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MINIREVIEWS

Palliative care for acute kidney injury patients in the intensive care unit

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Abstract

Patients with acute kidney injury (AKI) in the intensive care unit (ICU) are often suitable for palliative care due to the high symptom burden. The role of palliative medicine in this patient population is not well defined and there is a lack of established guidelines to address this issue. Because of this, patients in the ICU with AKI deprived of the most comprehensive or appropriate care. The reasons for this are multifactorial including lack of palliative care training among nephrologists. However, palliative care in these patients can help alleviate symptoms, improve quality of life, and decrease suffering. Palliative care physicians can determine the appropriateness and model of palliative care. In addition to shared decision-making, advance directives should be established with patients early on, with specific instructions regarding dialysis, and those advance directives should be respected.

Key words: Palliative care; Acute kidney injury; Intensive care unit; Dialysis; Advance directives

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Core tip: Role of palliative medicine in nephrology is not well defined and the patients with acute kidney injury in the intensive care unit may not receive the most comprehensive care surrounding their illness due to scarcity of established palliative care guidelines and lack of palliative care training among nephrologists. A multidisciplinary approach involving palliative care physician early in the course of illness may help in comfort care of acute kidney injury patients in the intensive care unit. Shared decision-making and advance directives play an important role guiding the physician as to what patient wishes are, and those decisions should be respected.

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INTRODUCTION

Intensive care unit (ICU) patients with acute kidney injury (AKI) have a high mortality rate and renal replacement therapy is not cost-effective in these patients[1]. Physicians in the ICU often face challenging situations when potentially inappropriate treatment has to be withdrawn in critically ill patients[2]. Various factors make these situations more complex; incapacitated state of ICU patients, the option of temporary dialysis due to reversible nature of AKI, and inadequate knowledge of surrogate decision-makers about the goals of care and prognosis[2]. Palliative medicine has a well-established role in many chronic disease states and principles of palliative care are well established for the management of end-stage disease symptoms. However, the role of palliative medicine in the field of nephrology is not well defined and patients with AKI leading to fluid overload, acidosis, hyperkalemia, acute respiratory distress syndrome, respiratory failure and multisystem organ dysfunction with hypotension and sepsis in the ICU may not receive the most comprehensive or appropriate care surrounding their illness. A multitude of factors contribute to this; lack of palliative care training among nephrologists, lack of epidemiological research on outcomes and scarcity of established palliative care guidelines for management of AKI patients in the ICU results in a substandard level of care. However, a multidisciplinary approach by involving palliative care physician early in the course of illness may help in comfort care of AKI patients in the ICU. In this review, we discuss the use of palliative medicine in this specific patient population.

PALLIATIVE CARE IN ACUTE KIDNEY INJURY IN THE ICU

One of the main reasons why palliative care is rarely offered to AKI patients in the ICU setting is the lack of palliative medicine training in most nephrology programs. As a result, most nephrologists may not feel comfortable or compelled to provide these services at an appropriate time. To help solve this issue, nephrology fellows in the future during their training should receive some exposure to palliative care, especially in the ICU setting. There are well-established prognostic indicators from multitudes of epidemiological research on disease progression and outcomes in end-stage renal disease (ESRD) patients. Due to this, nephrologists frequently consult palliative medicine in situations when it may be appropriate for the ESRD patient to withdraw from chronic dialysis. However, AKI patients on dialysis in the ICU may not have palliative care offered at an appropriate time due to the lack of guidelines/recommendations to make a clinical judgment. The following discussion may serve as a guide to nephrologists for providing palliative care to patients with AKI in the ICU.

Risk factors associated with poor outcome in critically ill AKI patients

Kao *et al*[3] conducted a retrospective cohort study to investigate in-hospital mortality and long-term survival rates in critically ill patients with AKI or ESRD receiving renal replacement therapy. This study found that overall in-hospital mortality was 66.5% and there was no significant difference in mortality rates between AKI and ESRD groups (adjusted odds ratio: 0.93; 95%CI: 0.84-1.02)[3]. Hypertension was found to be a high-risk factor for in-hospital mortality in patients with AKI while older age, chronic liver disease and history of cancer were found to be independent risk factors for in-hospital mortality in both AKI and ESRD groups[3]. In addition, older age, coronary artery disease, and ICU admissions were found to be risk factors in AKI patients for long-term dialysis dependence[3]. In another study, Bagshaw *et al*[4] investigated risk factors and outcomes associated with critically ill septic AKI patients in ICU. Compared to non-septic AKI group, septic AKI group had greater severity of illness (P = 0.0001), hypotension (P = 0.0001), tachycardia (P = 0.0001), worse lung function measures (P = 0.0001), higher white cell counts (P = 0.0001) and significant acidemia (P = 0.0001)[4]. Also, septic AKI group was associated with a higher crude mortality rate in the ICU (19.8% *vs* 13.4%, $P \leq 0.001$) and in the hospital (29.7% *vs* 21.6%, $P <$

