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Weil's Disease Early Diagnosis and Management: A Case Report

Ni Komang Rani Juli Antari[1], Dwiputra Yogi Pramarta[2]

[1]General Practitioner Intern of Internal Medicine at Buleleng Regional Hospital

[2]Internal Specialist Buleleng Regional Hospital

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Abstract: **Introduction: Leptospirosis, or *Weil's disease*, is the most common zoonotic infection. *Weil's disease* is caused by infection with the spirochete bacterium Leptospira. *Acute kidney injury* (AKI) is a common condition that often occurs in the final stages of *Weil's disease*. Although there is no definite consensus on *renal replacement therapy* (RRT) in severe leptospirosis patients, early diagnosis allows for earlier hemodialysis, which appears to be associated with a better prognosis. Therefore, this case report will present a case of *Weil's disease* undergoing hemodialysis as early management.**

Case Description: A 64-year-old male patient came to Buleleng Regional Hospital on May 15, 2023, complaining of yellowing of the eyes and skin for 7 days. The patient had also experienced nausea and vomiting for 7 days. The patient also complained of fever for 10 days. Supportive examinations were non-reactive anti-HCV and reactive anti-Leptospira IgM. The patient was diagnosed with *Weil's disease*, *acute kidney injury* (AKI), with a differential diagnosis of *acquired cystic kidney disease* (ACKD) and anuria.

Conclusion: Patients with leptospirosis infection are generally associated with kidney involvement related to the need for hemodialysis, which can increase mortality. Therefore, early diagnosis and management in the form of hemodialysis is needed to improve quality of life and reduce mortality.

Keywords: **hemodialysis, leptospirosis, *Weil's disease*.**

1. INTRODUCTION

Leptospirosis, or *Weil's disease*, is the most common zoonotic infection. *Weil's disease* is caused by infection with the bacterial *spirochete Leptospira*. In addition, *Weil's disease* is also known as "rat urine fever" in some countries.[1] The disease is most commonly spread through exposure to the urine of infected animals, either through direct contact or contact with urine-contaminated soil or water. Animals such as cattle, pigs, and horses commonly transmit leptospirosis to livestock. However, leptospirosis can also be transmitted from wild animals such as raccoons and hedgehogs.[2]

In Western countries, *Weil's disease* usually occurs in late summer or early fall. Meanwhile, *Weil's disease* usually occurs during the rainy season in the tropics. The incidence of *Weil's disease* in the tropics is almost 10 times that of Western countries.[3] In 2021, eight provinces reported 734 cases of *Weil's disease* in Indonesia. Of the number of reported cases, there were 84 deaths with a *case fatality rate* (CFR) of 11.4%.[1] The estimated annual incidence of leptospirosis globally is 853,000, with 48,000 deaths.[4] The clinical manifestations of leptospirosis are non-specific and easily confused with other viral diseases, such as dengue fever. If left untreated, leptospirosis can develop into life-threatening complications, including kidney failure, respiratory failure, and shock.[5]

The main reservoir of *Weil's disease* is rats.[6] Leptospira in the reservoir's body can survive as long as the reservoir lives without causing illness. Leptospira can be excreted from the reservoir's body through urine, contaminating the environment.[7] This is the central point of the epidemiology of *Weil's disease*. Leptospira can live in soil for 43 days and in water for weeks. Warm temperatures (25°C), wet/damp soil, and a soil pH of 6.2-8 are suitable environments for bacterial growth.[8]

Leptospira bacteria can be transmitted from animals to humans through direct contact with the urine or tissue of infected animals or through indirect contact with contaminated environments (water, soil, and plants). Leptospira infection can enter through broken skin and/or mucous membranes on the eyelids, mucous membranes, and nose.[6] The bacteria then enter the bloodstream, causing septicemia. Patients usually show severe inflammatory symptoms such as high fever, myalgia, and *superficial lymphadenectasis*.[9] Although rare, *Weil's disease* can also be transmitted from a sufferer to others through sexual intercourse during convalescence, as well as from mother to fetus through the placental barrier and breast milk.[10,11] Leptospira bacteria usually multiply in the kidneys and can leave a person's body through urine[8]

