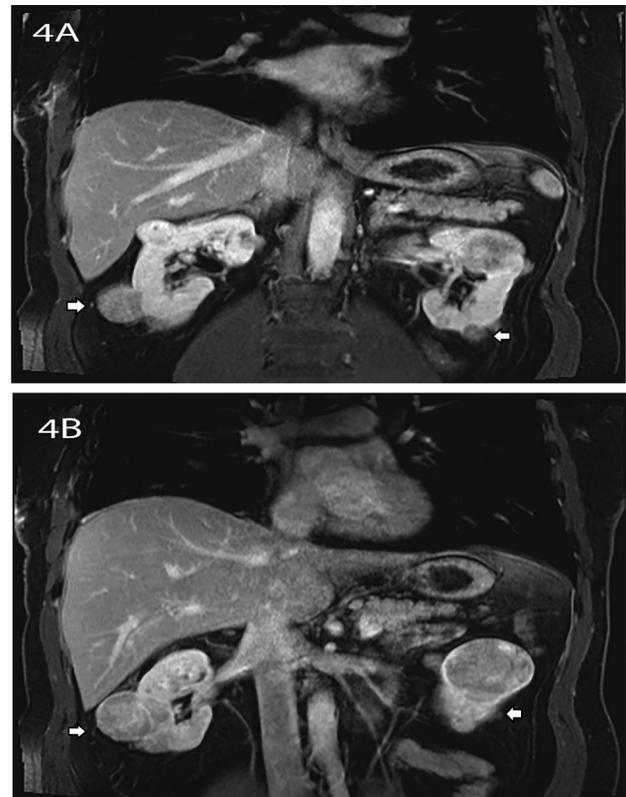


Figure 4. Computerized Tomography Scan showing bilateral renal tumors in the patient with Birt-Hogg Dube Syndrome. (A and B) The arrows are showing the bilateral renal tumors.

Patient 5, a 48-year-old male, with a history of recurrent spontaneous pneumothorax ($\times 3$), it was thought to be related to a recent motor vehicle accident in December 2019. He presented to ER with shortness of breath and worsening bilateral flank pain, and the work up CT chest showed a new pneumothorax (it was treated) but also a possible bilateral renal mass. MRI of the abdomen was performed showing bilateral multiple renal masses (Figure 4A and B). BHDS was diagnosed, but with a variant of the syndrome demonstrating no skin manifestations.

Clinical and pathological staging were performed using the TNM classification (13). Tumor grade was classified according to the Furhman grading system. Cell saver was used during the surgical procedure.

Before surgery. All patients were tested for Covid-19 24 to 48 hours before surgery.

No family members were allowed to visit the patients on the day of surgery.

During surgery. The participating cardiovascular anesthesiologist had previous experience in using TEE. TEE was used in the 3 Patients with RCC and TT (11).

Cell saver was used in order to avoid blood transfusions. (So far there is no evidence of Covid-19 transmission through blood

transfusions) (14). The use of transplant techniques helped with the rapid dissection and removal of both renal tumor and tumor thrombus safely (1-3, 15). The abdominal closure was performed using a running subcuticular monocryl 4-0 absorbable suture to avoid extra visits for staples removal.

After surgery. All patients were transferred to the recovery room, but Patient 3 was transferred to the intense care unit. Then, patients 1, 2 and 3, with RCC and TT, were transferred to the Transplant Unit, where strict regulations about Covid-19 have already been implemented by JMH (5), and care was provided by the nursing staff. Patient 4 and 5 were transferred to a surgical floor. While family members were not allowed to visit during the postoperative period, they did receive a daily update via regular phone calls, texts and/or using Zoom application. Personal protective equipment was used for both the Patients and care givers. Covid-19 testing was repeated before they were discharged.

Operative technique. The surgical technique has already been described at length previously for both right or left renal tumors with TT (1-3, 15). A sub-costal incision was performed commencing approximately 2 fingerbreadths below the right or left (according the tumor location) costal margin, extending out laterally to the mid-axillary line. Rochard self-retaining retractor

was placed to retract the costal margins and splaying them laterally towards the axillae. We pursued early intraoperative ligation of the involved renal artery. The kidney was mobilized medially with the liver or *en bloc* with the spleen and pancreas until the renal artery was identified and ligated (16). Arterial ligation resulted in decompression of collateral circulation, decreasing blood loss, which is very important in order to avoid the need for blood transfusions. The rest of the procedure has been described at length previously (1, 3, 15). The Patient 1 had a right tumor growing under the cava (Figure 1A), and the IVC needed to be mobilized extensively in order to allow for a complete resection. For Patients 1 and 2, there was no need to open the IVC; both TT was milked into the RV, then the RV was ligated and divided.