0.001) compared to non-septic AKI group[4]. Furthermore, a recent prospective cohort study involving septic AKI patients undergoing dialysis in the ICU found that norepinephrine use, hepatic failure, medical condition, blood lactate, and pre-dialysis creatinine level were associated with early mortality (seven days)[5].

Models of palliative care

Palliative care should be considered for all high-risk AKI patients in the ICU determined by the presence risk factors associated with poor outcome or high mortality rates as discussed earlier. Three palliative care models have evolved over two decades with an aim to improve quality of care and reduce suffering in the ill patients[6]. These models of care may be considered in the ICU setting for AKI patients as appropriate.

Conventional model of care: This is also called as the traditional dichotomous model of palliative care where ICU patients receive curative or disease-specific care for AKI till it fails following which palliative care will be initiated[7]. This dichotomous model offers AKI patients either curative/disease-specific care or palliative care but not both simultaneously, which leads to a sudden transition from curative to palliative care without enough transition time (Figure 1)[6,7]. The Conventional model of care is suitable for young AKI patients in the ICU without high-risk factors associated with the poor outcome such as septic shock, acidemia, hypertension, coronary artery disease, chronic liver disease and history of malignancy. Given higher resolution rates in this patient population, curative or disease-specific therapy is given first for the management of AKI till it is unsuccessful and then palliative care is initiated.

Comprehensive model of care: This is also called as the overlapping model of palliative care where ICU patients receive both curative or disease-specific care for AKI and palliative care simultaneously (Figure 2)[7]. Although this model of care is dichotomous, it offers both curative/disease-specific and palliative care simultaneously to the patients with a gradual increase in palliative care over time and slow withdrawal of curative/disease-specific care[6,7]. However, both of these dichotomous models of care have the disadvantage of providing one model of care at the cost of the other[6]. The Comprehensive model of care is suitable for older AKI patients in the ICU with multiple comorbid conditions in addition to the presence of high-risk factors for the poor outcome such as septic shock, acidemia, hypertension, coronary artery disease, chronic liver disease, history of malignancy and history of prior ICU admissions. Due to the poor outcome and higher mortality rates in this patient population, concurrent initiation of palliative care early in the course of medical management helps to prevent and relieve suffering from pain and other physical, psychological, emotional and spiritual distress[7].

Conceptualization model of care: This is also called as the individualized integrated model of palliative care where ICU patients concurrently receive both palliative care and curative or disease-specific care for AKI, but individualized to suit the needs of the AKI patients and family members[7]. In this model of care, palliative care extends beyond the death of the patient to include bereavement care for the family members[7]. In addition, the intensity of palliative care varies based on the needs of the patient or family member during the course of management[7]. Conceptualization model of palliative care is best suited for poor prognostic AKI patients in the ICU with multiple comorbidities and multi-organ failure. This model of care classifies all the interventions and options of care based on goals allowing more flexible management[6]. Once the palliative care is consulted for the impending death of a family member or friend that entails life-changing events and dynamics, the conceptual model helps in supportive intervention to educate family caregivers about stress coping strategies and creates a perception that they have necessary skills to confront problematic situations. (1) Cure-seeking care: Aim to eliminate the underlying disease/medical problem with medical treatment[6]. For example, treatment of sepsis, hypotension, acidosis, electrolyte imbalance, and underlying connective tissue and immunological disorders in AKI patients; (2) Life-extending care: Aim to prolong life in chronic disease states with the help of medical treatment while also enhancing the quality of life[6]. For examples, AKI patients with long-term dialysis dependence; (3) Quality of life and comfort maximizing care: Aim to improve function, reduce suffering and enhance the quality of life in AKI patients in the ICU, and these interventions may also prolong life[6]; (4) Family supportive care: Aim to address the grief and emotions of the family members from the time of diagnosis to past death[6]. The key variables that should be considered for supportive care interventions for family members are[8]; preparedness of the caregivers for the tasks and demands of the role, mastery to manage stress, competence to adapt more quickly to the situation, self-efficacy to manage a situation with coping behaviors,

