

## Renal carbuncle after SARS-CoV-2 infection in a pregnant woman

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### ABSTRACT

**Data:** Patient: Female, 21-year-old, and pregnant

Final diagnosis: Carbuncle of the left kidney

Symptoms: Acute pain in the lumbar region, radiating to the left inguinal region, and weakness

Clinical procedure: Ureteroscopy with stenting of both kidneys and kidneys decapsulation.

**Objective:** Rare coexistence of disease or pathology

**Background:** Here we present a patient who was admitted with a clinical suspicion of urinary system infection during pregnancy and was finally diagnosed with Carbuncle in her left kidney.

**Case report:** 21-year-old 26-week pregnant women with complaints of acute pain in the lumbar region radiating to the left inguinal region along with weakness was admitted to the Hospital No 7 Kalkaman Almaty on 18.05.2022. In her anamnesis, she was infected with SARS-CoV-2 infection prior to the admission. Based on the complaints, anamnesis and gynecological examination data preliminary diagnosis was made as urinary system infection at pregnancy 26 weeks. Further examination revealed that she had carbuncle of the kidney and perirenal tissue, carbuncle of the left kidney, paranephritis on the left, acute obstructive pyelonephritis on the right. Lab results showed elevated leukocytes, anemia, and lymphopenia.

**Conclusions:** This case shows us how woman's weakened immune system from COVID-19 along with pregnancy, which can further weaken the immune system made her susceptible to a kidney infection, which progressed to a kidney carbuncle and perirenal tissue involvement.

**Keywords:** kidney carbuncle, COVID-19, post-COVID-19 complication, pregnant women, lymphopenia, weakened immune system, COVID-19 related kidney injuries

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### INTRODUCTION

COVID-19, also known as the novel coronavirus, is a highly contagious respiratory illness caused by the SARS-CoV-2 virus. Since its emergence in Wuhan, China in December 2019, the virus has become a global pandemic, affecting millions of people and causing significant impacts on health, economy, and society. In post-COVID-19 infection cases COVID-19 can suppress the immune system in several ways. One of the ways it can do this is by altering the functioning of immune cells, such as T cells and natural killer cells, which play important roles in fighting infections [1-3].

One of the less well-known complications of post-COVID-19 is kidney carbuncle, which is a serious condition that

can result in permanent kidney damage or failure. This research note aims to provide an overview of the current state of knowledge about the kidney occurrence post COVID-19 infection and its impact on young pregnant women [4].

### CASE REPORT

#### Introduction

Carbuncle of kidney is a rare condition, and its occurrence during pregnancy is even more uncommon. Also, the association of this condition with COVID-19 has not been well documented in the literature. Here, we report a rare case of carbuncle of the left kidney in a pregnant woman with a recent history of COVID-19 infection, along with a literature review of similar cases [5].

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**Table 1.** CBS

On admission: 07.05.2022	08.05.2022	10.05.2022	11.05.2022	15.05.2022	16.05.2022	Reference ranges	
Red blood cell count	3.35	2.78	2.55	2.56	2.70	2.62	3.9-4.7×10 <sup>12</sup>
Hemoglobin	106	87	81	82	86	83	115-160 g/L
White blood cell count	16.87	15.77	20.02	15.05	8.51	8.99	4-9×10 <sup>12</sup>
Platelets	285	242	232	261	251	270	140-400×10 <sup>9</sup>
Hematocrits	31.80	34.00	24.30	24.50	25.70	24.80	35.5-44.9%
Segmented neutrophils	86.20	84.70	86.80	70.50	57.30	65.30	40-60%
Lymph	1.01 (5.9%)	1.54 (8.9%)	1.35 (9.5%)	2.74 (18.2)	0.89 (28.4%)	2.10 (23.4%)	1.2-3×10 <sup>9</sup> (18-40%)
Monocyte	1.20 (7.1%)	1.02 (5.9%)	0.46 (30.2%)	1.51 (10.0)	0.25 (10.5%)	0.79 (8.8%)	2-8%
Inflammation marker							
C-reactive protein	17.90	59.04	192.03	71.35	2.60	-	0-5 mg

**Table 2.** Urinalysis

On admission: 07.05.2022		09.05.2022	11.05.2022	13.05.2022	15.05.2022	16.05.2022	Reference ranges
Color	Pale yellow	Yellow	Yellow	Yellow	Pale yellow	Pale yellow	Pale yellow
Transparency	Transparent	Slightly cloud	Very cloudy	Slightly cloudy	Transparent	Transparent	Transparent
Specific gravity	1.016	1.017	1.018	1.020	1.014	1.013	1.010-1.020
Protein	Negative	1	0.3	0.3	Negative	Negative	0-0.14 g/l
Erythrocytes	Negative	300.00	300.00	300	500.00	50.00	4-5 cells u/l
pH	6.0	5.5	5.5	6.0	6.0	6.0	4.6-8.0
Leukocytes	25	500	500	500	Negative	Negative	0-5 cells/ul

### Case Presentation

A 21-year-old pregnant woman presented with acute pain in the lumbar region radiating to the left inguinal region and weakness. She had a recent history of SARS-CoV-2 infection and was in her 26<sup>th</sup> week of pregnancy. Based on her complaints, anamnesis, and gynecological examination data, the preliminary diagnosis was urinary system infection in pregnancy at 26 weeks. However, further examination revealed a carbuncle of the left kidney, paranephritis on the left, and acute obstructive pyelonephritis on the right.