Patient 3, with RCC and TT level IIIId (supradiaphragmatic but below the right atrium), had a more extensive surgery. The TT stopped almost 1 cm from the right atrium. There was no need for the use of cardio-pulmonary bypass (1-3, 17). The right renal tumor was resected *en bloc* with the IVC containing the TT (Figure 2B). The IVC was stapled at the level of the major hepatic veins, at the level of the left RV and about 3 cm about the IVC bifurcation (18). EviceI® was used over the remnant of the renal hilum, renal fossa and along the cavotomy of the IVC.

Results

The operative times were 105, 85, 255, 200 and 247 minutes for Patient 1 to Patient 5, respectively. Estimated blood loss was 100, 50, 3,900, 1,000 and 50 ml for Patient 1 to 5, respectively. Patients 1, 3, 4 had right RCCs, Patient 2 had a left RCC and Patient 5 had bilateral multiple RCCs. Patient 3, with a right RCC and TT above the diaphragm but just below the right atrium, had a blood loss of 3,900 ml and required 6 units of packed red blood cells (PRBCs) and 500 ml of cell saver. Patient 4, with the large right RCC of 26 cm, lost 1000 ml of blood and required 2 units of PRBCs.

Serum creatinine after surgery for Patients 1 to 4 were 1.0, 1.1, 0.8 and 1 mg/dl, respectively. Patient 5 with BHDS required dialysis in the immediate postoperative period, and possible kidney transplantation in the near future. All the patients had an uneventful postoperative course.

Pathological examination revealed RCC of the clear cell variety with sarcomatoid features in Patient 1, and RCC clear type in Patients 2 to 4. In Patient 5, the left kidney had more than 10 tumors and the right one had more than 6 tumors. All tumors in Patient 5 were chromophobe RCCs and oncocytomas.

Tumor sizes were 17, 15, 13 and 26 cm for Patients 1 to 4. Patient 5 with multiple bilateral renal tumors; the biggest one on the right side was 4.5 cm, and on the left was 5.2 cm. Furhman grade was IV for Patient 1 and 3 for the rest of the Patients. The TNM classification was: pT3aN0M0 for Patients 1 and 2; pT3cpN1pMn/a for Patient 3 with 5 lymph nodes positive out of 13 lymph nodes; pT2bN0pMn/a in Patient 4; pT1bNxMn/a in Patient 5. All the patients are being followed-up by the oncologists, none of them required chemotherapy at this time.

Discussion

Generally, “essential surgery only” approach has prevailed during Covid-19 pandemic including prioritizing surgeries with shorter operative time, expected reduced rates of complications and shorter hospital stay. Many complex surgeries are not performed during Covid-19 (29). About 37.6% and 81% of surgeries for malignant and benign lesions were delayed, respectively (19). American College of Surgeons set triage criteria to deal with surgical patients during the Covid-19 pandemic that were based on decrease the surgical activities in the setting of the peak, and the potential mortality if surgery is not performed in a specified time interval (6).

The cancer treatment journey needs many hospital and follow-up visits that may increase the exposure risk to Covid-19. The only way to keep an eye on those patients is to test them for Covid-19 every time they visit the hospital that may overload the hospital resources and increase the patient’s sufferings. The decision to manage cancer patients is dependent on a multidisciplinary team that, in addition to the health care workers and professionals, includes the patient. During the pandemic, virtual tumor board is being used for decision making (20).

Management of cancer patients during the Covid-19 pandemic may cause: (1) burnout of the surgical team owing to the longer duration of surgery; (2) increase the risk of Covid-19 exposure and infection in cancer patients due to cancer-related immunocompromised states; (3) unavailability of intensive care unit beds; (4) limited blood donations and availability; (5) metabolic stress and temporarily surgery-related immunocompromised states (21).

The surgical procedure for patients with multiple and/or large RCCs with or without extension into the RV or IVC is of high-risk, complex and challenging natures due to the association with difficult exposure, multiple venous collaterals, potential for the development of pulmonary emboli, and major blood loss. This critical surgical situation could not get any worse during the Covid-19 pandemic, when elective surgeries were cancelled or recommended to be reevaluated by the attending surgeon (6). Unfortunately, surgery is the only reliable curative option for these patients when they have these complex urological tumors with or without TT extending into the RV and IVC.