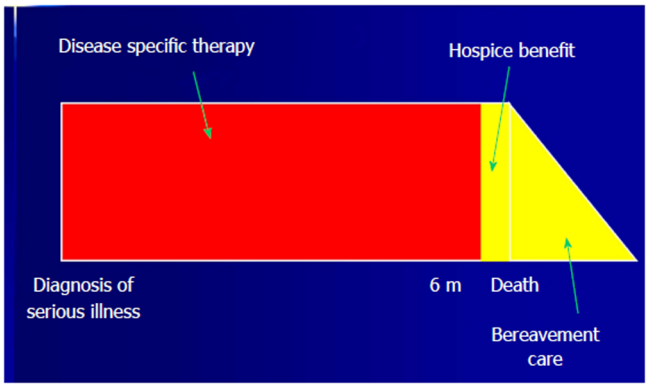


Figure 1 Conventional model of care. Patients receive curative or disease-specific care till it fails following which palliative care will be initiated.

social support to the caregivers, positive emotions to reframe the stressful situations in a positive way, optimism of caregivers to neutralize some potentially negative aspects of caregiving[8]; (5) Healthcare staff supportive care: Aim to address the grief and emotions related to the management of these AKI patients in the ICU[6].

Shared decision-making and advance directives

Patel *et al*[9] described outcomes and decision-making process for nephrologists in the management of AKI in the ICU setting. Expected outcomes and prognosis for patients with AKI remain poor with the mortality rate of 28%-90%[10]. The highest prognostic indicators for mortality were concomitant multi-organ failure, mechanical ventilation, liver-failure, and malignancy[9,11,12]. These prognostic indicators aid physicians to offer palliative care at an appropriate time in this patient population. Furthermore, the use of the RIFLE (Risk, Injury, Failure, Loss of kidney function, and End-stage kidney disease) criteria to establish predicted mortality was around 80%-85% and that, while not perfect, could still be an acceptable tool to help establish the prognosis for AKI patients in the ICU[9,13]. However, in those patients who survive, 70%-90% have a recovery of kidney function[12,13]. Hence RIFLE criteria can be considered when making clinical decisions regarding the discontinuation of dialysis in AKI patients[12,13]. The Renal Physicians Association/American Society of Nephrology (RPA/ASN) guideline, Shared Decision-Making in the Appropriate Initiation of and Withdrawal from Dialysis, helps to establish general recommendations in certain situations in which dialysis may be discontinued[14]. These situations are: (1) a patient with full capacity for judgment who asks for dialysis to be discontinued; (2) a patient who lacks capacity but previously expressed a desire not to continue dialysis; (3) a patient without capacity but power of attorney asking to withdraw dialysis; (4) a patient who has irreversible, profound neurological impairment; (5) a patient who has a terminal illness (severe cirrhosis, end stage pulmonary disease, advanced stage of cancer) with a life expectancy of ≤ 6 mo. In these situations, it is appropriate to consult palliative care and develop a plan to proceed with the discontinuation of dialysis.

Advance directives also play an important role in clinical decision-making. The presence of an advance directive gives clinicians a guide as to what patient wishes are, and those decisions should be respected[9]. However, one study involving cancer patients in the ICU demonstrated that the presence of an advance directive did not alter decision-making regarding life-supporting interventions[15]. This alone is concerning; however, this issue becomes more complex when it is considered that most advance directives typically do not directly address acute dialysis in the setting of AKI. Nephrologists are often left without a guide for advance directives to determine the continuity of care in this specific setting.

