Renal Replacement Therapy

CASE REPORT

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Iliopsoas abscess in patients receiving hemodialysis: a case series and a literature survey

Takuma Oshida[1], Tadashi Yoshida[2*], Hiroshi Itoh[1] and Mototsugu Oya[2,3]

Abstract

Background: Iliopsoas abscess is a relatively rare but serious infectious disease. Infectious disease is one of the major causes of death among patients receiving hemodialysis for end-stage renal disease (ESRD).

Case presentation: We experienced three cases of iliopsoas abscess in patients receiving hemodialysis. The infection route was distinct in each case. A 79-year-old woman with ESRD due to autosomal dominant polycystic kidney disease exhibited bilateral iliopsoas abscesses caused by bacterial contamination during a lumbar epidural block procedure. A 60-year-old woman with ESRD due to diabetic nephropathy was diagnosed as having an iliopsoas abscess, caused by the direct invasion of bacteria from a renal abscess. A 78-year-old woman who started hemodialysis because of nephrosclerosis developed an iliopsoas abscess caused by the hematogenous spread of bacteria from emphysematous cystitis. All three cases were treated with antibiotics and/or percutaneous drainage. A survey of published reports suggested that iliopsoas abscess can be caused by infection through a variety of routes in hemodialysis patients.

Conclusion: Because hemodialysis patients are at a high risk of infection because of their immunocompromised state, physicians should pay close attention to infection prevention. If iliopsoas abscess is suspected, examinations such as computed tomography, magnetic resonance imaging, and blood culture sampling should be conducted promptly, followed by appropriate treatment with antibiotics and/or drainage.

Keywords: Hemodialysis, Iliopsoas abscess, Spondylodiscitis, Renal abscess, Emphysematous cystitis

Introduction

Iliopsoas abscess is a relatively rare but serious infectious disease [1, 2]. It is caused by bacterial infection of the iliopsoas muscle components via multiple pathways. Indeed, primary iliopsoas abscess results from the hematogenous or lymphatic spread of pathogenic bacteria from another primary focus, while secondary iliopsoas abscess is caused by direct invasion from surrounding tissues or contamination during an invasive or surgical procedure [1, 2]. The diagnosis of iliopsoas abscess is sometimes delayed because its onset and clinical course are insidious and its symptoms are non-specific. Iliopsoas abscess is usually diagnosed based on computed tomography (CT) and/or magnetic resonance imaging (MRI) findings and is treated using a combination of drainage and antibiotics.

Patients receiving hemodialysis due to end-stage renal disease (ESRD) have an immunocompromised state, and infectious disease is one of the major causes of death among these patients [3–5]. Prompt diagnosis and appropriate treatment are critical for survival. Here, we report three cases of iliopsoas abscess in patients undergoing

*Correspondence: t-yoshida@keio.jp

[2] Apheresis and Dialysis Center, Keio University School of Medicine, 35 Shinanomachi, Shinjuku-ku, Tokyo 160-8582, Japan
Full list of author information is available at the end of the article

hemodialysis; each patient in this series had a different infection route.

Case presentation

Case 1

A 79-year-old woman with ESRD due to autosomal dominant polycystic kidney disease had been receiving intermittent hemodialysis for 11 years. She fell in January 2019 and subsequently suffered from pain in her left leg. She visited an orthopedic surgeon and was diagnosed as having L4 spondylolisthesis. She underwent a lumbar epidural block, and her symptoms improved transiently. However, her pain recurred and also spread to her right leg. She continued to receive a lumbar epidural block once a month. When a lumbar MRI was taken in June, an increase in intensity at the L4/5 disk on a T2-weighted image was detected. She was suspected of having spondylodiscitis. However, no increase in inflammatory markers was seen, and no medication was prescribed. In early July, she developed a chill, lumbago, and a pain in her right thigh. Her symptoms continued, and she visited our hospital. A laboratory examination showed an increased inflammatory reaction: white blood cell count (WBC), 10.7×10^3 /μL; C-reactive protein (CRP), 7.27 mg/dL; and procalcitonin, 12.09 ng/mL. Contrast-enhanced CT and MRI showed L3/4-spondylitis and bilateral iliopsoas abscesses (right: 25 mm, left: 15 mm) (Fig. 1A and B). Methicillin-susceptible *Staphylococcus aureus* was detected from blood cultures, and treatment with cefazolin (CEZ) was initiated (Fig. 2). The inflammatory response improved and the abscess cavity shrank (Fig. 1C), but her systolic blood pressure during hemodialysis remained at around 70–80 mmHg, probably because of the prolonged infection. The antibiotic treatment was continued for 6 weeks, based on the recommendation of previous studies [6, 7]. In the middle of August, she suddenly complained of abdominal pain. A contrast-enhanced abdominal CT was performed, and she was diagnosed as having non-occlusive mesenteric ischemia. Surgery could not be performed because of her low blood pressure. She was treated conservatively with fluid infusion and vasopressors, but she died 5 days later.