On physical examination general condition of moderate severity, due to pain syndrome. The skin and visible mucous membranes are pale in color. The tongue is clean and moist. In the lungs, vesicular breathing, no wheezing. Heart sounds are muffled, the rhythm is correct. Pulse 82 bpm in min. BP 100/70 mmHg art. On admission patient's body temperature was 36.9 C. The abdomen was soft, painless, enlarged due to pregnancy. The symptom of tapping is negative on both sides. Urination was free and painless.

Initial laboratory result showed significantly elevated leukocytes and lymphopenia. The laboratory parameters during the hospitalization are presented in **Table 1**.

**Table 2** shows urinalysis.

Right kidney–10.4×5.3 cm; around the middle pole there is a layer of liquid up to 0.3 cm thick; the thickness of the parenchyma is 2.4 cm; pelvicalyceal system is 2.4 cm, not expanded.

Left kidney–10.5×5.6 cm; the thickness of the parenchyma is 3.2 cm, in the middle pole there is an area of increased density 1.9×1.7 cm, without vascularization at a distance from the capsule 0.4 cm, in the upper 1.4×1.2 cm, at a distance from the capsule 0.9 cm; pelvicalyceal system is 2.2 cm, not expanded. Around the kidney there is a layer of liquid up to 0.3 cm thick in the middle and lower pole.

### Conclusions

Signs of bilateral pyelonephritis, carbuncle of the left kidney. Paranephritis on the right (**Figure 1** and **Figure 2**).



**Figure 1.** Gynaecological ultrasound (transvaginal) done on 05.07.2022: Pregnant 25-26 weeks (reprinted with permission of the patient)



**Figure 2.** Ultrasound of kidney 05.09.2022 (reprinted with permission of the patient)

### TREATMENT

From 07.05.2022 to 10.05.2022, the patient was administered cefotaxime (1 g, powder) intravenously twice a day, along with 1,300 ml of sodium chloride solution for infusion 0.9% and 200 ml of sodium chloride 0.9% with papaverine hydrochloride 2 ml intravenously once a day. From 07.07.2022 to 12.05.2022, she was administered metronidazole 100 ml solution 0.5% intravenously twice a day. The patient then stopped taking these medications and started receiving meropenem 1g powder and 1g intravenously with NaCl solution 200 ml intravenously and fraxiparine 0.3 ml subcutaneously from 12.05.2022 until her discharge [6] (Table 3).

#### Surgery

The patient underwent stenting of the ureter (Figure 3) and kidney decapsulation, which included lobotomy on the left, excision of the carbuncle, and sanitation of the paranephria (Figure 4). At discharge, the patient had no active complaints, was in satisfactory condition, and was discharged for further outpatient treatment [7].

In addition to the patient, from April to June 2022, **four more patients** with the same diagnosis were hospitalized. The age of the patients ranged from 22 to 26 years. The gestational age at the time of hospitalization of the patients



**Figure 3.** Stenting of the ureter (reprinted with permission of the patient)



**Figure 4.** Kidney decapsulation (reprinted with permission of the patient)

**Table 3.** Medication table

Medications	07.05	08.05	09.05	10.05	11.05	12.05	13.05	14.05	15.05	16.05	17.05
Cefotaxime (1 g powder & 1 g IV)	++	++	++	++							
Sodium chloride, solution for infusion 0.9% 1,300 ml (intravenous & drip)	+	+	+	+							
Metronidazole (100 ml soln. 0.5% & 100 ml IV)	+	++	++	++	++	++					
Meropenem (1 g powder & 1 g IV) with NaCl solution 200 ml IV						+++	+++	+++	+++	+++	+++
Sodium chloride 0.9% 200 ml + Papaverine hydrochloride 2 ml (intravenous [drip])	+	+	+	+							
Fraxiparine (0.3 ml SC)						+	+	+	+	+	

Note. \*How many & "+" So many times it was done per day

**Table 4. Patient 1**

RBC	3.47×10 <sup>12</sup> /l	3.9-4.7×10 <sup>12</sup>
WBC	24.33×10 <sup>9</sup> /l	4-9×10 <sup>12</sup>
Hb	110 g/l	115-160 g/L
PLT	232×10 <sup>9</sup> /l	140-400×10 <sup>9</sup>
HcT	31.6%	35.5-44.9%
Neutrophils	88.9%	40-60%
Lymphocytes	4.4%	18-40%
Monocytes	6.6%	2-8%
CRP	198 mg/l	0-5 mg/l

was from 24 to 36 weeks. From the anamnesis, it is known that they do not suffer from any chronic diseases, however, about three-six months ago they suffered from diseases with symptoms of COVID-19. It should be noted that this pathology, especially in pregnant women, is extremely rare in this clinic, however, five of these cases were registered in a relatively short period.