Cost-effectiveness of renal replacement therapy

Cost is another factor, which must be considered in these patients. The SUPPORT trial helped to establish the cost-effectiveness of AKI treatment involving 490 patients[1]. This trial determined that overall cost of renal replacement therapy per quality-adjusted-life-year in AKI patients in the ICU was $128200 with $274100 for patients in worst prognostic group and $61900 for patients in the best prognostic group. However, it surpassed the cost-effective limit of $50000 per quality-adjusted-life-year[1]. In another study by Gopal *et al*[16], the outcomes of 85 survivors of multi-organ failure who required the use of renal replacement therapy in ICU found that the cost of each year of survival was $50000, and the majority of survivors felt that their

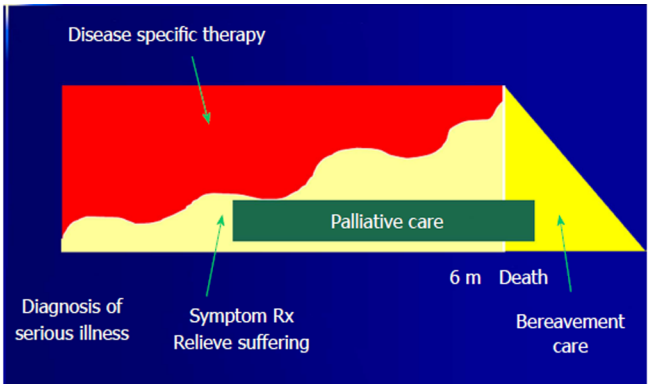


Figure 2 Comprehensive model of care. Patients receive both curative/disease-specific and palliative care simultaneously with a gradual increase in palliative care over time and slow withdrawal of curative/disease-specific care.

treatment was worthwhile and their quality of life was satisfactory. With a high mortality rate of up to 90% for ICU patients with AKI[10], the ethical principle of justice and the equitable distribution of resources must be considered when treating these patients. In these situations, a palliative care consult would provide a more cost-effective treatment apart from better symptom management and a better quality of life.

RECOMMENDATIONS

AKI in ICU patients has a host of symptoms, including pain, pruritus, anorexia, sleep disturbances, fatigue, sexual dysfunction, and others[17]. The appropriateness of palliative care in AKI patients in the ICU will be judged based on the complications and prognosis. However, a study done by Aslakson *et al*[18] establishes the role of palliative care in the ICU and determined that "palliative care is increasingly accepted as an essential component of comprehensive care for critically ill patients, regardless of diagnosis or prognosis". AKI in the ICU comes with a host of complications regarding treatment decisions. Among the most difficult decisions a physician must make is whether to withdraw dialysis from these patients. Due to difficulty in establishing the prognosis, this decision may not come lightly. Following is a list of recommendations and justifications for the palliative care in these critically ill AKI patients: (1) Palliative care is appropriate in patients with AKI in the ICU: Patients with AKI in the ICU are often appropriate for palliative care due to the multitudes of symptoms they can experience. These patients have historically not been provided this service due to multifactorial reasons. However, palliative care in these patients can help to alleviate problematic symptoms, improve quality of life, and decrease suffering. Palliative care physicians, with the teamwork of the patient's nephrologist, are equipped with the appropriate training and knowledge to make determinations regarding the appropriateness of palliative care for individual patients. Depending on the clinical situation and the presence of risk factors for poor outcome, one of the three models of care is recommended; (2) Establish an advance directive with patients early on, with specific instructions regarding dialysis, and respect those advance directives[9]: This will help to establish patient wishes early on, and with the ethical respect of these wishes, a physician can make a sound clinical judgment regarding the withdrawal of dialysis as well as the establishment of palliative care in that patient; (3) Discontinuation of dialysis should occur in the situations outlined by the RPA/ASN guidelines[14]: The RPA/ASN guidelines help to establish evidence-based ethical considerations when making the clinical decision to withdraw dialysis. Clinicians can use these guidelines combined with informed consent to educate patients and patient advocates about the risks, benefits, outcomes, and prognosis for each patient's condition.

LIMITATIONS AND ETHICAL CONSIDERATIONS

AKI in the elderly population has been shown to be associated with significant morbidity and mortality[19]. Furthermore, dialysis is associated with poor outcomes, suffering, and limited life prolongation at the cost of dignity and quality of life in the

elderly AKI patients admitted to ICU with multiple comorbidities[19]. Expectations of today's society about the standard of care have lead to indisputable provisions of dialysis in this patient population necessitating the reevaluation of these approaches[19]. Although RPA/ASN guidelines are applicable in the acute care setting, there are few factors that may limit its use in AKI patients in the ICU[20]. Shared decision-making is often difficult given decisions are urgent and physicians have not known patients and their family members prior to ICU admission in most cases[20]. In contrast, shared decision making in chronic kidney disease patients progressing to ESRD is much easier due to the long-standing relationship between caregiver, patients and their family members[20]. Some clinical scenarios may challenge caregivers with ethical and legal issues as few patients and their relatives may demand initiating or continuing dialysis even after it is considered futile[2]. In such situations, informed decision-making plays a crucial role in proving the legality of withholding or withdrawing dialysis[2]. All the discussions and communications with the patient and his/her family members or surrogate decision makers should be properly documented at all the times during the entire course of management[2]. In addition, a multidisciplinary approach involving palliative care team, nephrologists, intensivists, and institutional ethics committee may help to settle conflicts between the caregivers, and the patient and family members[2].