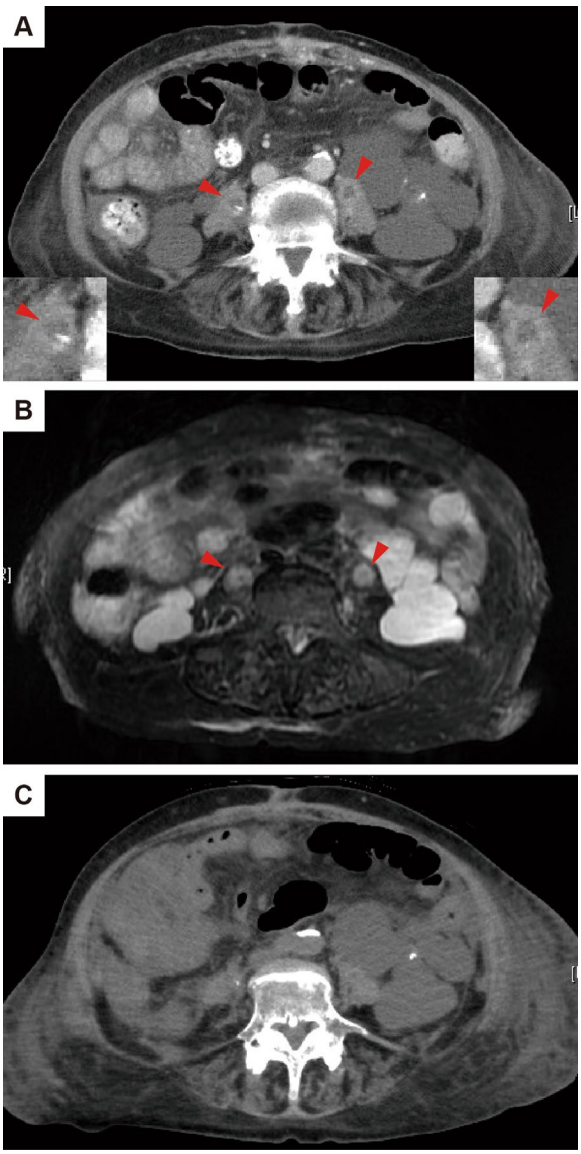

Fig. 1 CT and MRI images in Case 1. **A**, **B** Bilateral iliopsoas abscesses were detected using contrast-enhanced CT (**A**) and T2-weighted MRI (**B**) in early July. The red arrowheads indicate the iliopsoas abscesses. *Insets:* Magnified images of the iliopsoas abscesses. **C** A CT examination performed in the middle of August showed an improvement in the iliopsoas abscesses

Case 2

A 60-year-old woman had been receiving hemodialysis for ESRD caused by diabetic nephropathy for 16 years. In early April 2019, she visited a hospital because of a fever and a left lower back pain (day 1). She was diagnosed as having a left renal abscess with hematoma under the renal capsule, a left retroperitoneal abscess, and left hydronephrosis and was hospitalized. Treatment with meropenem (MEPM) was started, but her fever did not subside. On day 9, ultrasonography-guided aspiration of the abscesses was attempted; the needle reached the subcapsular hematoma, but the retroperitoneal abscess was unclear and could not be drained. As the hydronephrosis was unclear when visualization using ultrasonography was attempted, a nephrostomy could not be performed. A nephrectomy was also considered but was not performed because of marked calcification in the renal artery. The CRP level remained at around 10 mg/dL. The abscess cavity did not improve even after