Stensland *et al.* has just published a list of urological surgeries that should be prioritized vs. delayed during the height of the COVID-19 pandemic (7). The rationale for immediately performing radical nephrectomy for those tumors with extension into the RV and IVC was stated that they may progress rapidly and make the surgeries more complicated, thereby also increasing post-operative morbidity and mortality risks if delayed (7, 22).

When dealing with RCC and TT, the critical part of the operation is the management of the IVC (1-3). The important

goals are to minimize bleeding and prevent embolism from the TT during surgery, as either event can often lead to fatal consequences.

We have never preoperatively embolized any of our patients (1-3), but an important principle of our surgical approach includes mobilization of the kidney with early ligation of the renal artery. The kidney mobilization begins laterally and proceeds posteriorly paying special attention to ligate the perirenal collateral circulation. With the posterior approach, fewer adverse events are encountered as opposed to dissection anterior to the kidney. Once the kidney is mobilized medially, the renal artery is identified, ligated and divided. The collateral circulation quickly collapses, making the rest of the dissection easier, and has the same effect as preoperative embolization but without the morbidity risks (16).

Patients without private insurance are less likely to have access to medical care or participate in cancer screening programs. They are more likely to present with an advanced stage of the disease like patient 4 of our series (23, 24). We think that patient 3 also had a medical insurance problem. He was also uninsured, and he just migrated from a conflict country in Latin America. Li Y *et al*. reported that insured RCC patients had an improved cancer-specific survival (CSS) while individuals with any Medicaid suffered worse survival outcome. The 5-year CSS rates of patients with insurance, any Medicaid and no insurance were 88.3%, 82.6% and 82.7%, respectively (25). Patient 4 had 5 lymph nodes positive out of 13 lymph nodes. Lymph node metastasis in RCC has a poor prognosis (26). At this time, Patient is clinically stable and with no apparent metastatic disease and will be followed up by medical oncology team for further treatment (26). It is difficult to imagine the survival of Patients 3 and 4 with no insurance at all.

BHDS is a rare autosomal dominant hereditary disease characterized by lung cysts associated with spontaneous pneumothorax, cutaneous fibrofolliculomas, trichodiscomas, and renal neoplasia. It is caused by a germline mutation in the folliculin gene (27). Our patient presented with bilateral RCCs and pneumothorax but no skin manifestations. Radio frequency ablation and cryoablation have been used in the conservative management of RCC associated with BHDS (28). BHDS can also be associated with a recurrent tumor after a radical approach to the disease (29). We decided to proceed with bilateral hand-assisted radical nephrectomy after extensive discussion as he had multiple bilateral renal tumors and a conservative (ablation or nephron-sparing surgery) would not have been beneficial. We will follow him for a possible kidney transplant in the future.

Ellis *et al*. recommended that in order to reduce medical errors during such challenging circumstances, it is important to understand and appreciate the human factor in reducing the surgical errors (30). This real situation of the Covid-19 pandemic not only stresses the health system but also the

Patient and his/her family members. These 5 patients had complex surgical problems. Therefore, to decrease surgical errors, the surgery was described to the anesthesiologist team and to the nurses in details and they were aware about the negative Covid-19 test's result. It is important for these complex urological tumor cases to have trained surgical personnel familiarize with these cases to facilitate the surgery and decrease surgical errors during the stressful situations like the Covid-19 pandemic.

Conclusion

In this report, we described the surgical management of 5 Patients: 3 Patients with RCCs and TT, 1 Patient with 26 cm RCC, and 1 Patient with multiple bilateral renal tumors during Covid-19 pandemic. Our pre-, intra-, and post-operative measures succeeded to help them avoid the exposure to Covid-19 infection, with a favorable surgical outcome.

Conflicts of Interest

The Authors declare that there are no conflicts of interest.

Authors' Contributions

GC, AF and JJG designed the study. GC, AF and JJG wrote the article. GC, AF and JJG collected the data. GC, AF and JJG offered scientific advice. GC, AF and JJG revised the manuscript. GC critically revised the manuscript and was the supervisor.