CONCLUSION

AKI patients in the ICU have a host of symptoms and most often suitable for palliative care that can help relieve symptoms, improve quality of life and reduce suffering. The appropriateness of palliative care in this patient population is determined with the teamwork of the patient's nephrologist and palliative care physician. Shared decision-making and advance directives play an important role in the management and guide the physician as to what patient wishes are, and those decisions should be respected. Either comprehensive or conceptualization model of palliative care is recommended for these patients.

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CASE REPORT

Clear cell papillary renal cell carcinoma: A case report and review of the literature

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Abstract

Clear cell papillary renal cell carcinoma (ccpRCC) was recently established as a distinct type of epithelial neoplasm by the International Society of Urological Pathology Vancouver Classification of Renal Neoplasia. Here, we report a case of partial nephrectomy for a ccpRCC detected during the routine follow-up of a previously treated liposarcoma in a 70-year-old male patient. The patient was referred to the urology department for a right-sided renal mass (size: 2 cm) detected during routine annual imaging follow-up for a malignant right inguinal fibrous histocytoma and liposarcoma that had been diagnosed 6 and 4 years earlier, respectively, and treated with surgery and adjuvant radiation therapy. Following partial nephrectomy, the renal mass was pathologically diagnosed as ccpRCC, and immunohistochemistry revealed carbonic anhydrase 9 (CA9) expression. No recurrences or metastases were detected on follow-up imaging for 6 months. This is the first report of partial nephrectomy for incidentally discovered CA9-positive ccpRCC.

Key words: Clear cell; Papillary; Renal cell carcinoma; Partial nephrectomy; Carbonic anhydrase 9; Case report

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Core tip: Clear cell papillary renal cell carcinoma (ccpRCC) was recently established as a distinct type of epithelial neoplasm. Here, we report a case of partial nephrectomy for a ccpRCC detected during the routine follow-up a previously treated liposarcoma in a 70-year-old male patient. The patient received partial nephrectomy, the renal mass was pathologically diagnosed as ccpRCC, and immunohistochemistry revealed carbonic anhydrase 9 (CA9) expression. No recurrences or metastases were detected on follow-up imaging for 6 mo. This is the first report of partial nephrectomy for incidentally discovered CA9-positive ccpRCC.

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INTRODUCTION

Clear cell papillary renal cell carcinoma (ccpRCC), which is also known as clear cell tubulopapillary renal cell carcinoma, is a rare type of malignant renal tumor that differs markedly from other malignant tumor subtypes in terms of visual, microscopic, and immunohistochemical characteristics[1-4]. Cytopathologically, ccpRCC comprises epithelial cells with clear cytoplasm in both tubular and papillary arrangements, and thus exhibits characteristics of both clear cell renal cell carcinoma (ccRCC) and papillary renal cell carcinoma (pRCC). These clear tumor cells harbor a linear array of low-grade nuclei distal from the basement membrane and develop a range of tubular, papillary, and cystic structures. By contrast, atypical and mitotic cells, vascular invasion, necrosis, hyaline globules, foamy macrophages, and pleomorphism are rarely observed.

Although Tickoo *et al*[5] first identified ccpRCC in the context of end-stage kidney disease in 2006, this entity mainly occurs in normal kidneys and is rare in patients with end-stage or cystic kidney disease[1,2,6]. Recently, the International Society of Urological Pathology (ISUP) Vancouver Classification of Renal Neoplasia[7,8] recognized ccpRCC as a distinct epithelial tumor that could be distinguished from ccRCC and pRCC by genetic differences in the *von Hippel-Lindau (VHL)tumor suppressor* gene mutation and 3p loss status and the extreme rarity of gains in chromosomes 7 and 17 or the loss of chromosome Y, despite significant morphological, immunohistochemical, and genetic similarities among the three tumors[9]. Here, we report a case in which partial nephrectomy was used to treat a ccpRCC that was incidentally diagnosed during a recent imaging follow-up in a patient with a history of previously treated liposarcoma and malignant fibrous histiocytoma.