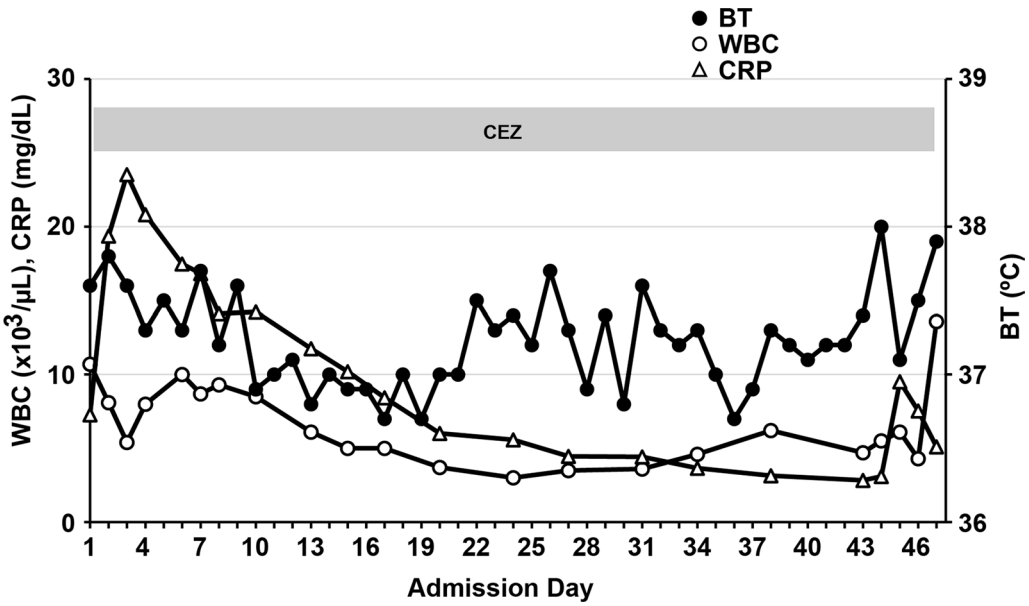

Fig. 2 Clinical course of Case 1. Changes in body temperature (BT, black circle), white blood cell count (WBC, white circle), and C-reactive protein (CRP, white triangle) levels are shown. The patient was treated with cefazolin (CEZ)

3 weeks of MEPM treatment. On day 45, a CT examination showed a renal abscess of 65 mm under the left renal capsule and an abscess of about 65 mm in the left iliopsoas muscle (Fig. 3A and B). She was transferred to our hospital. Treatment with cefmetazole (CMZ) was started. Her fever was alleviated, and the CRP level decreased. On day 58, percutaneous drainage was performed for the left subcapsular abscess and the iliopsoas abscess (Fig. 3C), and an outflow of dark-red fluid was observed. Abscess cultures and blood cultures both tested negative. CT examinations were repeated on days 61 and 65, and reductions in the sizes of the abscess cavities were seen. CMZ treatment was discontinued, and no recurrences were observed. She was discharged on day 67.