Early diagnosis of *Weil's disease* plays an important role in treating patients because antibiotic therapy is more effective when started early in the course of the disease.[12] The diagnosis of *Weil's disease* is confirmed by the growth of bacteria in special cultures or microscopic agglutination tests. *Weil's disease* can involve several organ systems so that several other examinations can be carried out, including kidney and liver function tests, complete blood count, *cerebrospinal fluid* (CSF), and chest x-ray. If there is concern about meningitis, it can be followed up with a lumbar puncture.[13,14] Treatment of leptospirosis depends on the severity. In outpatient cases, antibiotics that can be used include doxycycline, amoxicillin, or ampicillin.[15] In severe infections, one can use intravenous penicillin G, third-generation cephalosporins, or erythromycin.[2]

Acute kidney injury (AKI) is a common condition that often occurs in the late stages of *Weil's disease*.[15] In severe cases of leptospirosis, kidney involvement and the need for hemodialysis are common complications and have been associated with poor outcomes and death.[16] Approximately 20-85% of patients with severe leptospirosis develop AKI, and up to 31.6% of them require dialysis.[17] Although there is no definite consensus on *renal replacement therapy* (RRT) in severe leptospirosis patients, early diagnosis allows for earlier hemodialysis, which appears to be associated with a better prognosis.[18,19] Therefore, this case report will present a case of *Weil's disease* undergoing hemodialysis as early management.

Case Description

A 64-year-old male patient came to Buleleng Regional General Hospital on May 15, 2023, complaining of yellowing of the eyes and skin for 7 days (Figure 1). The patient had also experienced nausea and vomiting for 7 days. Vomiting 3-4 times a day, with food vomited about ½ glass each time. The patient has also complained of fever for 10 days. The fever has been felt to fluctuate, accompanied by chills and pain throughout the body, especially in the legs. The patient said that he last urinated 1 day before with a dark tea color and a small amount, but when the patient arrived, the patient admitted that he had not urinated at all. The patient's house is close to rice fields and a river. The patient works daily in the rice fields without wearing footwear. The patient claimed to have had a wound on the heel area for about 2 weeks before the complaint appeared.

Figure 1. The patient's condition with yellowing of the skin

History of diseases such as kidney disease, heart disease, and hypertension is denied. During the examination, vital signs were found to be within normal limits, including icterus of the sclera of both eyes and the whole body and tenderness of both calves. A complete blood test showed WBC 13,10 10^3/uL, urea 186.6 mg/dL, serum creatinine 8.72 mg/dL, potassium 5.91 mmol/L, HBsAg and anti-HCV non-reactive, total bilirubin 2. 66 mg/dL, direct bilirubin 1.88 mg/dL, indirect bilirubin 0.78 mg/dL, SGOT 20.2 U/L, SGPT 23.5 U/L, HbsAg and anti-HCV non-reactive, and Anti Leptospira IgM reactive. The

chest X-ray showed cardiomegaly, and the lungs showed no abnormalities. The abdominal ultrasound showed *acute on chronic bilateral parenchymal renal disease* and no obstruction (Figure 2). The patient was diagnosed with *Weil's disease* and *acute kidney injury* (AKI) with a differential diagnosis of *acquired cystic kidney disease* (ACKD) and anuria. The patient was given IVFD Futrolit 20 dpm, ceftriaxone 1x2 gr, lansoprazole 1x30 mg, ondansetron 3x4 mg, and emergency hemodialysis. After routine hemodialysis twice a week for 1 month, the lab results were urea 25.2 mg/dL, serum creatinine 1.00 mg/dL, and abdominal ultrasound within normal limits, so the patient did not continue hemodialysis.