CASE REPORT

A 17-year-old man was referred to department of urology after a routine computed tomography (CT) scan detected a right-sided enhancing mid-pole renal mass measuring 2.3 cm (Figure 1). He was previously treated for a right-sided inguinal lymph nodal malignant fibrous histiocytoma and right-sided pelvic high-grade pleomorphic and spindle cell sarcoma 6 and 3 years earlier, respectively, *via* surgical excision in the orthopedic department and radiation therapy (adjuvant dose of 60 Gy/30 fractions to the pelvis) in the radiology department. He had no other underlying diseases such as hypertension or diabetes. The follow-up of the patient included biannual pelvic magnetic resonance imaging (MRI) and chest CT and annual positron emission tomography (PET)-CT. No signs of recurrence or metastasis were identified until the currently described renal mass (Figure 1).

Following a full metastatic work-up, the patient underwent open right-sided partial nephrectomy. Subsequent pathology revealed a tumor measuring 1.7 cm × 1.4 cm × 1.0 cm with a capsule abutting, leading to a diagnosis of a grade 2 ccpRCC without necrosis and a final pathologic stage of T1aN × M0 (Figure 2). The patient was routinely followed at the urology outpatient clinic without any further adjuvant plan for 9 mo postoperatively.

DISCUSSION

According to the ISUP (ISUP) Vancouver Classification 2012, ccpRCC, which has also been described as clear cell tubulopapillary RCC or renal angio adenomatous tumor (RAT), is a recently recognized type of indolent epithelial tumor of the renal cortex, with a prevalence rate of 1%-4% among all resected asymptomatic renal tumors[7,10]. These tumors exhibit no age or sex prevalence, and no cases of local or nodal recurrence or distant metastasis have been reported[11,12]. However, despite the generally asymptomatic nature of ccpRCC, some patients, including the subject of this case, complain of abdominal or flank pain. Although these tumors may occur in patients with end-stage renal disease or von Hippel-Lindau (VHL) syndrome, most