Case 3

A 78-year-old woman had been treated for hypertension, diabetes, dyslipidemia, hyperuricemia, and chronic kidney disease (CKD) due to nephrosclerosis for more than 15 years. She had a past medical history of breast cancer at the age of 75 years. Her CKD had gradually progressed, and she experienced general fatigue and a loss of appetite in January 2018. She was diagnosed as having uremia, and hemodialysis was introduced after hospitalization. Although she did not have fever, a laboratory examination revealed increased inflammatory reactions, including a WBC of 3500 /μL and a CRP level of 4.20 mg/dL (Fig. 4). A CT examination was performed, and she was diagnosed as having emphysematous cystitis. *Klebsiella pneumoniae* was detectable by the blood culture test, and treatment with ceftriaxone (CTRX) was initiated. When CTRX was de-escalated to CEZ, a low-grade fever appeared. The antibiotic treatment was switched to tazobactam/piperacillin (TAZ/PIPC), but no remarkable changes in the fever were seen. Considering the possibility of drug-induced fever, the antibiotic treatment was discontinued. In addition, persistent diarrhea appeared. A stool sample tested positive for *Clostridium difficile* toxin. She was diagnosed as having *Clostridium difficile* enteritis and was treated with metronidazole (MNZ) for 10 days. However, she continued to have a low-grade fever, and a whole-body CT was performed to investigate the cause of the fever. She was found to have L3/4 pyogenic spondylitis and an iliopsoas abscess (Fig. 5A). Treatment with TAZ/PIPC was resumed. TAZ/PIPC was selected, because we considered that L3/4 pyogenic spondylitis and an iliopsoas abscess were caused by the hematogenous spread of *Klebsiella pneumoniae* from emphysematous cystitis and because it was sensitive to TAZ/PIPC based on the results of the antibiotic sensitivity test. The blood cultures tested negative at the moment. In late February, her treatment was changed from TAZ/PIPC to CTRX for de-escalation. Four weeks later, a CT examination showed improvement (Fig. 5B), and the CTRX treatment was discontinued. No exacerbation of the inflammation and fever was seen, and she was discharged in late March.

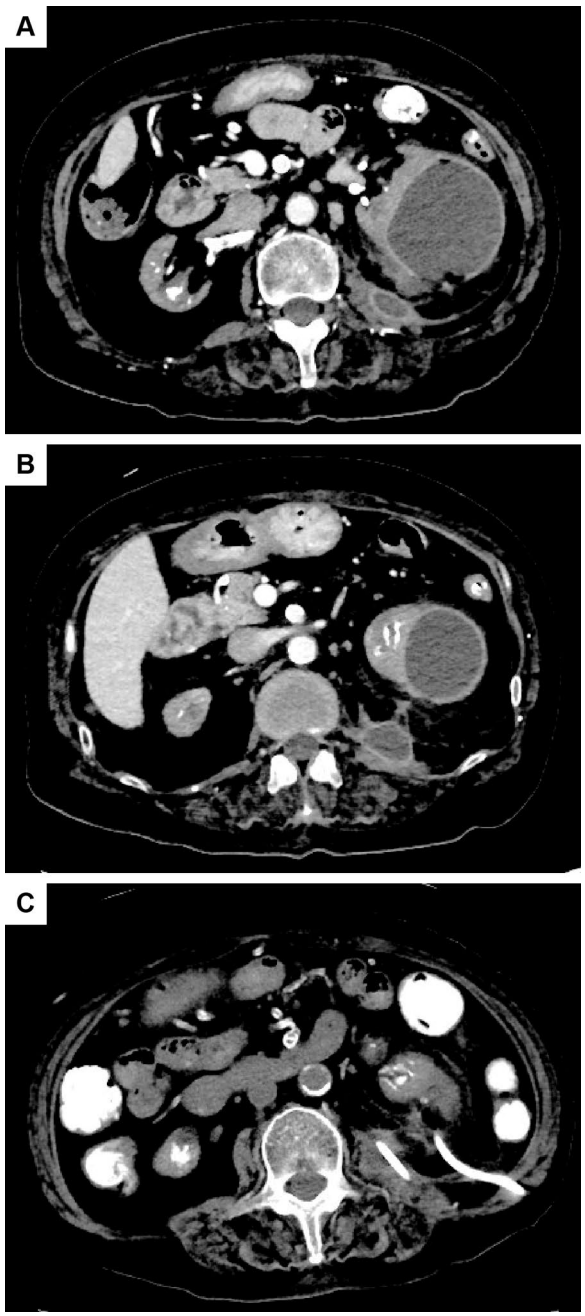

Fig. 3 Contrast-enhanced CT images in Case 2. **A**, **B** At day 45. **C** At day 58; percutaneous drainage was performed

Discussion

We experienced three cases of iliopsoas abscess in patients receiving hemodialysis. Of interest, the infection route differed in each case: Case 1 was caused by bacterial contamination during a lumbar epidural block procedure; Case 2 was caused by the direct invasion of bacteria from a renal abscess; and Case 3 was caused by the hematogenous spread of bacteria from emphysematous cystitis.