#### **Patient 1**

25-year-old pregnant woman, who was hospitalized on 09.05.2022 and discharged on 09.06.2022. The patient was diagnosed with carbuncles of the right kidney, acute paranephritis on the right, urosepsis, bilateral lower lobe pneumonia complicated by bilateral exudative pleurisy, respiratory failure 1 degree, anemia, reactive pancreatitis, hepatitis of unspecified genesis, moderate biochemical activity, thrombophlebitis of the saphenous vein of the right upper limb, and oligohydramnios. CBC on admission showed leukocytosis with a left shift and an elevated CRP level. Additionally, the patient had lymphocytopenia, with a low percentage of lymphocytes (4.4%, normal 18.0%-40.0%) and an absolute lymphocyte count of 1.07 (normal 1.2–3.0×10<sup>9</sup>/l) (**Table 4**).

#### **Patient 2**

Pregnant 24 weeks was admitted to the hospital on 26.04.2022 at 17:12 with a diagnosis of multiple carbuncles of the right kidney, acute apstomatous pyelonephritis on the right, urosepsis, infectious-toxic shock (dated April 28, 2022), and pregnancy at 24 weeks +1 day with low water and placenta previa. Her CBC on admission showed leukocytosis with a left shift and an elevated CRP level. The patient had neutrophilia (84.6%, abs-7.57) and lymphocytopenia (8.1%, abs-0.76) with a low percentage of monocytes (6.9%, abs-0.62) (**Table 5**).

#### **Patient 3**

36-week pregnant patient 3 was admitted on May 20, 2022, at 18:10 with a diagnosis of carbuncle of the right kidney and apstomatous pyelonephritis on the left. The patient had moderate anemia of mixed genesis and was 36 weeks pregnant. On admission, CBC results showed leukocytosis with a WBC count of 26.73×10<sup>9</sup>/L, neutrophilia with a percentage of 93.0% (abs-24.85), lymphocytopenia

**Table 5. Patient 2**

RBC	4.02×10 <sup>12</sup> /l	3.9-4.7×10 <sup>12</sup>
WBC	11.96×10 <sup>9</sup> /l	4-9×10 <sup>12</sup>
Hb	124 g/l	115-160 g/L
PLT	162×10 <sup>9</sup> /l	140-400×10 <sup>9</sup>
HcT	37.1%	35.5-44.9%
Neutrophils	84.6%	40-60%
Lymphocytes	8.1%	18-40%
Monocytes	6.9%	2-8%
CRP	114 mg/l	0-5 mg/l

**Table 6. Patient 3**

RBC	3.45×10 <sup>12</sup> /l	4.02×10 <sup>12</sup> /l
WBC	26.73×10 <sup>9</sup> /l	11.96×10 <sup>9</sup> /l
Hb	95 g/l	124 g/l
PLT	190×10 <sup>9</sup> /l	162×10 <sup>9</sup> /l
HcT	27.4%	37.1%
Neutrophils	93.0%	84.6%
Lymphocytes	2.4%	8.1%
Monocytes	4.5%	6.9%
CRP	415 mg/l	114 mg/l

**Table 7. Patient 4**

RBC	3.45×10 <sup>12</sup> /l	3.45×10 <sup>12</sup> /l
WBC	19.49×10 <sup>9</sup> /l	26.73×10 <sup>9</sup> /l
Hb	99 g/l	95 g/l
PLT	229×10 <sup>9</sup> /l	190×10 <sup>9</sup> /l
HcT	27.7%	27.4%
Neutrophils	91.4%	93.0%
Lymphocytes	2.7%	2.4%
Monocytes	5.7%	4.5%
CRP	430 mg/l	415 mg/l

with a percentage of 2.4% (abs-0.64), and monocytosis with a percentage of 4.5% (abs-1.19) (**Table 6**).

#### **Patient 4**

29-30 weeks pregnant patient 4 was hospitalized on May 18, 2022, with the diagnosis of carbunculosis of the right kidney and mild anemia against the background of the inflammatory process. CBC on admission revealed leukocytosis with a white blood cell count of 19.49×10<sup>9</sup>/l, and neutrophil predominance with a count of 91.4% (abs-17.82) and lymphopenia with a count of 2.7% (abs-0.52) (**Table 7**).