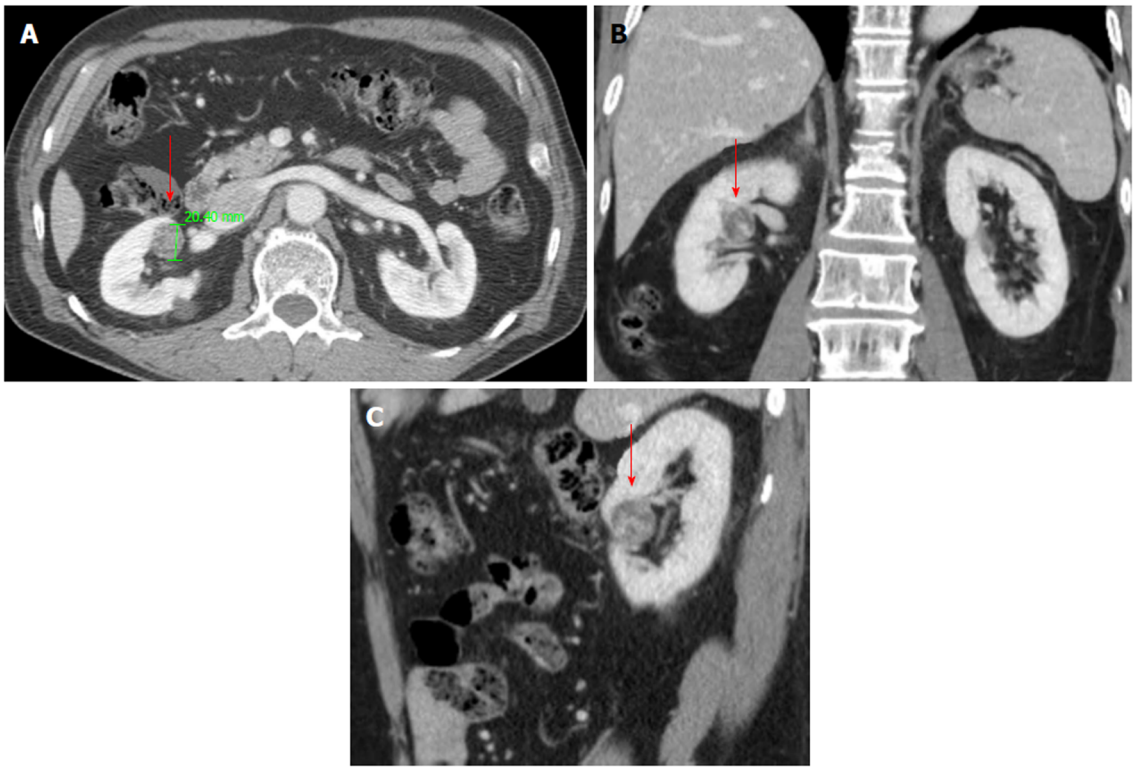


Figure 1 Computed tomography findings of clear cell papillary renal cell carcinoma. A 2-cm mass with an area of irregular enhancement is visible in the right kidney. A: Axial view; B: Coronal view; C: Sagittal view.

affect normal kidneys[1,2]. The finding that most ccpRCCs are diagnosed as stage 1 (excepting two stage 2 cases)[2,4,9,11] led to the designation of "low malignant potential" in the recent ISUP classification[12].

Imaging studies of ccpRCC indicate hypodense areas with cystic changes or cyst formation on CT and areas of isointensity and hypointensity on T1- and T2-weighted MRI, respectively[13]. ccpRCC frequently appears as a well-defined, well-encapsulated tumor with cystic changes or the formation of cysts[11,12] filled with serosanguinous fluid or colloid-like regions[9]. Morphologically, ccpRCC appears to be an intermediate between ccRCC and pRCC, with low nuclear grading, tubular and papillary arrangement of clear epithelial cells, a predominantly linear nuclear alignment distal from the basement membrane, and a distinctive immunohistochemical profile similar to that of RAT. Multifocality and bilaterality are rarely reported[8,10]. Macroscopically, the cut surface is whitish-tan, with variable surface coloration. Microscopically, most ccpRCCs are small and lack necrosis or invasion of the lymphatic vasculature and renal sinus, but are well-circumscribed and encapsulated with common cystic changes. Proteineous secretions are often observed within the lumina or acini of tubules[3]. Although foamy macrophages, psammoma bodies, and hemosiderin deposits are rarely observed[14], fibrous stroma is common[1] and usually indicates the association of a smooth muscle metaplasia with the tumor capsule[11]. Some previously diagnosed renal angiomyoadenomatous tumors with a predominantly smooth muscle histology have since been recognized as examples of ccpRCC.

Immunohistochemically, ccpRCC is positive for cytokeratin (CK)-7, CA-9, high-molecular-weight CK, Pax2 and Px8, and 34βE12 and negative for CD10 and alpha-methylacyl-CoA racemase[7,8,10]. Concurrent strong, diffuse CK-7 expression and a cup-shaped CA-9 expression pattern is usually considered an immunohistochemical hallmark of ccpRCC; this pattern corresponds with the shape of the neoplastic cell, which is typically cuboidal to low columnar, with round and generally uniform nuclei and inconspicuous linearly arranged nucleoli distal from the basal membrane.

Genetic analysis can be used to further differentiate ccpRCC from ccRCC and pRCC, and comparative genomic hybridization can differentiate sporadic ccpRCC from cases associated with end-stage renal disease. Although *VHL* mutation is a hallmark of ccRCC, mutations in this gene have been described in 15%-30% of ccpRCC cases. Furthermore, pRCC exhibits a loss of heterogeneity, although this is not accompanied by mutation or promoter methylation. Rather than *VHL* alterations, pRCC is known to harbor trisomies of chromosomes 7 and 17 and losses of Y, whereas ccpRCC does not exhibit these changes[15]. ccpRCC may occur in normal kidney, non-