In Case 1, the patient had leg pain bilaterally, and CT and MRI examinations both showed spondylodiscitis and bilateral iliopsoas abscesses. Methicillin-susceptible *Staphylococcus aureus* was detectable by blood cultures. We considered that the pyogenic spondylodiscitis and bilateral iliopsoas abscesses were caused by repeated lumbar epidural block procedures. Although no previous reports have described the characteristics of iliopsoas abscess in hemodialysis patients, the results of a previous study investigating 105 hemodialysis patients hospitalized for infectious spondylodiscitis showed that fever was relatively infrequent and that the most common route of bacterial entry was the vascular access (30.5%) in hemodialysis patient [8]. They also showed that the most common causative pathogen was *Staphylococcus aureus* [8]. In the present series, the possibility of hematogenous infection arising from vascular puncture during the hemodialysis sessions could not be ruled out completely in Case 1, because the patient did not have an epidural abscess and had received vascular punctures three times a week for maintenance hemodialysis. Although spondylodiscitis after an epidural puncture is often accompanied by an epidural abscess in many cases [9–11], epidural block-induced spondylodiscitis without an epidural abscess has also been reported [12, 13]. In addition, no signs of infection were present at the site of vascular access puncture in the patient. Moreover, CT findings showed a subcutaneous hematoma scar at the L3/4 level of the epidural block, the localization of which was consistent with the spondylodiscitis. Based on these findings, the pyogenic spondylodiscitis in Case 1 was likely associated with the lumbar epidural block and probably led to the bilateral iliopsoas abscesses.

The patient in Case 1 died of non-occlusive mesenteric ischemia in the end. Surgery could not be performed, because her blood pressure was low continuously. For the treatment of iliopsoas abscess, she was treated with antibiotics only. Her prognosis might have been different if the drainage was simultaneously performed.

In Case 2, a left renal abscess and a left iliopsoas abscess were observed. The iliopsoas abscess in Case 2 was considered to have been caused by the direct extension of inflammation from the perirenal area. Generally, renal and perirenal abscesses larger than 30 mm require percutaneous drainage or surgery, whereas abscesses smaller than 30 mm can be treated with antibiotics only [14, 15]. Unfortunately, the initial drainage in Case 2 was not successful, leading to sustained inflammation. The patient had been anuric because of ESRD and had diabetes, both of which are risk factors for renal abscess [15]. The rapid initiation of percutaneous drainage and/