References

- 1 Ciancio G, Livingstone AS and Soloway M: Surgical management of renal cell carcinoma with tumor thrombus in the renal and inferior vena cava: The university of miami experience in using liver transplantation techniques. *Eur Urol* 51(4): 988-995, 2007. PMID: 17175095. DOI: 10.1016/j.eururo.2006.11.055
- 2 González J, Gaynor JJ, Martínez-Salamanca JL, Capitanio U, Tilki D, Carballido JA, Chantada V, Daneshmand S, Evans CP and Gasch C: Association of an organ transplant-based approach with a dramatic reduction in postoperative complications following radical nephrectomy and tumor thrombectomy in renal cell carcinoma. *Eur J Surg Oncol* 45(10): 1983-1992, 2019. PMID: 31155470. DOI: 10.1016/j.ejso.2019.05.009
- 3 Ciancio G, Gonzalez J, Shirodkar SP, Angulo JC and Soloway MS: Liver transplantation techniques for the surgical management of renal cell carcinoma with tumor thrombus in the inferior vena cava: Step-by-step description. *Eur Urol* 59(3): 401-406, 2011. PMID: 20724064. DOI: 10.1016/j.eururo.2010.07.028
- 4 Ciancio G, Manoharan M, Katkooi D, De Los Santos R and Soloway MS: Long-term survival in patients undergoing radical nephrectomy and inferior vena cava thrombectomy: Single-center experience. *Eur Urol* 57(4): 667-672, 2010. PMID: 19560258. DOI: 10.1016/j.eururo.2009.06.009