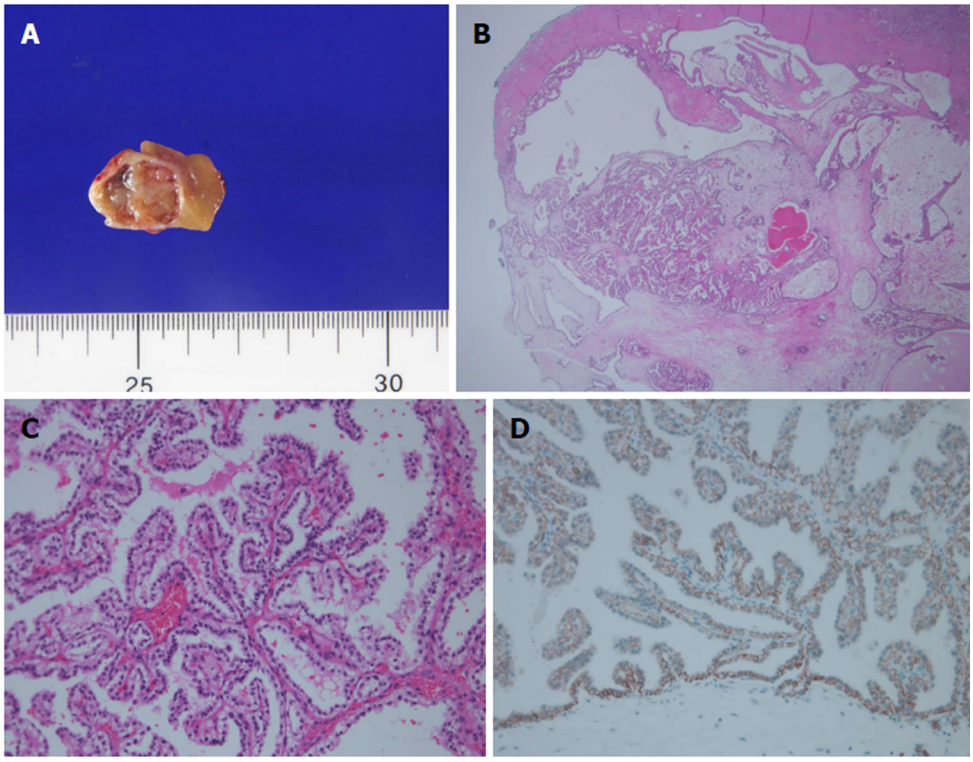


Figure 2 Photomicrographs of clear cell papillary renal cell carcinoma. A: Gross findings; B: H and E: The tumor showed papillary, cystic and tubular patterns in low powered magnification (original magnification × 12.5); C: The tumor is composed of clear cells with uniform nuclei typically showing a linear arrangement away from the basal membrane (original magnification × 200); D: The typical immunohistochemical staining of carbonic anhydrase IX. The staining pattern is a cup-like distribution typical feature of clear cell papillary renal cell carcinoma (original magnification × 200).

cystic end stage renal disease and acquired cystic disease[3,11,16,17]. Two cases of ccpRCC occurred within 10 years of hemodialysis[18].

Some cases have been associated with von Hippel-Lindau disease[19]. The association with other renal cancers such as papillary RCC, clear cell RCC, chromophobe RCC, multilocular cystic RCC, acquired cystic disease-associated RCC and renal oncocytoma have also been reported[11,16,20].

Total or partial nephrectomy is generally performed when surgical resection is feasible and the tumor is solitary[1]. Because these tumors are generally indolent, active surveillance with strict follow-up may be possible in selective cases.

In conclusion, this report describes the first case of partial nephrectomy for a ccpRCC that was incidentally diagnosed in an elderly male patient during the imaging follow-up of previously treated tumors. More comprehensive sampling may be warranted to identify the characteristics of ccpRCC with prognostic variables.

ARTICLE HIGHLIGHTS

Case characteristics

The patient was referred to the urology department for a right-sided renal mass (size: 2 cm) detected during routine annual imaging follow-up for a malignant right inguinal fibrous histocytoma and liposarcoma that had been diagnosed 6 and 4 years earlier, respectively.

Clinical diagnosis

A routine computed tomography (CT) scan detected a right-sided enhancing mid-pole renal mass measuring 2.3.

Differential diagnosis

Immunohistochemistry revealed carbonic anhydrase 9 (CA9) expression could be helpful for differential diagnosis.

Imaging diagnosis

A routine CT scan detected a right-sided enhancing mid-pole renal mass measuring 2.3 cm.

Pathological diagnosis

pathology revealed a tumor measuring 1.7 cm × 1.4 cm × 1.0 cm with a capsule abutting, leading

to a diagnosis of a grade 2 ccpRCC without necrosis and a final pathologic stage of T1aN × M0.

Treatment
The patient underwent open right-sided partial nephrectomy.

Experiences and lessons
Patients who have previously been treated with tumor need careful follow-up.

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