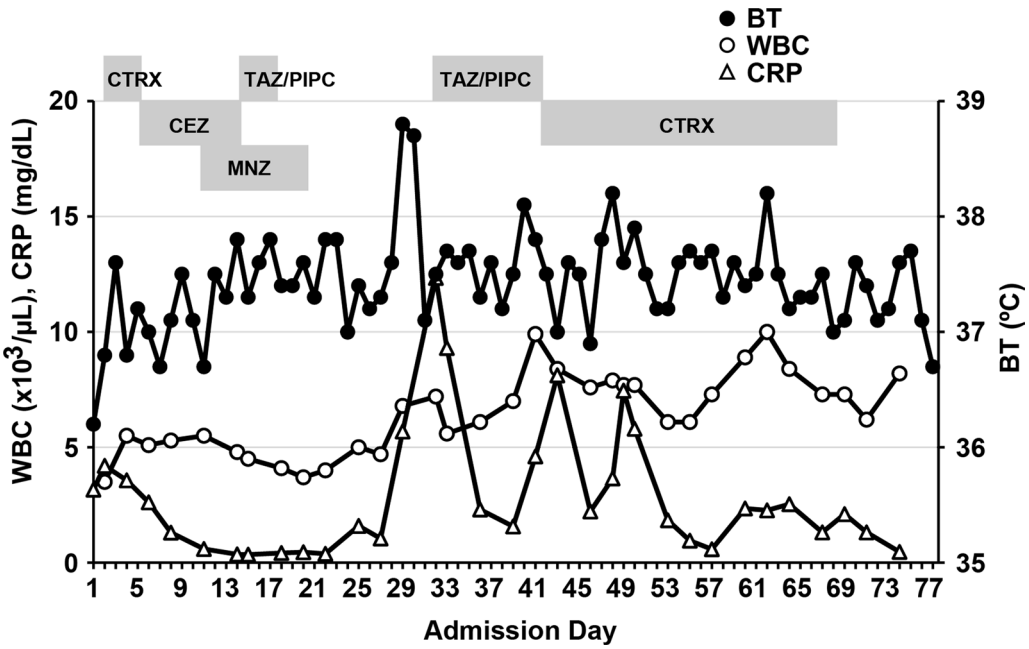

Fig. 4 Clinical course of Case 3. Changes in body temperature (BT, black circle), white blood cell count (WBC, white circle), and C-reactive protein (CRP, white triangle) levels are shown. The patient was treated with ceftriaxone (CTRX), cefazolin (CEZ), tazobactam/piperacillin (TAZ/PIPC), and metronidazole (MNZ)

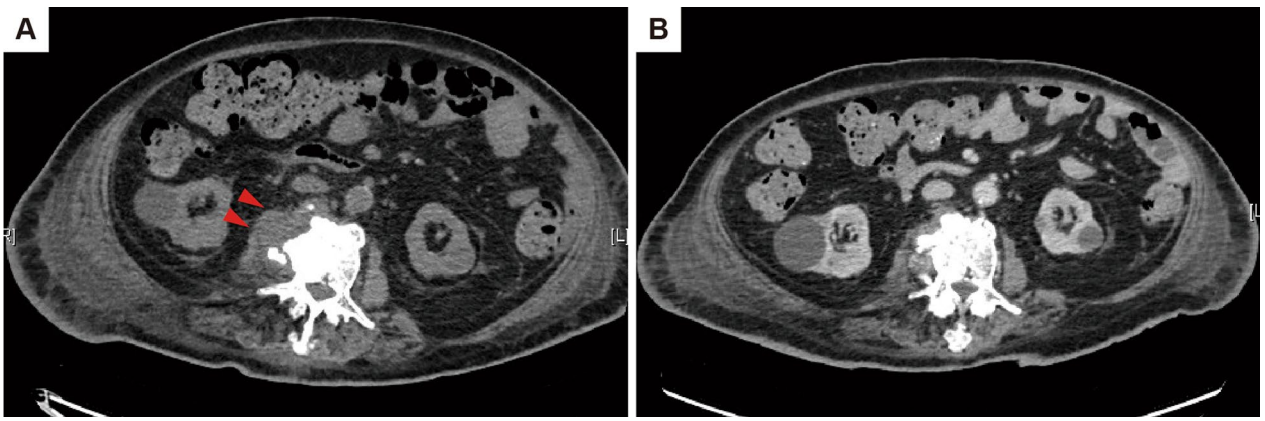

Fig. 5 CT images in Case 3. **A** In the middle of February, a right iliopsoas abscess was detected using a plain CT. The red arrowheads indicate the iliopsoas abscess. **B** A contrast-enhanced CT examination performed in late March showed an improvement in the iliopsoas abscess

or surgery as well as appropriate antibiotic therapy are needed in patients with these conditions.

In Case 3, spondylitis and the right iliopsoas abscess were observed during treatment with antibiotics for emphysematous cystitis. These lesions were thought to have been caused by a hematogenous infection originating from the emphysematous cystitis for the following reasons. First, a CT examination performed at the time of admission did not show either the spondylitis or the iliopsoas abscess. Second, *Klebsiella pneumoniae* was detected in blood cultures. Third, the fever started during the antibiotic treatment, and the inflammatory reaction worsened after the treatment was paused. We thought that bacteremia arising from the emphysematous cystitis likely occurred first and that bacteria were then subsequently trapped in the spine, ultimately causing the iliopsoas abscess. Generally, the vertebral bodies of adults are in contact with the anterior longitudinal ligament

and are nourished by the peripheral arterial arch; therefore, spondylitis and spondylodiscitis do not occur as the initial site of infection. Instead, since the blood flow to vertebral bodies is poor in adults, bacterial seeding and occlusion can easily occur, leading to spondylitis and spondylodiscitis [16].