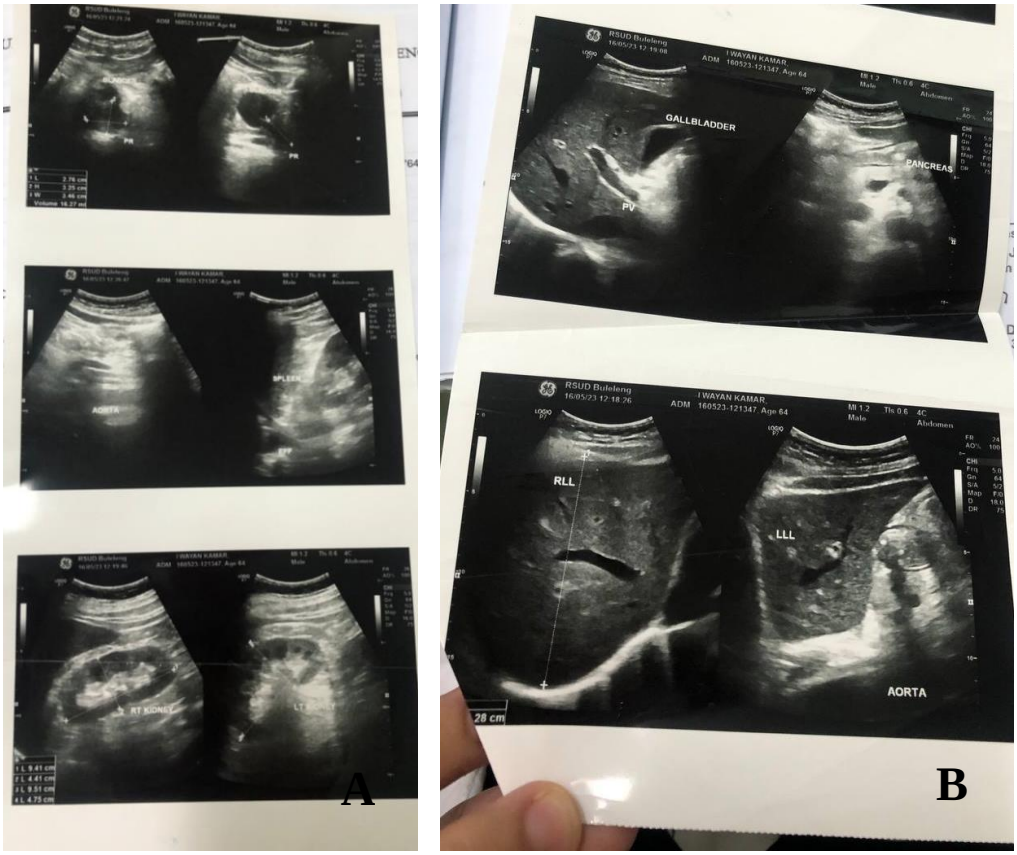

Figure 2. Ultrasound examination results. (A) A catheter balloon is visible in the bladder, filled with minimal urine, and no stones are visible. The size of the spleen is normal, and no pathological lesions are visible. The size of the right kidney is normal, the echocortex is increased with a *hypoechoic* pyramid. (B) *Gallbladder* size is normal, no visible stones, and CBD is not dilated. Hepatic size is normal, acute angle, regular surface, echo-parenchymal homogeneous normal, normal vascular system does not appear IHBD/EHBD dilation, no nodules or cysts appear

2. DISCUSSION

This case report focuses on early diagnosis and management in patients with *Weil's disease*. Leptospirosis is a zoonotic disease caused by pathogens of the genus Leptospira. Many people are asymptomatic, although a small number of patients experience fever. In the final stages, AKI is common and can be associated with a fatal outcome.[16] The development of AKI can occur due to the direct effects of the etiological agent, dehydration, rhabdomyolysis, and hemodynamic changes. Leptospira can cause multisystemic vasculitis. Endothelial activation and systemic inflammation play an important role in developing leptospirosis and its complications, although there is no precise mechanism. [20] Kidney involvement and the need for hemodialysis are common complications of severe leptospirosis and have been associated with poor prognosis and death. *Acute kidney injury* occurs in 20-85% of patients with severe leptospirosis, and up to 31.6% of them require dialysis.[18,21]