## **DISCUSSION**

Our case report highlights the rare occurrence of a renal carbuncle in a pregnant woman with a recent history of COVID-19 infection. The underlying mechanism linking



COVID-19 infection with carbuncle of the kidney remains unclear, but it is likely related to the combined effects of COVID-19 infection and pregnancy on the immune system. Pregnant women are known to have a weakened immune system, which can make them more susceptible to infections. COVID-19 infection further weakens the immune system and increases the risk of severe infection. Acute kidney injury is the most common renal complication of COVID-19 infection [1]. It is possible that this patient's renal carbuncle was a result of acute kidney injury. However, further studies are needed to establish the exact relationship between COVID-19 infection and renal carbuncle in pregnancy. However, it is well known that COVID-19 can affect multiple organs and systems, and it is possible that the virus can damage the kidney, leading to the formation of carbuncle. The timely diagnosis and management of carbuncle of the kidney in pregnant women are crucial to avoid complications and ensure a favorable outcome for both the mother and the fetus. The present case and the literature review suggest that carbuncle of the kidney can occur in pregnant women with a recent history of COVID-19, and physicians should consider this possibility in the differential diagnosis [8].

#### **COVID-19 and Its Effect on Kidney and Immune System**

COVID-19 can cause severe and lasting harm in the kidneys as well. Signs of kidney pathologies in patients with a history of COVID-19 are abnormally high levels of protein or presence of blood in the urine and abnormal blood work.

Lymphopenia is quite notable in SARS-CoV-2 infection. SARS-CoV-2 infection may either directly suppress bone marrow or induce an immune mediated destruction of lymphocytes resulting in lymphopenia [4]. SARS-CoV-2 might share a similar inner mechanism with SARS-CoV-2 virus, including direct infection and destruction of lymphocytes and cytokine mediated lymphocyte destruction. Hence there is an established link between COVID-19 and lymphopenia [9].

It is a known phenomenon that the levels of certain immune cells, including T-helper lymphocytes, can decrease during pregnancy. This is a normal physiological adaptation that occurs to prevent the immune system from attacking the growing fetus, which is perceived as a foreign object. This decrease in T-helper cells can make pregnant women more susceptible to infections and other illnesses.

It is possible that the decrease in T-helper lymphocytes and the physiological changes during pregnancy may contribute to the occurrence of a renal carbuncle in the present case [10].

#### **Hypothesis**

It is probable that the woman's weakened immune system from COVID-19 along with pregnancy, which can weaken the immune system, made her susceptible to a kidney infection, which progressed to a kidney carbuncle

and perirenal tissue involvement. Acute kidney injury, with a variable prevalence of hospitalized patients, is reported to be the most common renal complication related to COVID-19 infection. Furthermore, increased urinary frequency as a symptom of COVID-19 might be detected, but renal carbuncle with COVID-19 infection is a rare phenomenon [11].

#### **Strength of the Study**

The strength of our study lies in its contribution to the limited amount of existing research on the presentation and management of renal carbuncles in post-COVID-19 infected pregnant women. To the best of our knowledge, this is the first study to report on the occurrence of renal carbuncles in this patient population, which highlights the importance of considering this differential diagnosis in pregnant women with post-COVID-19 fever and flank pain. Our study underscores the significance of prompt diagnosis and treatment of renal carbuncles to prevent serious complications, such as sepsis and renal failure. Furthermore, our findings emphasize the importance of a high index of suspicion and the use of imaging modalities to confirm the diagnosis of renal carbuncles in pregnant women with post-COVID-19 infection.

#### **Limitations**

Although our study provides valuable insights into the management of renal carbuncles, it is important to note that the origin of the carbuncle in our patient population remains unclear. This limitation highlights the need for further research to investigate the underlying causes of renal carbuncles and potential preventative measures, particularly in post-COVID-19 infected pregnant women.

### **CONCLUSIONS**

Renal carbuncle is a rare complication of COVID-19 infection in pregnant women. This case report highlights the importance of considering renal carbuncle as a potential complication in pregnant women with a recent history of COVID-19 infection who present with renal symptoms. Further studies are needed to establish the exact relationship between COVID-19 infection and renal carbuncle in pregnancy. Pregnant women with a recent history of COVID-19 infection should be monitored closely for renal symptoms to ensure early detection and prompt management of any renal complications.

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**Ethics statement:** The authors stated that all medical documentation was included to the information system of Kazakhstan, which is called - damumed.kz, and only the attending physician has access to information about the patient. The authors further stated that informed consent of the patients was obtained in writing upon admission to the hospital and is attached to the patient's medical history.

**Declaration of interest:** No conflict of interest is declared by authors.

**Data sharing statement:** Data supporting the findings and conclusions are available upon request from the corresponding author.

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