Although the causative bacteria were identified in Cases 1 and 3, it was not detectable in Case 2. The difference was probably caused by the timing of the blood culture tests. The blood culture sample was collected before starting antibiotic treatment in Cases 1 and 3, whereas the patient was treated with antibiotics before identifying the causative bacteria in Case 2. Although specific data regarding iliopsoas abscess are not available, the results of a previous study showed that blood culture tests were positive in about 60% of cases with pyogenic

Table 1 Clinical characteristics of hemodialysis patients who developed iliopsoas abscess

Case	Reference	Age (years)	Sex	ESRD etiology	HD vintage	Cause of iliopsoas abscess	Pathogenic bacteria	Treatment
1	Tillman et al. [18]	48	Male	Chronic analgesic use	2 years	Discitis	*Staphylococcus aureus*	A, S
2	Tillman et al. [18]	66	Male	Nephrosclerosis	10 months	AVF infection	*Staphylococcus aureus*	A, D
3	Kikuchi et al. [19]	53	Female	DMN	7 months	Catheter-related	MRSA	A, D
4	Kikuchi et al. [19]	64	Male	CGN	2 months	Catheter-related	MRSA	A
5	Kato et al. [20]	69	Male	CGN	24 years	Acute enterocolitis	*Bacteroides fragilis*	A, S
6	Chuang et al. [21]	55	Male	DMN	1 month	n.d	*Proteus vulgaris*	A, S
7	Dovas et al. [22]	66	Female	Chronic pyelonephritis	11 years	Acute enterocolitis	*Bacteroides fragilis*	A, D
8	Sato et al. [23]	57	Male	PKD	14 years	Diverticulitis	*Bacteroides fragilis*	A, D
9	Sato et al. [23]	58	Male	PKD	18 years	Catheter-related	*Staphylococcus aureus*	A, D, S
10	Sato et al. [23]	59	Male	DMN	15 years	Infection in the kidney	*Enterococcus faecalis*	A, D, S
11	Sato et al. [23]	61	Male	DMN	27 years	Enterocolitis	*Streptococcus agalactiae*	A, D, S
12	Sato et al. [23]	67	Male	DMN	2 years	Discitis	MRSA	A, D, S
13	Sato et al. [23]	69	Male	CGN	11 years	Infective endocarditis	*Streptococcus spp.*	A
14	Sato et al. [23]	70	Female	CGN	19 years	Discitis	*Staphylococcus aureus*	A, D
15	Sato et al. [23]	78	Male	CGN	5 years	AVF infection	MRSA	A, D, S
16	Kim et al. [24]	53	Female	DMN	6 months	Acupuncture	Negative	A, D
17	Hsiao et al. [25]	47	Female	n.d	6 months	Catheter-related	MRSA	A, S
18	Alif Adlan et al. [26]	53	Female	DMN	n.d	Catheter-related	*Staphylococcus aureus*	A, S
19	Okada et al. [27]	70	Male	PKD	19 years	Cutaneous ulcer (leg)	*Enterococcus avium*	A, S
20	Koda et al. [28]	58	Male	n.d	16 years	Cellulitis (leg)	*Staphylococcus aureus*	A, D, S
21	Okabe et al. [29]	62	Female	CGN	13 years	Nerve block injections	MRSA	A, D
22	Kawai et al. [30]	91	Female	CGN	3 years	Catheter-related	MRSA	A, D
23	Kawai et al. [30]	76	Male	DMN	2 months	Catheter-related	MRSA	D
24	Kawai et al. [30]	72	Female	CGN	29 years	Suppurative knee arthritis	MRSA	A, D
25	Kawai et al. [30]	75	Male	DMN	7 years	n.d	*Streptococcus spp.*	A, D
26	Kawai et al. [30]	79	Male	DMN	8 months	Infective endocarditis	MRSA	A, D
27	Kawai et al. [30]	79	Male	DMN	9 months	n.d	*Staphylococcus aureus*	A, D
28	Kawai et al. [30]	46	Male	DMN	4 years	Infective abdominal aortic aneurysm	MRSA	A, D
29	Kawai et al. [30]	71	Female	Lupus nephritis	4 years	Peritonitis	*Bacteroides ovatus*	A, D
30	Kawai et al. [30]	56	Male	CGN	33 years	n.d	*Staphylococcus epidermis*	D
31	Current case 1	79	Female	PKD	11 years	Nerve block injections	*Staphylococcus aureus*	A
32	Current case 2	60	Female	DMN	16 years	Renal abscess	negative	A, D
33	Current case 3	78	Female	Nephrosclerosis	1 month	Emphysematous cystitis	*Klebsiella pneumoniae*	A