The therapy focused on this case report is hemodialysis in *Weil's disease* patients with kidney involvement. Dialysis is a form of RRT. The kidneys filter the blood and remove excess water, solutes, and toxins. Dialysis ensures the maintenance of homeostasis (a stable internal environment) in people who experience rapid loss of kidney function, known as acute kidney injury, or prolonged and gradual loss of kidney function, called *chronic kidney disease* (CKD). Hemodialysis can be used to overcome acute kidney function decline, delay the time until a kidney transplant is performed, or for life for patients who are not transplant candidates.[22]

Hemodialysis is indicated for acute illnesses related to several diseases, such as AKI, uremic encephalopathy, pericarditis, life-threatening hyperkalemia, refractory acidosis, hypervolemia causing end-organ complications (e.g., pulmonary edema), growth and malnutrition failure, peripheral neuropathy, gastrointestinal symptoms that are difficult for asymptomatic patients with a *glomerular filtration rate* (GFR) of 5 to 9 ml/minute/1.73 m² to overcome. Absolute contraindications for hemodialysis are the inability to obtain vascular access, and relative contraindications include difficult vascular access, heart failure, and coagulopathy.[23]

The Kidney Foundation's Kidney Disease Outcomes Quality Initiative (KDOQI) guidelines recommend that patients who reach stage 4 CKD (GFR, 30 mL/min/1.73 m^2), and patients who require maintenance dialysis during the initial assessment should be counseled on renal failure and treatment options (kidney transplantation, home or hospital hemodialysis, PD) as well as conservative treatment. Family members and caregivers should also be educated. The decision to start dialysis should be based on an assessment of the signs and symptoms of renal failure (pruritus, acid-base or electrolyte abnormalities, serositis), volume or blood pressure dysregulation, and progressive deterioration in nutritional status. The decision to start dialysis should not be based on the level of kidney function in asymptomatic individuals.[24]

The patient previously claimed to have no history of kidney disease. However, urea levels of 186.6 mg/dL and serum creatinine of 8.72 mg/dL were obtained after a supporting examination. Based on the symptoms and examination results, the patient was diagnosed with *Weil's disease* and AKI. After that, initial management was performed in routine hemodialysis twice a week for 1 month. The lab results were urea 25.2 mg/dL, serum creatinine 1.00 mg/dL, and abdominal ultrasound within normal limits so that the patient did not continue hemodialysis. This case report shows that diagnosis and early management are closely related to a better prognosis.

Rapid severity identification can help improve the therapeutic approach in patients with leptospirosis.[19,25] In patients with *Weil's disease*, the use of daily hemodialysis to maintain strict control of azotemia and fluid volume can improve survival, especially for patients who are at risk of pulmonary hemorrhage and death. Early initiation of hemodialysis followed by daily hemodialysis is essential. We found that rapid initiation of dialysis, along with daily dialysis, appears to reduce mortality in the ICU. A study by Andrade concluded that early initiation of dialysis is associated with better outcomes and prognosis in AKI patients with leptospirosis.[19] In addition, the results of this case report are also supported by a study by Daher et al., in which early hemodialysis management resulting in a protective effect and the use of penicillin are associated with decreased mortality.[26]

Weil's disease patients with severe infections often experience severe metabolic acidosis, fluid overload that does not respond to diuretics and anuric renal failure.[27] Indications for RRT should not be delayed or the dose reduced if necessary, as early use can reduce mortality.[28] Continuous modalities (continuous venous hemodialysis or continuous venous hemodiafiltration) have a beneficial effect on improving survival.[19] However, peritoneal dialysis has also been associated with excellent results if this therapy is unavailable.[29] Based on previous literature, early diagnosis and initial hemodialysis management in patients with *Weil's disease* provide many benefits. It reduces mortality rates, as evidenced by the improvement in the condition presented in this case report.

3. CONCLUSION

Patients with leptospirosis infection are generally associated with kidney involvement related to the need for hemodialysis, which can increase mortality. Therefore, early diagnosis and management in the form of hemodialysis is needed to improve quality of life and reduce mortality.

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