- 5 COVID-19 (Novel Coronavirus 2019) Protocol. Available at: http://www.jhsmiami.org/stewardship/UploadData/765_docs/nCoVCOVID-19PROTOCOL%204.17.20.pdf [Last accessed on December 16, 2020]
- 6 American College of Surgeons. Covid-19: recommendations for management of elective surgical procedures 2020. Available at: www.facs.org/about-acscovid-19/information-for-surgeons [Last accessed on December 16, 2020]
- 7 Stensland KD, Morgan TM, Moinzadeh A, Lee CT, Briganti A, Catto JW and Canes D: Considerations in the triage of urologic surgeries during the covid-19 pandemic. *Eur Urol* 77(6): 663, 2020. PMID: 32279903. DOI: 10.1016/j.eururo.2020.03.027
- 8 Froehner M, Heberling U, Zastrow S, Toma M and Wirth MP: Growth of a level iii vena cava tumor thrombus within 1 month. *Urology* 90: e1-e2, 2016. PMID: 26772645. DOI: 10.1016/j.urology.2015.12.043
- 9 Ciancio G, Vaidya A, Savoie M and Soloway M: Management of renal cell carcinoma with level iii thrombus in the inferior vena cava. *J Urol* 168(4 Part 1): 1374-1377, 2002. PMID: 12352396. DOI: 10.1097/01.ju.0000023441.00587.02
- 10 Neves R and Zincke H: Surgical treatment of renal cancer with vena cava extension. *Br J Urol* 59(5): 390-395, 1987. PMID: 3594097. DOI: 10.1111/j.1464-410x.1987.tb04832.x
- 11 Fukazawa K, Gologorsky E, Naguit K, Pretto Jr EA, Salerno TA, Arianayagam M, Silverman R, Barron ME and Ciancio G: Invasive renal cell carcinoma with inferior vena cava tumor thrombus: cardiac anesthesia in liver transplant settings. *J Cardiothorac Vasc Anesth* 28(3): 640-646, 2014. PMID: 24050854. DOI: 10.1053/j.jvca.2013.04.002
- 12 Serena G, Gonzalez J, Gaynor JJ, Salerno T, Verzaro R and Ciancio G: Pulmonary tumor embolization as early manifestation in patients with renal cell carcinoma and tumor thrombus: perioperative management and outcomes. *J Card Surg* 34(10): 1018-1023, 2019. PMID: 31376225. DOI: 10.1111/jocs.14182
- 13 Swami U, Nussenzeig RH, Haaland B and Agarwal N: Revisiting AJCC TNM staging for renal cell carcinoma: quest for improvement. *Ann Transl Med* 7(Suppl 1), 2019. PMID: 31032299. DOI: 10.21037/atm.2019.01.50
- 14 Cai X, Ren M, Chen F, Li L, Lei H and Wang X: Blood transfusion during the covid-19 outbreak. *Blood Transfus* 18(2): 79, 2020. PMID: 32267830. DOI: 10.2450/2020.0076-20
- 15 Ciancio G, Vaidya A, Shirodkar S, Manoharan M, Hakky T and Soloway M: En bloc mobilization of the pancreas and spleen to facilitate resection of large tumors, primarily renal and adrenal, in the left upper quadrant of the abdomen: techniques derived from multivisceral transplantation. *Eur Urol* 55(5): 1106-1111, 2009. PMID: 19167808. DOI: 10.1016/j.eururo.2008.12.038
- 16 Ciancio G, Vaidya A and Soloway M: Early ligation of the renal artery using the posterior approach: a basic surgical concept reinforced during resection of large hypervascular renal cell carcinoma with or without inferior vena cava thrombus. *BJU Int* 92(4): 488, 2003. PMID: 12930447. DOI: 10.1046/j.1464-410x.2003.04372.x
- 17 Ciancio G, Shirodkar SP, Soloway MS, Livingstone AS, Barron M and Salerno TA: Renal carcinoma with supradiaphragmatic tumor thrombus: avoiding sternotomy and cardiopulmonary bypass. *Ann Thorac Surg* 89(2): 505-510, 2010. PMID: 20103332. DOI: 10.1016/j.athoracsur.2009.11.025
- 18 González J, Gorin MA, Garcia-Roig M and Ciancio G: Inferior vena cava resection and reconstruction: technical considerations in the surgical management of renal cell carcinoma with tumor thrombus. *Urol Oncol* 32(1): 34.e19-26, 2014. PMID: 23499500. DOI: 10.1016/j.urolonc.2013.01.004
- 19 Natasha LW, and Chidi CE: COVID-19: What are the challenges for NHS surgery? *Curr Probl Surg* 57(9): 100856, 2020. PMID: 32948255. DOI: 10.1016/j.cpsurg.2020.100856
- 20 Farhanul H, Praveen K, Sudhir KS, Saumya A and Somprakas B: Covid-19 and surgery: Challenging issues in the face of new normal – A narrative review. *Ann Med Surg (Lond)* 60: 162–167, 2020. PMID: 33133594. DOI: 10.1016/j.amsu.2020.10.039
- 21 Spinelli A and Pellino G: COVID-19 pandemic: perspectives on an unfolding crisis. *Br J Surg* 107(7): 785-787, 2020. PMID: 32191340. DOI: 10.1002/bjs.11627
- 22 Campi R, Amparore D, Capitanio U, Checcucci E, Salonia A, Fiori C, Minervini A, Briganti A, Carini M and Montorsi F: Assessing the burden of nondeferrable major uro-oncologic surgery to guide prioritisation strategies during the covid-19 pandemic: Insights from three Italian high-volume referral centres. *Eur Urol* 78(1): 11-15, 2020. PMID: 32307215. DOI: 10.1016/j.eururo.2020.03.054
- 23 Michael McWilliams J: Health consequences of uninsurance among adults in the united states: Recent evidence and implications. *Milbank Q* 87(2): 443-494, 2009. PMID: 19523125. DOI: 10.1111/j.1468-0009.2009.00564.x
- 24 Li Y, Zhu M-X and Zhang B: The impact of insurance status on the survival outcomes of patients with renal cell carcinoma. *Transl Androl Urol* 9(4): 1678, 2020. PMID: 32944529. DOI: 10.21037/tau-20-1045
- 25 Niu X, Roche LM, Pawlish KS and Henry KA: Cancer survival disparities by health insurance status. *Cancer Med* 2(3): 403-411, 2013. PMID: 23930216. DOI: 10.1002/cam4.84
- 26 Clausen L, Stein A, Grønbæk-Thygesen M, Nygaard L, Søltoft CL, Nielsen SV, Lisby M, Ravid T, Lindorff-Larsen K and Hartmann-Petersen R: Folliculin variants linked to birt-hogg-dubé syndrome are targeted for proteasomal degradation. *PLoS Genet* 16(11): e1009187, 2020. PMID: 33137092. DOI: 10.1371/journal.pgen.1009187
- 27 Matsui Y, Hiraki T, Gobara H, Iguchi T, Tomita K, Uka M, Araki M, Nasu Y, Furuya M and Kanazawa S: Percutaneous thermal ablation for renal cell carcinoma in patients with birt-hogg-dubé syndrome. *Diagn Interv Imaging* 100(11): 671-677, 2019. PMID: 31302073. DOI: 10.1016/j.diii.2019.06.009
- 28 Ather H and Zahid N: Recurrent renal cancer in birt–hogg–dubé syndrome: A case report. *Int J Surg Case Rep* 42: 75-78, 2018. PMID: 29223882. DOI: 10.1016/j.ijscr.2017.11.032
- 29 Ellis R, Hay-David A and Brennan P: Operating during the covid-19 pandemic: How to reduce medical error. *Br J Oral Maxillofac Surg* 58(5): 577-580, 2020. PMID: 32312584. DOI: 10.1016/j.bjoms.2020.04.002
- 30 Nepogodiev D and Bhangu A: Elective surgery cancellations due to the COVID-19 pandemic: global predictive modelling to inform surgical recovery plans. *Br J Surg* 107(11): 1440-1449, 2020. PMID: 32395848. DOI: 10.1002/bjs.11746

Received November 24, 2020

Revised December 9, 2020

Accepted December 17, 2020