HD hemodialysis, *CGN* chronic glomerulonephritis, *DMN* diabetic nephropathy, *PKD* polycystic kidney disease, *AVF* arteriovenous fistula, *MRSA* methicillin-resistant *Staphylococcus aureus*, *A* antibiotic treatment, *D* percutaneous drainage, *S* surgical intervention, *n.d.* not described

spondylitis [17]. The collection of blood samples before the initiation of antibiotic treatment may be important.

There are many previous case reports of iliopsoas abscess in hemodialysis patients [18–30]. Thus far, 33 cases have been reported. As summarized in Table 1, the patient age, etiology of ESRD, duration of hemodialysis, cause of iliopsoas abscess, and pathogenic bacteria varied among the reports. Indeed, the median age at the onset of iliopsoas abscess was 66 years, and 20 out of 33 patients (61%) were male. The etiology of ESRD consisted of diabetic nephropathy (13 cases, 39%), chronic glomerulonephritis (9 cases, 27%), polycystic kidney disease (4 cases, 12%), and others. The median of the HD vintage was 72 months. The causes of iliopsoas abscess varied, such as catheter-related (7 cases, 21%), enterocolitis (3 cases, 9%), and the infection of arteriovenous fistula (2 cases, 6%). The pathogenic bacteria were methicillin-resistant *Staphylococcus aureus* (11 cases, 33%), *Staphylococcus aureus* (8 cases, 24%), *Bacteroides fragilis* (3 cases, 9%), and others. For the treatment of iliopsoas abscess in hemodialysis patients, 31 out of 33 patients (94%) were treated with antibiotics, whereas 29 patients (88%) received percutaneous drainage and/or surgical intervention. Physicians should be aware that iliopsoas abscess in hemodialysis patients can be caused by a variety of reasons.

Conclusion

We reported three cases of iliopsoas abscess in patients undergoing hemodialysis. The present cases and a summary of previous reports suggest that iliopsoas abscess can be caused by a variety of reasons in hemodialysis patients. Because hemodialysis patients are at a high risk of infection because of their immunocompromised state, physicians should pay close attention to infection prevention. If iliopsoas abscess is suspected, examinations such as CT, MRI, and blood culture sampling should be conducted promptly, followed by appropriate treatment with antibiotics and/or drainage.

Abbreviations

CT: Computed tomography; MRI: Magnetic resonance imaging; ESRD: End-stage renal disease; WBC: White blood cell count; CRP: C-reactive protein; CEZ: Cefazolin; MEPM: Meropenem; CMZ: Cefmetazole; CKD: Chronic kidney disease; CTRX: Ceftriaxone; TAZ/PIPC: Tazobactam/piperacillin; MNZ: Metronidazole.

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Author contributions

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Availability of data and materials

Not applicable.

Declarations

Ethics approval and consent to participate

This article does not contain any studies with human participants or animals performed by any of the authors. Written informed consent was obtained from the patient or the daughter of the patient for the publication of this case report and any accompanying images.

Consent for publication

Written informed consent was obtained from the patient or the daughter of the patient for the publication of this case report and any accompanying images.

Competing interests

The authors declare no conflict of interest.

Author details

[1]Division of Endocrinology, Metabolism and Nephrology, Department of Internal Medicine, Keio University School of Medicine, Tokyo, Japan. [2]Apheresis and Dialysis Center, Keio University School of Medicine, 35 Shinanomachi, Shinjuku-ku, Tokyo 160-8582, Japan. [3]Department of Urology, Keio University School of Medicine, Tokyo, Japan.

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